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PHYTOTHERAPEUTIC TREATMENT OF ALLERGIC RHINITIS IN AUTISTIC SUBJECT

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Abstract
        In this study the efficacy of a nasal spray based on extract of lemon pulp for treatment of allergic rhinitis in autistic subjects by nasal cytology was evaluated. The extract of lemon pulp was obtained by means of an innovative technology of solid-liquid extraction using Extractor Naviglio or Rapid Solid-Liquid Dynamic Extractor, that can extracts vegetable matrices of each species, by using different types of solvents (organic and/or inorganic liquids). Due to pressure-depressure action, by using water as extractive liquid it is possible to extract both hydrophilic and lipophilic substances contained in vegetables. The efficacy of the lemon based nasal spray has been tested on 20 young patients aged between three and eight years (10 males and 10 females, mean age 5.5 years). The cytology was performed by exfoliative technique, with a sterile swab soaked in sterile saline solution and then crawled on the middle part of the inferior turbinate. The collected sample was stained with the method of May-Giemsa Grumwald to highlight the morphological changes of the nasal epithelium before and after therapy based on nasal spray. Experimental data demonstrated that the anti-inflammatory effect of the lemon based nasal spray was a safe medical device as an aid in the reduction of inflammatory cells observed on rinocitogram. The lemon based nasal spray containing extract of lemon pulp can be used in all autistic patients, even in children, given the absence of alcohol.

Keywords: Autism, lemon pulp extract, allergic rhinitis, nasal cytology, nasal spray

Introduction
        Autism is a complex pathological form characterized by changes in behavior, communication and social interaction of the child with the presence also of stereotypy. This complex symptom is called "Autism". Although the exact cause of autism is not known, there are many theories that currently link autism to brain damage resulting in early neurocognitive damage. The exposure to toxic metals, environmental pollution and poor dietary habits may interact with genetic predisposing factors, characterized by immune dysfunction, gastrointestinal abnormalities, becoming an etiological factor. The diet, therefore, is the first reference of a correct therapeutic approach and should represent an opportunity for family members of self-analysis, aiming to optimize their relationship with food. The exclusion of gluten, casein, soy, sugar and yeast promotes a condition characterized by immune suppression, gastrointestinal symptoms, hyperactivity, lack of relationships. The autistic subject includes not only allergies in the gastrointestinal tract, but also in the respiratory tract which possible causes are to be found mainly in the increased environmental pollution and lack of movement. The optimization of respiration, leading to a reassessment of the hormonal

system, the production of endorphins, the compensation of energy, it would be very useful in these cases, but practically it is very difficult to induce the autistic children to engage in a program of breathing exercises.

In these cases it could be better to concentrate on rehabilitation with neuropsicomotoria exercises and speech therapy, making sure that you do not breathe through their mouths open during movement. In some studies a correlation has been shown between ASD mastocytosis and eosinophilia (1-3) pathological form complex that involves both the activation and proliferation of cutaneous mast cells, with the appearance of nettle-rash pigmentosa, both of other organs leading to skin reactions, food allergies, rhinitis, asthma, often in the absence of positive skin test (4,5). Mast cells and eosinophils are not only determinants for innate allergic reactions and acquired, but also for inflammations, being involved in the permeability of the tissue membranes (6-8). Some natural flavonoids such as quercetin and luteolin could inhibit the growing of mast cells and the release of inflammatory molecules. Particularly, quercetin can reduce oxidative stress in autistic subjects with the decrease in the level of lipid hydroperoxides and antioxidant enzymes. It was demonstrated that in rats subjected to stress as a result of forced swimming showed increased levels of corticosterone and hydro-peroxy lipids in serum, producing a severe oxidative damage to hypothalamic level. In this case, the administration of quercetin contrasted significantly the increase of these parameters and therefore can be considered useful for the prevention and treatment of oxidative damage induced by stress in the brain (9). Moreover, luteolin inhibits the production of microglia, reducing the inflammatory action of glial cells (10,11); it inhibits the release of cytokines and has neuroprotective action, for which may be useful in the treatment of neuroinflammatory diseases, alone or as adjuvant for other therapeutic approaches. Flavonoids, however, and in particular the luteolin, are lipophilic substances and are poorly absorbed after oral administration, being metabolized by the liver. Acute infections of the upper respiratory tract are common among autistic children as rhinosinusitis sinusitis, pharyngitis/tonsillitis, ear infections, laryngitis, rhinitis and allergic asthma. Asthma is one of the most common chronic diseases and a major cause of morbidity in children worldwide. The symptoms of asthma in children include recurrent episodes of wheezing, dry cough, chest tightness with inflammation and airway obstruction: triggering factors for the disease are atopy, allergens, infections, obesity, smoking.

The aim of this study was to examine the behavior of the nasal membrane in autistic subjects before and after treatment with nasal spray prepared from pulp of lemon.

Nasal cytology is of remarkable importance in the study of rhino-sinus diseases, especially the Vasomotor Rhinitis (VMR), as it represents a valuable means of differential diagnosis between allergic/non-allergic diseases and bacterial/viral infections. It is a popular and proven method, considering that it dates back to 1889, when Gollash (12) identified the numerous eosinophils in the nasal secretion from an asthmatic patient and attributed their presence a key role in the pathogenesis of asthma. The nasal cytodiagnosis was actually encouraged by the study of Charles Eyermann (13) in 1927, who identified the eosinophils in the nasal exudate of allergic patients and underlined its diagnostic importance.

Methods
Materials and instrumentation
Naviglio Estrattore® serie LAB mod. 500 cc. (Atlas Filtri srl, Padua, Italy); May-Grünwald- Giemsa Reagent (Carlo Erba, Milano,Italy); microscope (Nikon Instruments S.p.a., Florence, Italy); lemon extract 1% (w/v) titrated with citric acid 6% (w/v); pure Aloe Juice, essential oil of Ravensara, soluble Propoli WSEP-70®, essential oil of Niaouly (Intermedia Synergie s.r.l., Cernobbio, Como, Italy) were used in the preparation of nasal spray.

For the preparation of the extract of lemon pulp was used Extractor Naviglio® LAB series mod. 500 cc. (Atlas Filtri srl, Padua, Italy), demineralized water and 2 kg of lemons (about 12 lemons) following the procedure previously reported (21).The extract showed a pH between 3 and 3.5 and a citric acid content ranging from 6% to 7% (w/w); the juice of Aloe barbadensis Miller, Propoli WSEP-70® and small quantities of Ravensara Niaouly essential oil were added to obtain a nasal spray with no preservatives and no alcohol, suitable even for kids.

Protocol

Twenty patients were selected, relating to AIAS (Italian Association to Spastic Assistance) structure of Afragola, both male and female, mean age 5.5 years (min. 3 years, max 8), with autistic spectrum not in drug treatment. All parents of the patients have accepted the administration of the spray For all subjects after completion of the formalities, amnestic and objective examination was performed in the presence of the parents who helped to define the clinical picture of the subject, which has been designated a number from 0 (no symptoms) to 3 (presence of any allergic symptoms) during treatment was necessary in addition to the presence of the parents that qualified personnel to prevent panic attacks or bouts of hyperactivity, that are very difficult to manage.

The cytological sampling was performed by exfoliative technique, with a sterile swab soaked in sterile saline and then crawled on the middle part of the inferior turbinate. The material thus collected was then transferred onto a glass slide for microscopy by stretching thoroughly for stratify them in a thin layer and has subsequently been subjected to staining by following the method of May-Grunwald-Giemsa, preferred by us as able to color all the cellular components normally present in normal conditions or immune inflammation.

Observation with an optical microscope, Nikon Eclipse 200, into an immersion 1000x were perfermed; we proceeded to a reading for fifty fields, examining the entire surface of the slide to find cell phones with greater interest for the purposes of diagnosis (neutrophils, eosinophils, lymphocytes, mast cells).

The twenty autistic subjects were divided into two groups of ten. Group A who received the nasal spray: Lemon Extract 1% citric acid titrated to 6%, pure aloe vera juice, essential oil Ravensara, Propolis-soluble WSEP 70 ®, essential Oil Niaouli (two puffs - equal to 0.14 ml-3 times daily); Group B which has been administered an equal amount of isotonic saline solution (two puffs - equal to 0.14 ml-3 times day). It was first performed cytology based upon the inclusion of patients in the study. Nasal cytology control was performed for each subject after ten days treatment with nasal spray. Lastly we proceeded to rhinocytological control in all cases after 30 days of therapy. For the statistical evaluation of the experimental results was used the Wilcoxon-Two-Sample Test(t approximation), with an evaluation of statistically significant p = <0.05

Results

The evaluation of the rhinocytogram in autistic subjects, it is highlighted a rich neutrophilic component, with a discreet but constant representation of eosinophils and mast cells, in both group before the therapy. In all subjects examined of the group A, in the first ten days, was reported to be an improvement examination.

The topical administration of the spray lemon based showed at the end of therapy the almost complete disappearance of eosinophils and mast cells, with the persistence of some neutrophil and eosinophil granules and metachromatic very rare in the treatment period regard the group A, while in the group B there was not evidence of significative changes

(**TAB1**)
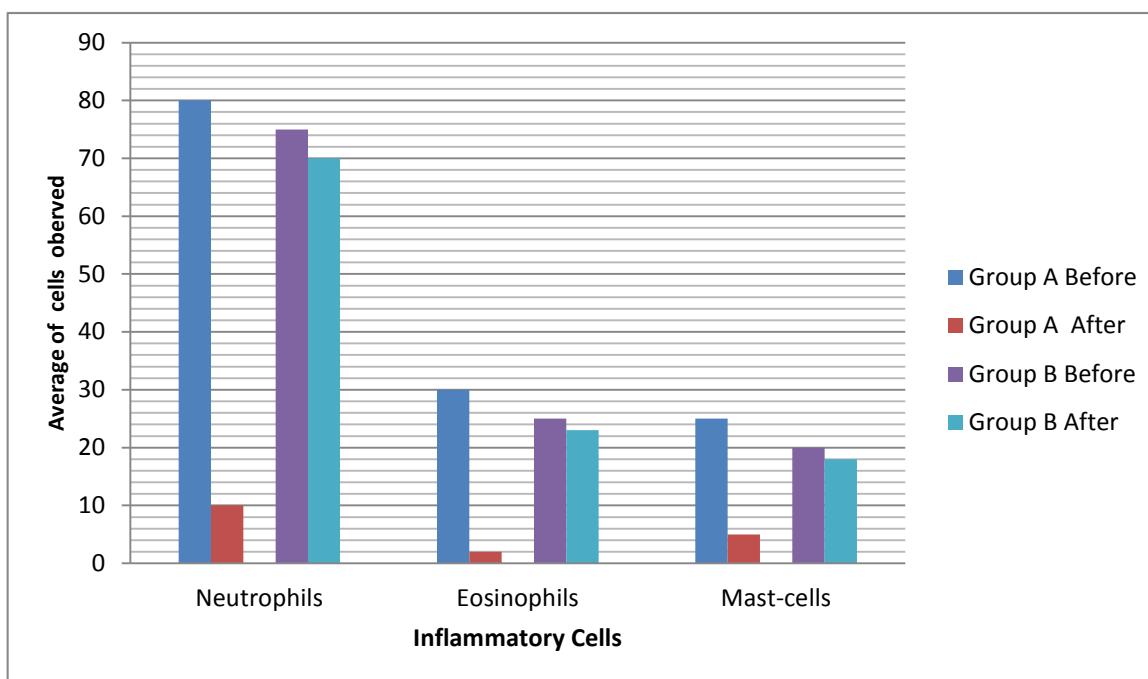
Table 1 Total progress of inflammatory cells for both group before and after therapy

It is therefore essential during treatment, constant toilet nasal washes or showers with saline solutions, in order to remove all the conditions conducive to the unfolding of the allergic reaction. Sometimes, for the severity and subjective symptomatology is necessary to increase the dose of the spray lemon-based, without however have side effects.

The analysis of rhinocytograms is in perfect correspondence with the clinical improvement reported by the parents. In fact, to an improvement of the overall symptom, has always corresponded to a reduction of the inflammatory cells of the nasal secretion. The improvement of the rhinocytological framework is given by control mechanisms due to the synergistic action of the natural substances present in the spray and still under study.

Although the cases are limited to draw conclusive remarks, the positive results to the likelihood that the spray has definitely anti-inflammatory action.

Discussion and Conclusion

The evaluation of the initial rhinocytograms group A ~~was~~ documented a rich neutrophilic component, with a discreet but constant representation of eosinophils and mast cells, in nine cases rare lymphocytes. In all subjects examined, in the first ten rounds, it was detected a clear regression of symptoms with adequate standards of objectivity and nasal symptoms individually, only in two cases it was necessary to increase the number of daily doses, because of allergic symptoms and persistent. At the microscopic observation, it was observed an absence of neutrophils and lymphocytes, with a reduction of more than 50% of eosinophils and mast cells. In some cases have been observed in rare degranulations eosinophilic and mast cells. At the end of therapy, all subjects A, equal to 100%, have reported a symptomatology individual equal to 0 (no symptoms). This has been confirmed by an examination local objective, which documented a clear improvement of the mucosa, both by rhinocitograms that has detected a reduction of mast cells (average 20.26 to 2.18; standard dev 19.56 to 3, 17) of eosinophils (mean 13.6 to 2.5; standard dev 16.4-6.38) neutrophils (average 37 to 1.74; standard dev from 55.21. 5.15) and lymphocytes (average from 5.32. to 0.88, standard dev 11.45 to 2.95) (p <0.01). Subjects in Group B did not show substantial improvements or cytological or symptom (p <0.01). Analysis of the results of our study follows that of people with autism, there is a greater susceptibility to colds phones and that

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the nasal cytology, a method we use is undoubtedly valid, as well as being well tolerated and easy to perform (12-16).

The shapes studied have documented a cytologic pattern represented by a significant proportion of neutrophils, eosinophils and mast cells pathognonomic of cellular forms (17-21). Lymphocytes are probably related to previous viral infections.

The main aim of our study was the assessment of the variation in cellularity nasal, in particular of those cells known for their involvement in the determination of the framework and of allergic complications in the course of local therapy with a nasal spray lemon based. The analysis of rhinocytograms are in perfect correspondence with the clinical improvement.

In fact, to an improvement of subjective symptoms, has always corresponded to a reduction of the inflammatory cells of the nasal secretion. The improvement of the framework rhynicitologic is given by control mechanisms due to the synergistic action of the natural substances present in the spray and still under study by the botanical.

There seems to say that the spray can be used in all those children, in this case autistic, in which the traditional therapy is contraindicated, due to the absence of alcohol-based substances. Moreover, we can argue that the nasal cytology may be a useful method and objective to assess, not only the phases of a clinical pathology rhinitis, but also for monitoring the effects of therapy on the component of inflammatory cells, the reduction of which is a guarantee of effectiveness therapeutic.

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PHYSICAL - CHEMICAL AND BACTERIOLOGICAL ANALYSIS OF THE RIVER DRINI I BARDHE

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Faton Maloku
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Abstract

Water quality in the River Drini i Bardhë is influenced by various factors. The main influence comes from urban leaks, discharges of pollutants from wastewater, as well as infiltration from agriculture, discharges from industries which perform their activities in the river basin of Drini i Bardhë.

The purpose of this work is to provide data on water quality of river Drini i Bardhë , based on physical chemical and bacteriological monitoring form broad source of river until the end flow in Kosova.

In this paper are analyses of physical chemical and bacteriological parameters in water of river Drini i Bardhë, such as temperature, specific conductivity, total hardness, dissolved oxygen, potassium permanganate value, turbidity, nitrites, ammonia, phosphates, iron, manganese as well as bacteriological parameters, such as total number of coliform bacteria in 100 ml, fecal originating coliform bacteria in 100 ml, the total number of aerobic mesophilic bacteria.

Water samples were analyzed in physical chemical and bacteriological laboratory, with methods like volumetric method, atomic absorption method (AAS), spectrophotometric methods, etc.

During this research parameters that were measured are physical chemical and bacteriological and they were presented in tables. They are considered important indicators in the river Drini i Bardhë and they indicate an elevated presence of all the parameters due to several tributary river inflow into the river Drini i Bardhë. In these statements of test results is given a general water quality of the river Drini i Bardhë relying on the based on chemical, physical and bacteriological contamination that show the quality of the river Drini i Bardhë as consequence of urban and, pollutant dischargers..

Keywords: River, Drini i Bardhe , physical - chemical and bacteriological parameters

Introduction

Drini i Bardhe is river that crosses the western part of Kosovo, respectively Dukagjini flat. River Drini i Bardhe originate from Radavc cave of Rusolia mountain, at 586 m above sea level, before it descend in plane and joins with river Drini i Zi near town of Kukes forming river called DRINI that in ancient times was known as *Drillon*.   At of source it has 30 m per second. Surface of White Drin basin is 4265 km2 in Kosovo. Tributaries of Drini are Peja Lumbardhi, Erenik, Prizren Lumbardhi.

Waters of River Drini i Bardhe constitute a substantial part of the hydrographic network of Kosovo and represent a great wealth of our country.

The main influence on the White Drin pollution is from urban discharges of pollutants from wastewater, also infiltration from agriculture, discharges from industries that perform their activities in the river basin of river Drini i Bardhe.

The purpose of this work is to provide data on water quality of river Drini i Bardhe , based on physical chemical and bacteriological monitoring form broad source of river until the end flow in Kosovo.

Materials and methods

In this paper are analyses of physical chemical and bacteriological parameters in water of river Drini i Bardhë, such as temperature, specific conductivity, total hardness, dissolved oxygen, potassium permanganate value, turbidity, nitrites, ammonia, phosphates, iron, manganese as well as bacteriological parameters, such as total number of coliform bacteria in 100 ml, fecal originating coliform bacteria in 100 ml, the total number of aerobic mesophilic bacteria.

Sampling was made on 26 January 2013, where the air and water temperature was low. Sampling locations were chosen based on those sites where pollution is expected, close to restaurants, traffic etc. 1 liter of water were taken as sample.

Water samples were analyzed in physical – chemical and bacteriological laboratory with: volumetric method, atomic absorption method (AAS), spectrophotometric methods, etc.

Results

Tabele no 1.Results of physical-chemical and bacteriological analysis of river Drini i Bardhe

Data: 26.01.2013		Radavc	River Kline-Drini			River Mirush-Drini		
Parametres		I	II	III	IV	V	VI	VII
A. Physical - chemical	h	8:45h	09:50 h	11:10 h	11:20 h	12:00 h	12:10 h	12:20 h
Temperatura e ajrit	^{0}C	-4	-3.8	-3.5	-3.5	-3	-3	-3
Temperatura e ujit	^{0}C	4.8	5.2	5.2	5.2	5.4	5.3	5.3
Turbullira	NTU	0.69	5.17	3.98	4.05	3.65	3.75	3.69
Vlera e pH-së	-	7.61	7.92	7.68	7.76	7.78	7.77	7.77
Hargjimi i KmnO$_4$	mg/dm^{3}O$_2$	2.84	6.32	6	6.32	5.68	5.68	6
Perquesh. Spec.	µs/cm	285	397	324	316	321	364	343
Fortesia. Totale	°dH	7.14	8.12	8.4	8.12	7.84	8.12	8.12
Mbetja pa avu.	mg/dm^3	171	238.2	194.4	189.6	192.6	218.4	218.4
Kloruret	mg Cl$^-$/dm^3	7.09	11.69	8.5	9.21	9.92	8.5	9.21
Oksigjeni i tretur	mgO$_2$/dm^3	12	11.3	11.5	11.4	11.3	11.8	11.7
Amonjaku,N-NH$_3$	mgN/dm^3	0.08	0.15	0.12	0.18	0.14	0.17	0.16
Nitritet, N-NO$_2^-$	mgN/dm^3	0.003	0.015	0.015	0.017	0.013	0.014	0.012

Nitratet, N-NO$_3^-$	mgN/dm^3	0.045	0.22	0.22	0.25	0.195	0.21	0.18
Fosfatet	mgP/dm^3	0.19	0.29	0.25	0.28	0.27	0.26	0.25
Hekuri	mgN/dm^3	0.04	0.16	0.1	1.1	0.15	0.13	1.4
Mangani	mgMn/dm^3	0.009	0.028	0.02	0.027	0.026	0.017	0.021
Parametrat Bakteriologjik								
Bakteret totale coliforme		20	80	150	150	100	150	130
B.colif prejardhje fekale		-E.coli	-E.coli	-E.coli	-E.coli	-E.coli	-E.coli	-E.coli
Nr. i b.aerobe mezofilike		30	120	200	200	150	200	180

Tabele no 2.Results of physical-chemical and bacteriological analysis of river Drini i Bardhe

Data: 26.01.2013		Lumbardh i D.-Drini			Ereniku-Drini			Lumbardh i P.-Drini		
Parametres		VIII	IX	X	XI	XII	XIII	XIV	XV	XVI
	h	13:00h	13:15h	13:30h	14:30h	14:45h	15:00h	16:00h	16:20h	16:40h
Temperature air T°C	^{0}C	-2.8	-2.5	-2.5	-2.5	-2.5	-2.7	-3	-3	-3
Temperature water T°C	^{0}C	5.2	5.3	5.2	5.4	5.4	5.4	5.3	5.3	5.5
Turbidity	NTU	3.16	4.52	4.23	5.06	4.67	4.82	4.83	5.01	4.94
pH value	-	7.68	7.82	7.8	7.89	7.83	7.85	7.86	7.81	7.84
KMnO$_4$ value	mg/dm^3 O$_2$	5.37	5.68	6	7.26	6.32	3.79	6.95	6.32	6.16
Electr.conductivity	µs/cm	311	375	369	408	389	399	321	379	362
Total hardness	°dH	7.56	8.4	8.12	8.68	8.4	8.12	8.12	8.4	8.12
Dry residue	mg/dm^3	186.6	225	221.4	244.8	233.4	239.4	192.6	227.4	217.2
Chlorides	mg Cl$^-$/dm^3	9.21	8.5	8.8	12.4	9.92	10.63	11.69	9.21	9.92
Dissolved oxygen	mgO$_2$/dm^3	11.9	11.7	11.7	11.6	11.8	11.4	11.5	11.7	11.8
NH4 + ammonium	mgN/dm^3	0.11	0.12	0.12	0.19	0.22	0.14	0.21	0.19	0.16
Nitrites(NO$_2$)	mgN/dm^3	0.011	0.012	0.012	0.02	0.012	0.016	0.018	0.014	0.015

Nitrates NO_3	mgN/dm^3	0.165	0.18	0.18	0.3	0.18	0.24	0.27	0.21	0.22
PhosphatePO$_4$	mgP/dm^3	0.23	0.27	0.25	0.29	0.26	0.27	0.28	0.24	0.25
Iron(Fe)	mgN/dm^3	0.09	0.14	0.12	0.19	0.15	0.16	0.17	0.16	0.15
Manganese(Mn)	mgMn/dm^3	0.025	0.017	0.024	0.035	0.024	0.023	0.027	0.024	0.025
Bacteri.indicators										
Total no. coliform		120	140	150	150	100	170	130	150	140
E.coli		-E.coli	-E.coli	-E.coli	-E.coli	-E.coli	-E.coli	-E.coli	-E.coli	-E.coli
Total no. of viable bac.		150	180	200	200	150	250	180	200	180

Diagram no.1: Turbidity, pH value, KMnO$_4$ value.
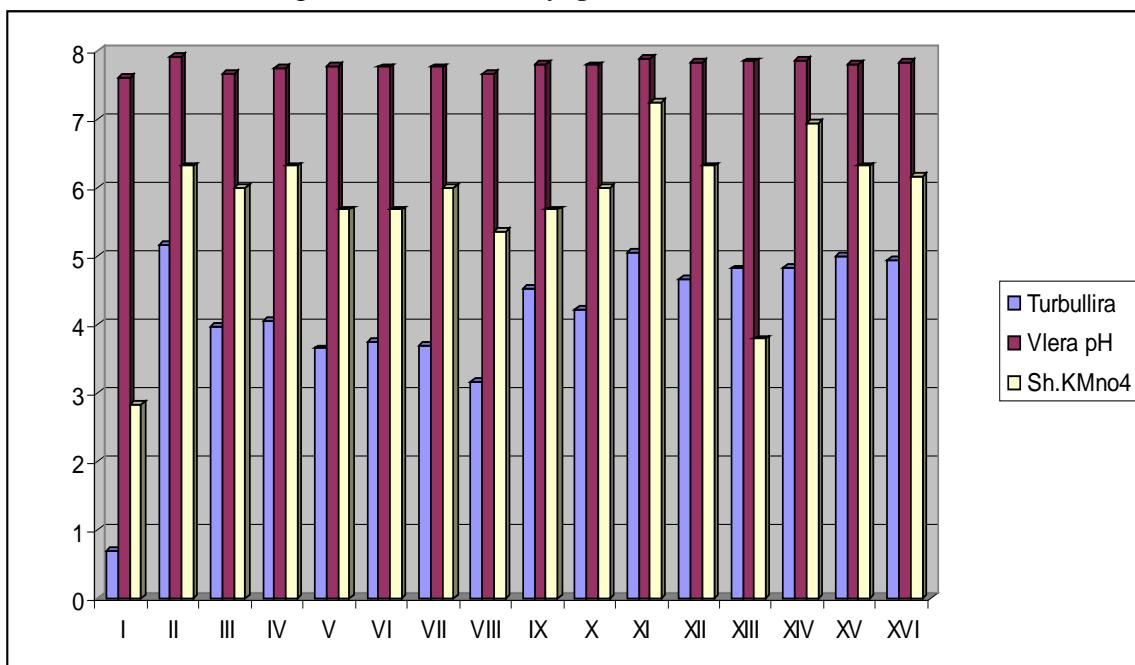
Diagram no.1: Iron(Fe), Manganese(Mn), NH4 + ammonium, Nitrites(NO$_2$), PhosphatePO$_4$
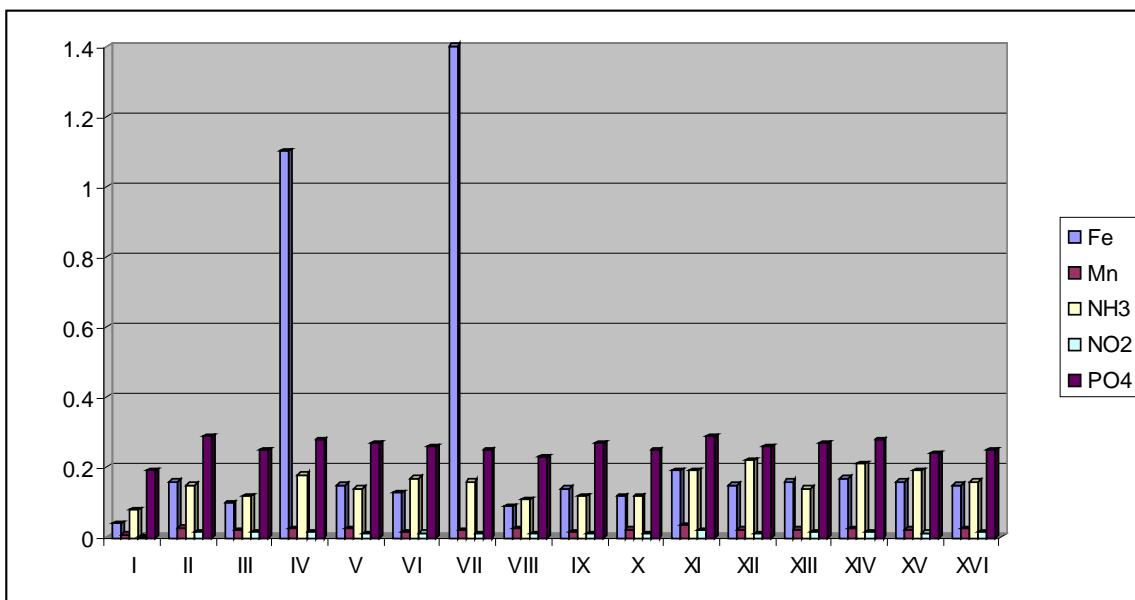
Discussion

During the winter season of 2012, were performed physical chemical and bacteriological analyses, in 16 locations of river Drini i Bardhë. Analyzed parameters were: temperature, turbidity, pH value, total hardness, dissolved oxygen, KMnO4 vakue, nitrite, manganese, iron, ammonia, phosphates, etc..

Water temperature is an important parameter, the results of the analysis show that there are differences from the first location with temperature 4.8 ° C up to highest temperature of 5.5 ° C.

Turbidity ranges from 0.69 NTU on first location up to 5.17 NTU on the second location.

Dissolved oxygen in water varies from 11.3-12 mg / l, indicating that the amount of oxygen is high due to the low water temperature.

The pH value results from 7.61 to 7.92; result presented show that the pH value is not increased much.

Potassium permanganate value is lowest in the water at location 1 (2.84 mg / l) and highest in the location 11 (26.7 mg / l).

Nitrites range from 0.003 mg / l in the first location up to 12:02 mg / l in the location eleven.

Ammonia values were lowest in the location one (0.08 mg / l), while the highest values were in location twelve (0.22 mg / l).

Conclusion

Based on research done in the river Drini i Bardhe , in January 2013, we can draw the following conclusions:

Water samples of river Drini i Bardhe were analyzed in order to determine the physical-chemical and bacteriological parameters, as well as some elements that can be found in traces.

In the results of test is given a general water quality of the river Drini i Bardhe based on chemical, physical and bacteriological results that show the contamination of river Drini i Bardhë as consequence of urban discharges of pollutants from wastewater etc

It is recommended that the governmental institutions exercise their responsibility to institutions for preservation of water, so that:
-     to monitor waters;
-     to gradually decrease pollution, degradation and other activities that pose grate risk to the water environment;
-     Protection of water should be based on the gradual introduction of European Union Standards.

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ASSESSMENT, MONITORING AND PROTECTION OF GROUNDWATER POLLUTION IN URBAN AREAS - *CORDOBA CITY - ARGENTINA*

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Abstract

Urbanization increases the impervious surfaces. These impervious surfaces result in increased storm-water runoff, which consequently carries with it any dirt, chemicals, or pollutants which have been dripped, spilled, or leaked into these surfaces. Whether the runoff eventually percolates into the ground or enters a nearby stream or Wadi, the carried pollutants will eventually reach and contaminate the groundwater. On the other hand, activities such as improper waste disposal and neglected cesspits can also contaminate the watershed groundwater resources.

The main objective of this research is to develop guidelines for governments, water managers, spatial planners and environmental managers in order to understand the impacts of polluting activities on groundwater resources in urban catchments and use them in order to develop strategies for groundwater protection.

Aquifer under Cordoba City consists of Quaternary sediments with moderate hydraulic conductivity. Groundwater chemistry shows high concentrations of Sulphate and Chloride. In some industrial areas, concentrations of Nitrates, Arsenic, Fluorine and Bacteria Coliformes exceed tolerable limits. Major sources of pollution are urban wastewater, urban storm water, solid waste disposal sites. Analysis shows that urban storm waters consist of very high concentrations of TSS, BOD, COD, $N-NH^{4+}$, $N-NO^{3-}$, and PO^4.

The vulnerability map of Cordoba city shows zones of moderate and high vulnerability. The DRASTIC index has values ranging from 101 to 193.

Aware of the need to more extensive knowledge for the protection of the groundwater resource, a hydro geological modeling of the phreatic aquifer was made by means of the MODFLOW code in order to study the dynamics of the groundwater system and have a tool for future predictions.

Keywords: Groundwater, pollution, monitoring , urban areas

Introduction

The combined forces of population growth and urbanization are creating rapid population growth in urban areas. By 2030, the urban population will have risen to 5 billion, 60 per cent of the world's population. Growing cities are the engines of the world's economic development. One of important resources to sustain urban growth is water resources.

Groundwater has historically provided a locally available low-cost source of water for public supply and domestic use. As groundwater is generally of good quality and requires less treatment, groundwater is increasingly being exploited in preference to surface water for drinking water supply.

Apart from the problem of the over-exploitation, groundwater pollution in urban areas is a growing environmental problem in the world. Worldwide, surface water and shallow groundwater have been found polluted from diffusive sources of intensive agricultural activities and urban runoff. Direct waste water discharge and solid waste disposal from rapid urbanization and industrialization have polluted many rivers and groundwater. In developing countries, groundwater pollution commonly results from indiscriminate disposal of municipal and industrial wastes, extensive use of on-site sanitation systems and urban agriculture. Urban areas include a wide diversity of land uses. The increased diversity and intensity of these land uses generate a wider variety of pollutants at higher concentrations than are found in rural or wild land areas.

Urbanization creates serious challenges for protecting water quality and aquatic ecosystems. The management and control of water quality within large urban catchment demand an integrated and interdisciplinary approach. With the increasing pressures on groundwater resources, strategies for protecting urban groundwater should be formulated based on unbiased scientific information from monitoring and assessment of groundwater quality.

Groundwater is increasingly used for urban water supply in Argentina. Pollution sources generated in urban areas are threatening groundwater quality. The research project on urban groundwater pollution and protection will contribute to better understanding of potential groundwater pollution problems and development of effective strategies for groundwater resources protection.

The main objectives of the research programme were envisaged as:

- To identify most hazardous pollution sources so that a priority list can be established for controlling and mitigating pollution sources;

- To assess groundwater vulnerability to pollution so that the resulting vulnerability map can be used for better urban land use planning for preventing potential groundwater pollution;

- To propose a groundwater quality monitoring program so that hazardous groundwater pollution can be detected in an early time;

- To develop guidelines for groundwater protection so that policy makers, water managers, spatial planners, environmental managers and public can all contribute to groundwater resources protection and sustainable use.

Main Text

A general research framework is presented in Figure 1. A conceptual understanding/model of hydrogeological system should be established to understand how the groundwater system is believed to behave. It serves the basis to assess groundwater vulnerability to pollution, to identify possible pathways of pollutant transport to groundwater, and to interpret the monitoring results to assess the quality status of the groundwater system.

Chemical characteristics and processes in the unsaturated zone have profound impacts on retardation and degradation of pollutants. The spatial variations of groundwater quality may be caused by differences in land uses, geological settings, climate variations, and hydrological conditions. All these factors are combined to create a groundwater vulnerability map. Investigation of sources of groundwater pollution is necessary to identify potential threats of groundwater pollution. The combination of vulnerability mapping and pollution sources rating leads to the assessment of groundwater pollution risk. The groundwater pollution risk map serves the basis to locate important sites for groundwater quality monitoring. Groundwater samples can then be taken to assess groundwater quality status. All these assessments will contribute to formulating effective strategies for groundwater resources protection.
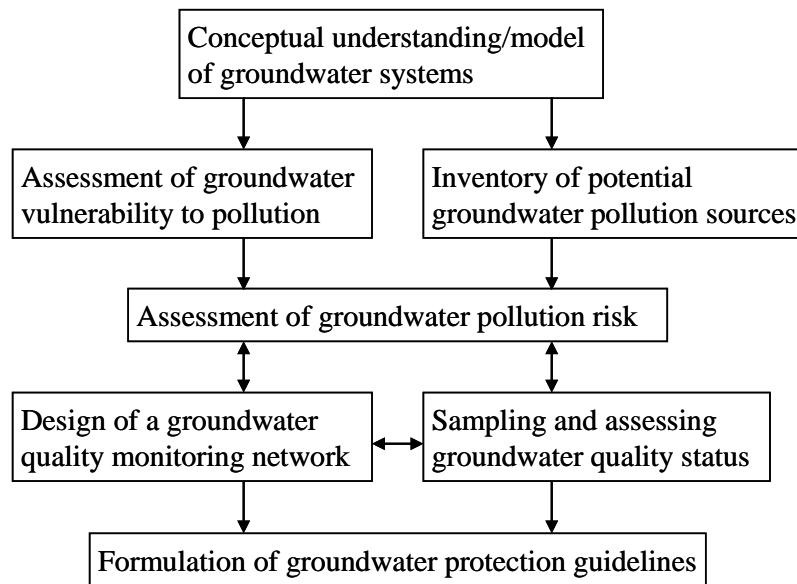
Figure 1 Framework for conducting monitoring, assessment and protection of groundwater resources.

Inventory of pollution sources.

All existing and potential sources of groundwater pollution should be identified using a protocol of pollution source inventory and evaluated using some rating methods (Zaporozec, 2004). The sequence of methods for inventory of pollution sources used by U.S. EPA (1991) is presented in Figure 2.
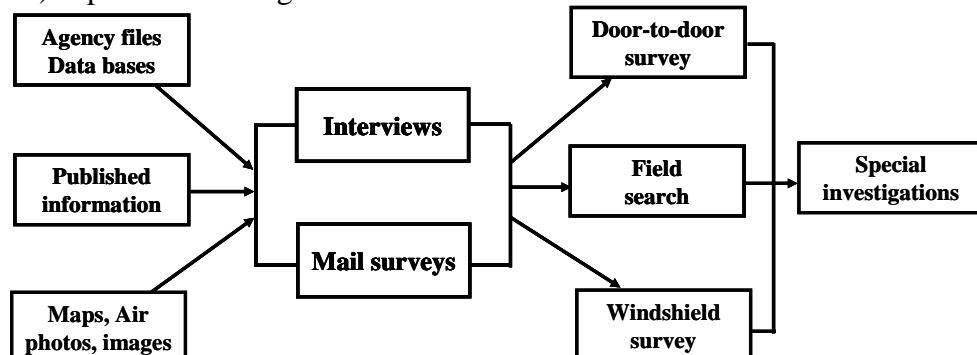
Figure 2 Sequence of methods for pollution sources identification (US EPA, 1991)

The following pollution sources were investigated:
- Domestic wastewater
- Industrial wastewater
- Urban storm water
- Solid waste disposal sites
- Polluted rivers/sewer drains
- Diffusive sources

Vulnerability assessment.

The concept of groundwater vulnerability is based on the assumption that the soil-rock-groundwater system provides some natural protection to groundwater against human impacts, especially with regard to contaminants entering groundwater from land surface. Over the last 20 years many methods for vulnerability assessment have been developed

(NRC, 1993; Vrba and Zaporozec, 1994). The most widely used methods are overlay and index method called DRASTIC (Aller et. Al., 1987), and newly developed European approach (Zwahlen, 2003) for Karst aquifers.

Drastic index method

DRASTIC is a standardized system developed by U.S. EPA for the evaluation of the groundwater pollution potential. The name DRASTIC is taken from the initial letters of the 7 hydrogeological factors used to evaluate the intrinsic vulnerability of aquifer systems:
- D= Depth to water table,
- R= net Recharge,
- A= Aquifer media,
- S = Soil media
- T = Topography
- I = Impact of vadose zone
- C = hydraulic Conductivity

Each factor is assigned a rating ranging from 1-10, according to the proportion of the degree of vulnerability. Then, the rating is multiplied by a weight to reflect the importance of this factor to the vulnerability. The DRASIC index is made up of the sum of the products of rating and weights of the seven factors:

DRASTIC index = DRDW+RRRW+ARAW+SRSW+TRTW+IRIW+CRCW

Where:

R =Rating ,W = Weight

The higher the DRASIC index is, the greater the groundwater pollution potential. The index is usually classified into 5 vulnerability categories (very high, high, moderate, low, and very low). The method is suited to implement in a GIS environment using map overlay method (Evans and Myers, 1990). The resulting DRASTIC map is a relative indictor of groundwater vulnerability to pollution. The method is widely used in USA for state-wide groundwater vulnerability assessment. DRASTIC method has been applied to Cordoba.

Design of groundwater quality monitoring networks.

Methods for designing groundwater quality monitoring networks depend on the objectives of the monitoring. An overview of methods is shown in Table 1.

Table 1 Methods for designing groundwater quality monitoring networks

Objectives of monitoring	Design methods	Sources of information
Assessment of groundwater quality status	Stratified random site selection	USGS (Scott, 1990)
	Arithmetic mean and confidence interval	EU WFD (2001)
Monitoring of diffusive source pollution	Groundwater pollution risk map	IHP-VI (2004)
	Prospective monitoring	US EPA (1998)
Monitoring of point source pollution	Detection monitoring system	US EPA (1992)
Sampling frequency	Power of trend detection	Zhou (1995)
	Regression test	EU WFD (2001)
	Conceptual system	EU WFD (2003)

The groundwater pollution risk map and detection monitoring system were used to propose groundwater quality monitoring networks for the study area.

Formulation of groundwater protection guidelines.

Table 2 lists possible strategies for groundwater resources protection. The current practices in this study case were analyzed. Proposals for improvement were formulated.

Table 2 Groundwater resources protection strategies

Strategy	Methods	Actions
Prevention of groundwater pollution	Reduction of pollution sources	Integrated land use planning; re-use of waste products and wastewater; treatment of solid wastes and wastewater, etc.
	Mitigation of pollution risk	Reduction of agricultural chemical use; isolation of waste disposal sites and storage, etc.
	Protection of wellhead and water supply sources	Delineation of protection zone; restriction of pollution activities in the protection zone.
Institutional framework	Governments	Policy, regulation, standard settings, and law enforcement.
	Private sectors	Use of clean technology, adoption of environment-friendly approach.
	NGOs	Monitoring, information campaigning, etc.
Legislation	Water law	Definition of basic water quality standards
	Pollution prevention law	Directives for isolation of pollution sources; restrictions in land use; Penalty measures.
	Safe drinking water act	Dinking water standard; delineation of protection zone; restrictions in protection zone.
Public awareness	Workshop of stakeholders	Information dissemination; Acceptance of protection measures.
	Public information campaigning	Posters; brochures; games; roleplays; outreach to school students.

Conclusion

Due to the time and financial constraints, assessments were made mainly based on the available data collected from various government agencies and survey organizations. Limited urban runoff samples and groundwater samples were taken for the analysis of pollutant concentrations. Table 3 summarizes main outputs of the research from the study case.

Table 3 Main outputs of the research

Research themes		Cordoba city
Inventory of pollution sources	Identified potential sources	100 solid waste disposal sites 50 wastewater discharge outlets 100 ha irrigated area
	Pollution sources map	Map of point and diffusive sources of

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		pollution
Vulnerability assessment	Thematic maps	7 thematic maps
	Vulnerability map	DRASTIC index map
Pollution risk assessment		
	Validation	10 Samples Main pollutants:
Design of groundwater monitoring network	Selection of monitoring sites	100 monitoring wells
	Samples analysis	100 groundwater samples 100 urban runoff samples
Guidelines design for groundwater protection	Protection strategy	Prevention Institution Regulation

Cordoba City

Aquifer under Cordoba City consists of Quaternary sediments with moderate hydraulic conductivity. Groundwater chemistry shows high concentrations of Sulphate and Chloride. In some industrial areas, concentrations of Nitrates, Arsenic, Fluorine and Bacteria Coliformes exceed tolerable limits. Major sources of pollution are urban wastewater, urban storm water, solid waste disposal sites. Analysis shows that urban storm waters consist of very high concentrations of TSS, BOD, COD, $N-NH^{4+}$, $N-NO^{3-}$, and PO^4.

The vulnerability map of Cordoba city shows zones of moderate and high vulnerability. The DRASTIC index has values ranging from 101 to 193. The DRASTIC index in the northern and shourthen part of the area is minimum and the value increases towards center of the area attaining maximum values near Suquia River and Cañada stream. In the study area it is possible recognize two levels of vulnerability: moderate vulnerability with values to 101 to 159 in the most part of the city and highly vulnerable area for ground water pollution near the Suquia river and cañada stream with values from 160 to 230.
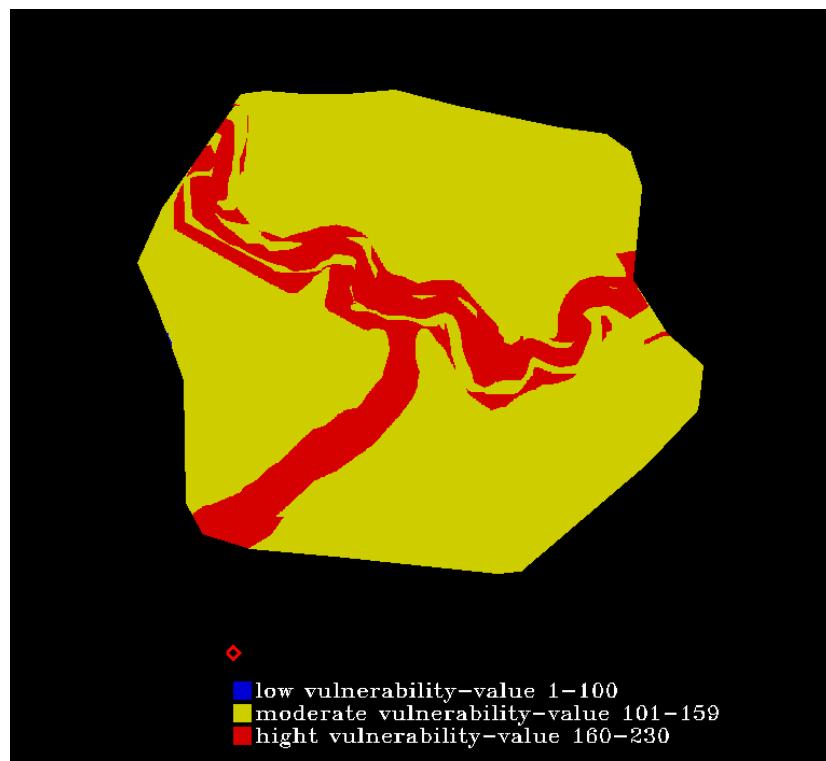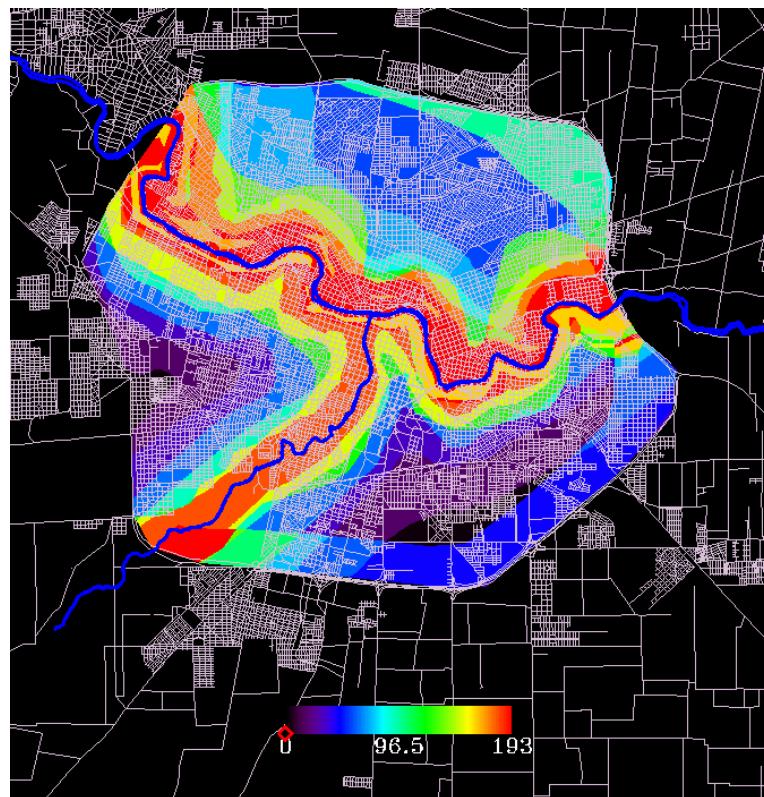
Figure 5 DRASTIC index vulnerability map of Cordoba city

Groundwater is not used for drinking water supply in Cordoba city. There is no systematic groundwater quality monitoring in the area. However, groundwater is used for

industrial water supply and will be used to supplement domestic water supply in future with increasing water demand and during low flow of surface water. A groundwater quality monitoring network is recommended for the assessment of groundwater quality and identify potential place of groundwater supply sources.

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DISTURBED HOMEOSTASIS OF SOME INORGANIC ELEMENTS ASSOCIATED WITH CHRONIC EXPOSURE TO LOW LEVELS OF BENZENE AND POSSIBLE ASSOCIATED HEALTH HAZARDS

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Abstract

Objective: Moderate and long-term exposures to benzene carry the risk of numerous health problems. Involvement of inorganic elements in such hazards has been suggested, but their role in problems resulting from occupational exposure to low-level benzene has not been reported.

Methods: An all male cohort of 60 healthy control subjects and 180 individuals occupationally chronically exposed to low levels of benzene in their daily activity was enrolled in the study. Nineteen elements were determined in plasma and RBCs.

Results: Higher levels of lead, mercury and cadmium were found in the plasma and RBCs of benzene-exposed workers, while the levels of zinc, selenium and copper were lower. Cobalt showed only a small but significant increase. There were no significant differences between other assayed elements in exposed workers and control subjects. Exposure to benzene was found to cause oxidative stress with significant elevation of plasma MDA level and decrease in total antioxidant activity. There was also a tendency for a higher degree of hemolysis in blood samples.

Conclusion: All of the accumulated metals are proposed to contribute to oxidative stress by different mechanisms. They are either redox-active, directly involved in the production of free radicals, or are redox-inert, and contribute to oxidative stress by inhibiting antioxidant defense. The effect of excessive production of free radicals on RBCs membrane may explain the tendency for hemolysis in blood samples from benzene-exposed subjects. Metals with decreased concentrations may cause other metabolic disturbances and accelerate free radical production, probably through decreased participation in antioxidant protection.

Keywords: low level benzene contamination, metal homeostasis, oxidative stress

Introduction:

Moderate and long-term exposure of humans to benzene may cause numerous untoward effects. The most serious health hazards in these cases appear to be of hematologic, immunologic, genetic and malignant nature (Savitz & Andrews,1997;Rimsky, et al., 1981; Aksoy,1988; Cooper &Snyder, 1988). Although the involvement of trace metals in such conditions has been suggested (Valco, et al., 2005), disturbances in trace elements homeostasis and their contribution to health hazards resulting from chronic exposure to benzene have not been documented.

Metals and other inorganic elements play important roles in a wide variety of biological processes of living systems. Several essential transition elements, such as zinc, magnesium, iron, copper, cobalt and manganese participate in the control of various metabolic and signaling pathways. However, their rich coordination chemistry and redox properties are such that they are capable of escaping out of the control mechanisms, such as homeostasis, transport, compartmentalization, and binding to the designated tissue and cell constituents. Breakdown of these mechanisms has been involved in a large variety of diseases (Halliwell & Gutteridge,1990; Halliwell & Gutteridge,2007; Jomova & Valko,2011), as it may lead to the metal binding to protein sites other than those designated for that purpose or to displacement of other metals from their natural binding sites (Valco, et al., 2005; Nelson, 4999).

Disruption of metal homeostasis is known to modulate gene expression by interfering with signal transduction pathways. This action may lead to uncontrolled metal-mediated formation of free radicals participating in the modification of DNA bases, enhanced lipid peroxidation and altered sulfhydryl homeostasis (Gutteridge,1995; Valko, et al., 2007). Metals may interfere with deregulation of cell proliferation by activating various transcription factors controlling cell cycle progression and apoptosis (Evan & Vousden, 2001), and play important roles in cell growth and development (Valko, et al., 2006). Humans may be exposed to redox-inert elements such as cadmium, and arsenic, which have no known biological function and are even known to be toxic at low concentrations. Exposure to these elements arises from a variety of natural sources, including air, drinking water and food. While redox-active metals undergo redox-cycling reactions, the primary route of toxicity and carcinogenicity for the group of redox-inert elements is depletion of glutathione, bonding to sulfhydryl groups of proteins and other mechanisms of action (Speisky, et al., 2008; Sinicropi, et al., 2010; Peralta-Videa, et al., 2009).

Searching available literature for disturbances in redox-active or redox-inactive metals as a result of chronic exposure to low level benzene was negative. Whether some of the deleterious effects of chronic exposure to benzene in the environment could be attributed, at least in part, to disruption of metal homeostasis has not been reported. The present study was undertaken to investigate the possible disturbance in homeostasis of some elements and their distribution between plasma and erythrocytes as a consequence of chronic exposure to benzene-contaminated work environment. The relation between the changes in metal homeostasis and oxidative stress was also considered.

Subjects, Material and Methods:

An all-male cohort of 240 individuals, from different districts of Alexandria, was recruited to participate in the present study. This cohort included 60 healthy individuals that served as a control group and 180 individuals occupationally chronically exposed to low-levels of benzene in their daily activity during routine work. A small group worked in printing shops and the rest were involved in work related to the automotive industry like gas station and car wash attendants, car body-shop repair employees, mechanics or drivers. All participants were of the same socio-economic standard with similar living conditions and dietary habits. Exclusion criteria from the cohort included individuals suffering from endocrine diseases like diabetes or thyroid dysfunctions. The Ethics Committee of the Medical Research Institute, Alexandria University; approved the study protocol and all experimental procedures are in accordance with the Helsinki Declaration of 1975, as revised in 1983.

After explaining the objectives of the project and obtaining consent, a 10 ml blood sample was withdrawn over heparin from each individual by qualified personnel. One part of the sample was used fresh for assessment of oxidative stress by estimating total plasma

antioxidant activity and determining the level of malondialdehyde (MDA) as a measure of lipid peroxidation (Satoh , 1978; Ohkawa , et al., 1979).The remaining part of each blood sample was centrifuged and plasma and RBCs were separated. The percentage of hemolysis in the withdrawn samples was also determined (Roper, 2001). Thirteen metals were determined in plasma and RBCs of the collected samples: copper, cobalt, chromium, selenium, cadmium, aluminium, mercury, lead, rubidium, magnesium, manganese, zinc and tin. Six other non-metals were also determined; sodium, potassium, lithium, calcium, phosphorus and boron. All elements were assayed using methods and conditions of metal assays(Elnimr, 1993). All values are presented as the mean ± standard deviation and were analyzed by Statistical Package for Social Science (SPSS) version 10. Paired t-test was used to compare two mean parameter values for the same element and the level of significance was set at P value of 0.05 or less.

Results:

Benzene-exposed workers were found to be under oxidative stress. There were significant elevations of plasma MDA level, and decrease in plasma total antioxidant activity as compared to control values. The average MDA level was 45.7% higher in the exposed group as its value was 2.01±1.62 mmol/L as compared to1.38± 1.27 mmol/ L for controls, while the mean plasma total antioxidant capacity (0.90+0.64 mmol/L) was 36.6% lower than the corresponding control values (1.42±0.54 mmol/L). A higher degree of hemolysis was observed in the blood samples from benzene-exposed individuals. While the degree of hemolysis ranged between zero and 2% (mean 1.4%) in control samples, it averaged about 5.2% in the exposed individuals, reaching values as high as 9 to10% in some cases.

In the plasma and RBCs samples from exposed workers, the levels of seven of the assayed elements were found to be statistically different from controls. The levels of lead, mercury, cobalt, and cadmium were higher, and on the other hand, the concentrations of zinc, selenium and copper were lower [Figures 1 and 2]. All other assayed elements in exposed workers had the same mean values in the plasma and RBCs as control subjects. As presented in Figure-1, mercury concentration in the plasma of controls was 0.73± 0.12 and 1.12±0.18 µg/L in the exposed group, while it was 2.10±0.55 and 3.10±0.72 µg/L in the RBCs. Such increases were 53.4% and 47.3% respectively. Compared to control values; cadmium was 83.1% and 13.3% higher in the plasma and RBCs of the exposed group respectively, while cobalt showed only a small but statistically significant increase ranging between 15% and 17% in plasma and RBCs.

As shown in [Fig. 2], lead had concentrations in the plasma of exposed workers averaging 88.9±15.6   and 292.2±48.1 µg/L in the RBCs, which were 77.7% and 88.9% above mean control values of 50.04±9.48 µg/L and 161.49±50. µg/L, for plasma and RBCs respectively. On the other hand, lower levels of copper were found in the plasma of the benzene-exposed group, as it decreased by 43.4% from 1246.1±66.52µg/L to 704.90±70.79 and by 41.2% in the RBCs, which decreased from 1215.22±67.55 µg/L to 714.20±100.78 µg/L. Deficiency in two other metabolically important elements; namely zinc and selenium, was clearly evident in the blood of the benzene exposed group. Zinc, which is almost equally distributed between plasma (1056.84±35.11 µg/L) and RBCs (992.32±13.82 µg/L) in control subjects decreased by35.7% to 680±67.11 µg/L in the plasma and by 31.9% to 675.73±35.26 µg/L in the RBCs of exposed persons. Deficiency in selenium was also detected as a result of chronic exposure to benzene. Its level in plasma was 150.95+15.49 µg/L, which was lower than that of controls (243.33+7.14 µg/L) by 38.0%. In the RBCs, the level in the exposed group averaged 153.90+11.36 µg/L. This value was 34.8% below the mean of the control group, which was 235.95+5.64 µg/L.
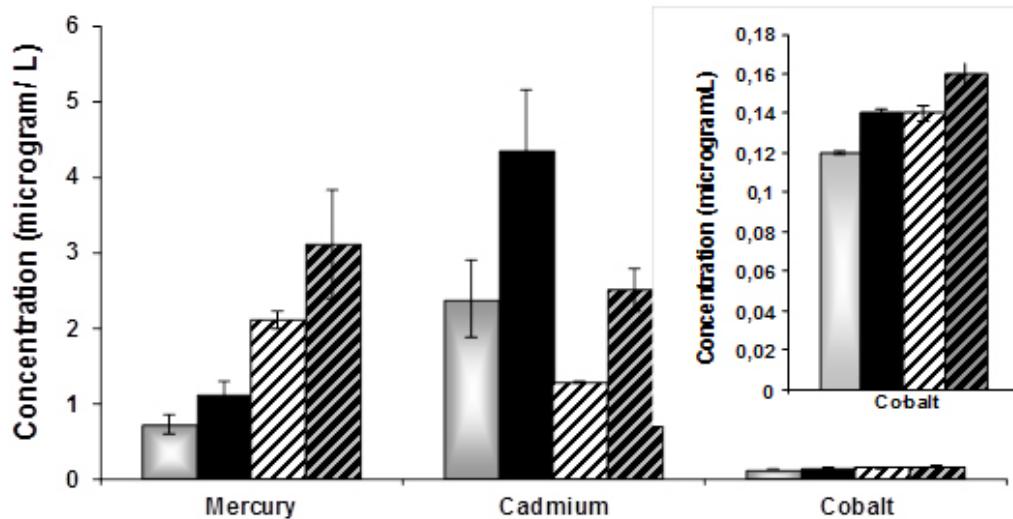
Fig. 1 : Concentrations of elements in the RBCs and plasma of control and benzene-exposed workers.

☐ Plasma Control   ▨ RBCs Control

■ Plasma Exposed   ▨ RBCs Exposed
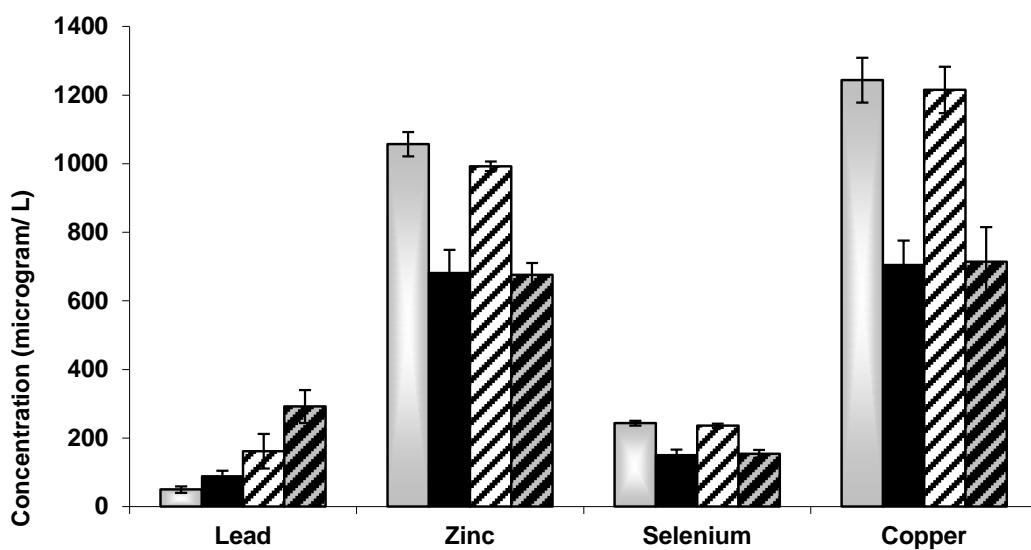
Fig. 2 : Concentrations of elements in the RBCs and plasma of control and benzene-exposed workers.

☐ Plasma Control   ▨ RBCs Control

■ Plasma Exposed   ▨ RBCs Exposed

Discussion:

The disturbance in many inorganic elements in the blood of personnel chronically exposed to benzene was quite evident. These elements are essential for a multitude of biological processes and their homeostasis, which is maintained within strict limits, is critical

for life (Valco, et al., 2005). Disruption of such homeostasis may lead to oxidative stress. The generation of free radicals in living systems is closely linked with the participation of redox-active metals which undergo redox cycling reactions and possess the ability to produce reactive radicals in biological systems. Some redox-active metals including cobalt, cadmium, mercury and lead were found in the present work to be higher in both plasma and RBCs of workers chronically exposed to relatively low levels of benzene. The underlying mechanisms of their toxicity involve formation of the superoxide radicals, hydroxyl radicals and other reactive oxygen species (ROS), finally producing mutagenic and carcinogenic malondialdehyde (MDA), 4-hydroxynonenal and other exocyclic DNA adducts. Increased formation of ROS overwhelms body antioxidant protection (Evan & Vousden, 2001) , which may be the underlying cause of the decreased antioxidant activity observed in the present study, leading to possible induction of numerous conditions detrimental to health. Besides, depletion of cellular major sulfhydryl reserves seems to be an important mechanism of oxidative stress that is induced by redox-inactive metals (Stohs & Bagchi, 1995).

Some heavy metals, including mercury and lead, found to be relatively increased in the present study, cause hemolysis and lipid peroxidation (Ribarov & Benov, 1981). The interaction of heavy metals with oxyhemoglobin has been suggested as an important source of superoxide radical formation in RBCs (Carrell, et al., 1975). It is possible that the observed increased hemolysis of blood samples from benzene exposed population may be due, at least in part, to such interaction.

Relatively elevated levels of lead in the RBCs of control as well as benzene exposed subjects, probably results from pollution from the use of leaded gasoline and lead containing paints. Lead exposure may increase the susceptibility of membranes by altering their integrity via causing deterioration of their components (Gurer & Ercal, 2000) and this was suggested to be the possible mechanism for hemolysis (Levander, et al., 1977. Blood lead level reflects the equilibrium between absorption, deposition in tissues and excretion. Levels associated with chronic exposure may underestimate total body burden because the majority of body lead is stored in teeth and bones. It has also been shown that even without overt toxicity, mildly elevated blood lead levels of 10µg/dL or higher are considered toxic and result in neurological disorders, cognitive impairments and other disorders (Patrick, 2006). Lead inhibitory effects on antioxidant enzymes appear to impair the antioxidant defences of cells and to render them more susceptible to oxidative attacks. Free radical-induced damage by lead is accompanied by two independent, although related mechanisms (Ercal , et al., 2001). The first involves direct formation of ROS and the second mechanism is achieved via depletion of the cellular antioxidant pool (Gurer & Ercal, 2000). Lipid peroxidation in the brains and livers of lead-exposed rats was detected (Shafiq,1984; Shafiq, et al, 199; Sandhir & Gill,1995) and a direct correlation was observed between lead concentration and lipid peroxidation (Shafiq ,1984).

Environmental mercury is ubiquitous and consequently it is practically impossible to avoid exposure to some form of mercury (Valco, et al., 2005). The general population is exposed to numerous of its chemical forms including elemental mercury vapor, inorganic and organic compounds (Fitzgerald & Clarkson, 1991)]. Inorganic mercury is suggested to increase hydrogen peroxide production by impairing the efficiency of oxidative phosphorylation and electron transport at the ubiquinone –cytochrome b5 step (Lund , et al, 1991; Nath , et al, 1996).

Cobalt is released to the environment from burning coal and oil, from automotive and airplane exhausts and from industrial processes that use the metal or its compounds (Gutteridge , 1995). Other than being an integral part of vitamin B_{12}, cobalt is not known to serve any physiological function (Roth ,et al, 1996). Its toxicity is relatively low compared to many other metals (Gal , et al, 2008), but it has been designated as a potent generator of

oxidative stress and free radicals, which in turn induce DNA damage and inhibit DNA repair mechanisms (Galanis , et al, 2009). However, an opposite effect on free radical generation has also been reported, as pretreatment with cobalt was found to attenuate hypoxia-induced oxidative stress (Shukla , et al, 2009). In view of this paradox, and the observed modest increase, it is difficult to evaluate the role of this metal in the production of free radicals and the generation of oxidative stress associated with chronic exposure to benzene.

Cadmium is another metal that was found to be elevated in the blood benzene-exposed individuals. Increase in lipid peroxidation represented by increased MDA level, has been observed in experimental animals treated with cadmium (Eybl, et al, 2006). While cadmium itself is unable to generate free radicals directly, indirect generation of various radicals has been reported. Such mechanism involves displacement of other redox-active metals from their binding sites thus increasing their free form and enhancing their capability of producing free radicals (Galan, et al, 2001).

There is no mechanism for the excretion of cadmium in humans, and accordingly cadmium accumulates in the tissues. The largest part is deposited in the kidneys, liver, pancreas and lungs. In most studies, the half-life in humans was estimated to be between 15 and 20 years (Jin , et al, 2008) and 20-35 years in kidney cortex (Jomova & Valko, 2011). Therefore, it is possible that the levels of cadmium in the blood of benzene-exposed workers do not reflect its body burden, which could be much higher. The magnitude of the deleterious effects of accumulated cadmium in this case may be more severe than what could be predicted from blood levels.

The decrease in the levels of zinc found in benzene exposed workers amounted to one third the level of controls. A special position among metals is occupied by zinc, which is present in more than 70 different enzymes that function in many aspects of cellular metabolism. In view of the increased levels of some heavy metals in the blood of benzene-exposed workers, it is possible that zinc could be replaced by heavy metals, thereby making the enzymes inactive (Donaldson , 1991).

Mild to moderate zinc deficiency can depress immune function through impairment of macrophage and neutrophil, natural killer cell and complement activity (Wintergerst , et al., 2007). This redox-inert metal is an essential component of numerous proteins involved in defense against oxidative stress, as for example superoxide dismutase (SOD). Besides it possesses neuroprotective properties. Depletion of zinc may enhance DNA damage via impairment of DNA repair mechanisms (Jomova & Valko, 2011; Gutteridge, 1995).

The function of zinc as an antioxidant involves two different mechanisms: (i) the protection of sulfhydryl groups of proteins against free radical attack and (ii) prevention mechanisms causing reduction of free radical formation through antagonism of redox-active transition metals (Bray & Bettgerer, 1990). Zinc deficiency may result in exaggerated toxic action of other metals. An example is the increased susceptibility of testes to cadmium-mediated free radical damage in case of low zinc levels (Oteiza , et al., 1999).

Copper is an essential micronutrient that is incorporated into a variety of proteins and metalloenzymes which perform essential metabolic functions. It is necessary for the proper growth, development, and maintenance of many body organs. Copper is involved in key redox reactions in essential metabolic processes such as mitochondrial respiration and electron transport (Valco, et al., 2005). Its deficiency alters the role of other cellular constituents involved in antioxidant activities, such as iron, selenium and glutathione, and therefore plays an important role in diseases in which oxidant stress is elevated (Johnson, et al, 1992; Kaegi & Schaffer, 1988). Copper depletion leads to increased cellular susceptibility to oxidative damage and leads to decreased capability to produce superoxide dismutase (SOD), thus increasing their propensity to oxidative damage (Pan & Loo,2000). A marginal (mild) copper deficiency can impair health in subtle ways. Those affected suffer from

lowered resistance to infection, general fatigue, impaired neurological function and elevated risk for coronary heart disease and osteoporosis (Klevay , 1980; Strain , 1994).

Selenium is an essential component of seleno-enzymes and seleno-proteins, and plays a pivotal role in regulating free radical scavenging system (Rotruck , et al, 1973; Stadtman , 1980). A low selenium concentration in serum has been associated with increased risk of gastrointestinal and prostatic cancer (Willette, et al, 1983). Selenium deficiency may be associated with myopathy, cardiomyopathy and immune deficiency including oral candidiasis and impaired phagocytic function (Dworkin , 1994).

It is clear from the above discussion that disturbance in trace elements homeostasis can be an underlying cause of some serious hazards resulting from work in professions that necessitate chronic exposure to low levels of benzene. Special attention should be directed to child labor in this case, which is a common practice sometimes. Beside the health hazards, it is possible that the dexterity, cognitive function and manual skills of children and young adolescents working in such professions would be hindered affecting the quality of their lives and the development of their careers.

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THE USE OF GROUND BLAST FURNACE SLAG , CHROME SLAG AND CORN STEM ASH AS A COATING AGAINST THE CORROSION

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Abstract

Metals having chemical and electrochemical reactions with their surroundings can go bad and become unusable. It's called corrosion. Many metals , especially iron , undergo corrosion when exposed to air and water. 1/10 of all metallic materials produced every year becomes unusable and it's not possible to recycle them. Loss caused by corrosion costs billion of dollars every year.

This study presents the results of corrosion resistance of ground blast furnace slag (GBFC) , chrome slag (CS)and corn stem ash. (CSA)

In this study GBFC , CS and CSA , produced as a result of some procedures , are mixed with pitch in different portions. The reason for mixing with pitch is to gain the adherence. Then the iron plates were coated with this mixture. Coated and uncoated plates were undergone corrosion in Na Cl solution (35g/L Na Cl). Having kept in the solution for one mount , the coated and uncoated plates were taken out and dried. The plates were put into Na Cl solution with the help of electrodes and the potential differences were measured. Our aim to do so was to reduce the potential difference. If the potential difference reduces , the electric currency reduces , so the corrosion is reduced too.

The potential difference of the uncoated iron plates was 0.501 volts. Of coated with pitch 0.301 and mixed up with our experiment materials was 0. So the corrosion was reduced totally.

This means:

Billions of dollars loss is prevented

A profitable use of GBFC , which is environmentally harmful , can be made and the nature can be protected.

An economical use of CS , which is thrown away can be gained

Some profit can be gained from corn stems that are left to be rotten in the fields.

If the substance we've produced is used all the fields that iron is used , such as buildings , ships , water pipes etc , billions of dollars can be saved.

Keywords: Furnace slag, chrome slag, corrosion

Introduction
Every year billion of dollars are lost due to corrosion.
Corrosion

The word 'corrosion' comes from the Latin word 'corrosus' which means 'abrasion' by surroundings. Corrosion is that metals having chemical and electrochemical reactions with their surroundings can go bad and become unusable. Metal are the unabandonable basic elements of industry. Due to improvement in science and technology , corrosion has become an important problem / issue in structures that contain metals. Corrosion is an undesirable event that costs big damage in the economy of many countries.

The harms of corrosion can be counted as

Corrosion is the major cause of waste of our metal source . 1/3 of all metals produced becomes unusable at the end of first year.

Along with material loss , we also waste some effort , energy , knowledge and financial sources.

Corrosion pollutes its surroundings and it accelerates metallic corrosion.

Chlorium corrosion that harms human health is a well known fact . Some pieces of planes can be broken due to corrosion and it can lead to some casualties.

Some establishments can become out of service and it leads to lack of efficiency.

Types of Corrosion

-Homogenously distributed corrosion
-Pit Corrosion
-Galvanic Corrosion
-Selective Corrosion
-Underground Corrosion
-Corrosion in wet surroundings

Rust (Corrosion of Iron)

The most familiar and costly example of corrosion is the formation of rust on iron. Iron and steel structures are highly susceptible to corrosion. The chemistry of corrosion under atmospheric conditions is extremely complex and is catalyzed by H^+ aq) explaining why increased acid precipitation causes increased rates of corrosion. Oxygen gas and water must also be present for Iron to rust.

Rusting is a redox reaction , involving the loss and gain of electrons between reactants. An electrochemical cell is created with impurity sites in the iron acting as cathodes for the reduction of O_2 :

$$2 \text{ Fe (solid)} = 2 \text{ Fe}^{2+} + 4e^-$$
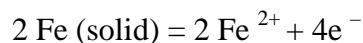
The electrons given up by the iron reduce atmospheric oxygen to water at the cathode:

$$O_2 + 4H + 4e^- = 2H_2O$$
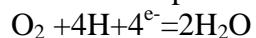
The Fe^{2+} ions formed at the anode are further oxidized by oxygen the overall redox equation:

$$4Fe^{2+} + 3O_2 + 6H_2O = 2Fe_2O_3 \ 6H_2O$$

Hypothesis

In this study we have searched the use of GBFC thrown away from the steel Factory , the CS thrown away from the chromium factory in our city and corn stems left to be rotten in the fields.These elements are in amorphous structure and due to their chemical qualities they 're very resistant to corrosion It's expected that a protective plate made of above mentioned elements will prevent corrosion to great extents.

20 000 tons of GBFS per year are thrown away , 100 000 tons of CS are thrown too and CSA left to be rotten in the fields. So by these materials we avoid environmental pollution and create the coating.

The process of experiment

So in this study , these materials (GBFS , CS and CSA) we mix with pitch. We put coated and uncoated plates in Na Cl solution. So Na Cl solution with help copper of electrodes for measuring the corrosion in the plates. Our aim was to reduce potential difference. If the potential difference reduces , the electric currency reduces , therefore the corrosion reduces.

The potential difference only with uncoated plates was 0.501 , with pitch 0.301 volts and with our materials was 0.0000000 volts.

Results

Billion of dollars are prevented.A profitable use of CS which is thrown away can be gained.A profitable of GBFS, which is environmentally harmful, can be gained.Some profit can be gained from corn stem ash that are left to be rotten in the fields.

Materials

Ground Blast Furnace Slag

GBFS is the name given to lighter metals collected on surface due to potential difference when impure metals are melted. GBFS is obtained by quenching molten iron slag form blast furnace to produce granular product that then is dried and ground into a fine powder.

Corn Stem Ash

Corn stems are the parts up to cm above them have been used for the experiment. The reason to use these parts was that silicon is mostly collected in these parts. Silicon is known as an important element to prevent corrosion.

Chrome Slag

When you analyze the chemical composition of chrome slag, you see four dominant elements. These are silicon , magnesium , aluminium and calcium. These elements form 95 % of slag as oxides. There are no organic elements in slag.

Pitch

Pitch is a non- christalline viscious material , black or dark brown , which is soluble in carbon disulphide , possessing adhesive and water proofing qualities.

Methods

GBFS is 1000 grade Celsius when it comes out of iron factory. At this temperature by pouring cold water it was turned in amorphous state.

The slag made amorphous was dried and sieved in 60 micron sieve.

Having collected from field , corn stems were dried at 250 grade Celsius in a freezing and thawing climate chamber. Then they were burnt is an oven at 500 grade Celsius. In burning the organic materials , the temperature needs to be lower than 700 grade Celsius in order to obtain reactive amorphous silica. Thus , these materials can be burnt with an incinerator or furnace.

Having ash at this temperature , we cold water , was applied to it . That way we had some amorphous corn stem ash. Then we sieved the ash in 60 micron sieve.

When chromium slag out of the factory is located in amorphous state. Chromium slag was divided into small particles by Los Angeles Machine rolls. Chromium slag was divided into small particles and were sieved in 60 micron sieve.

So these materials were mixed with pitch. Coated and uncoated were left in NaCl solution , to be dried later.

And lastly we measured potential difference.

Discussion and conclusion

In our research after some experiments , we aimed to find out if the remnants of GBFS CSA and CS could be used against corrosion.

These substances , as in amorphous state , are expected to prevent corrosion. In the market today are materials used against corrosion , but are very expensive. So our project is with 0 cost.

In our research , and experiments we improved a wrapping material that's made of remnants such as GBFS , CS and CSA , too much produced and with less costs. We avoid environment pollution and make something great for industry.

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KINETICS OF A S.G. CAST IRON

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Abstract

The paper presents an application for calculating the kinetics parameters in the case of a phase transformation in solid state in A.D.I. S.G. grade. It is pointed out the influence of some factors (the temperature and the holding time at the isothermal level) on the phase transformation and properties in the studied cast iron. The kinetics of austenitization of S.G. Cast Iron, was described by the "Johnson-Mehl-Avrami" equation.

Keywords: Materials Science, cast iron, heat treatment, phases transformation

Introduction

Austempered Ductile Iron (A.D.I.) with a bainitic matrix, obtained by heat treatment and isothermal hardening is the material which combines a lot of superior attributes of the classical Austempered Ductile Irons or forged iron (Batra et. al., 2003), being in a serious competition with the iron used by the moment in the automotive industry (Bahmani et. al., 1997). The combination of high strength and high toughness achieved by A.D.I. suggests the engineering use of this material will continue to expand (Simon, 1996).

A wide range of properties can be obtained in these material components owing to changes in proportions of the major phases present in the microstructure: bainitic ferrite, high carbon austenite and graphite nodules. Martensite, ferrite, iron carbides and other alloy carbides may also be present.

The paper presents an application for calculating the kinetics parameters in the case of a phase transformation in solid state in A.D.I. S.G. grade. It is pointed out the influence of some factors (the temperature and the maintained time at the isothermal level) on the phase transformation. The kinetics of austenitization of S.G. Cast Iron, was described by the Johnson-Mehl-Avrami equation.

Research objectives

This research has a number of objectives which can be started as follows:
1.   Identify the effect of heat treatment over the structure and properties.
2.   To determine hardness (HB) at the isothermal temperature.
3.   Calculating the kinetics parameters of S. G. cast iron, using the "Johnson-Mehl-Avrami" equation.

Materials

The studied cast iron has the following chemical composition (% in weight): 3.57% C; 2.69% Si; 0.47 % Mn; 0.010%P; 0.005%S; 0.06%Mg; 0.54% Ni, 0.48%Cu. This cast iron was made in an induction furnace. Nodular changes were obtained with the "In mold" methods, with the help of prealloy FeSiCuMg. The microstructure in raw state is presented in figure 1.
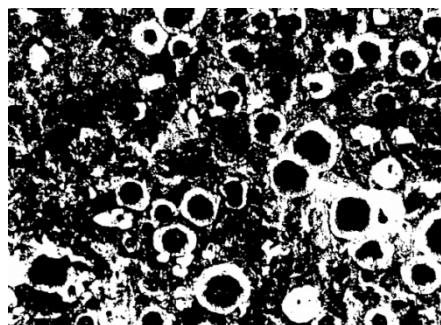
Figure 1: Microstructure in raw state (SEI at 200x magnification)

The microstructure is perlito-feritic typical for a cast iron with geometrically regular nodular form (Eric et. al., 2006).

Heat treatments

The parameters of the heat treatment done were the following: the austenizing temperature, $T_A = 900$ [°C]; the maintained time at austenizing temperature, $\tau_A = 30$ [min]; the temperature at isothermal level, $T_{iz} = 300$ and 400 [°C]; the maintained time at the isothermal level, $t_{iz} = 1; 2; 5; 10; 20; 30; 40;$ and 50 [min]. All these 2 experimental lots A ($t_{iz} = 300°$ C) and B ($t_{iz} = 400°$ C) were performed at isothermal maintenance in salt-bath, being the cooling after the isothermal maintenance was done in air.

Experimental results

From this material, 15 typical HB test specimens was done (ϕ 20 x 50 mm) and after the heat treating, it was determined the results of HB. The aim of the experiments is to determine the hardness (HB) at the isothermal temperature. The experimental values of the hardness are presented in table 1.

Table 1: The experimental values of hardness, for various T_{iz} and τ_{iz}

T_{iz} , [° C]	τ_{iz} , [min]	Hardness, [HB]		
		H_0	H_f	$H_{(t)}$
	1			488
	2			472
	5			460
	10			449
	20			435
300	30	488	402	424
	40			413
	50			402
	1			413
	2			402
	5			393
400	10	413	346	383
	20			372
	30			354
	40			346

where: H_0 – initial hardness, corresponding $\tau_{iz} = 1$ min;
H_t – hardness obtained after a maintaining time (t) at the isothermal level, [%];

H_f – final hardness, corresponding at the maintaining time at the isothermal level, which are considered as a final time for the first stage of transformation of the bainitic reaction.

In figure 2, is presented the specific microstructure at the 200x magnification for all these 2 experimental lots A ($t_{iz} = 300°$ C) and B ($t_{iz} = 400°$ C) after the isothermal heat treatment.
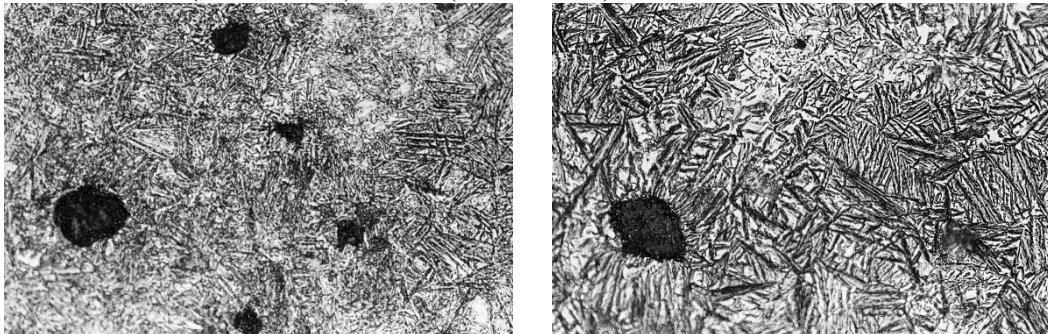
Figure 2: Microstructure: (a) lot A, $\tau_{iz} = 50$ min; (b) lot B, $\tau_{iz} = 40$ min (SEI at 200x magnification)

After annalizing the structure presented it was done a general observation:

- the structure of the sample maintained at $t_{iz} = 300°$ C and $\tau_{iz} = 50$ min, has an fine acicular form, characteristic for lower bainitic ferrite;

- the structure of the sample maintained at $t_{iz} = 400°$ C and $\tau_{iz} = 40$ min, has an scales form, characteristic for upper bainitic ferrite (Eric et. al., 2006).

Transformation kinetics

For the study of the phase transformation kinetics, it was used the first stage of the bainitic reaction (Liu et. al., 1995):

$$\gamma \rightarrow (\alpha) + (\gamma) \tag{1}$$

where: γ - metastable austenite;

(α) - bainitic ferrite;

(γ) - austenite enriched in carbon

In this researches work it was used the methods of the variation's hardness analyse function of the time at the isothermal level (τ_{iz}), considering that this values are depended from the proportion of the transformed fraction "$X_{(t)}$". It was utilised the expression:

$$X_{(t)} = \frac{H_0 - H_{(t)}}{H_0 - H_f} \ , [\%] \tag{2}$$

where: $X_{(t)}$ – the transformed fraction;

H_0 – initial hardness, corresponding $\tau_{iz} = 1$ min;

H_t – hardness obtained after a maintaining time (t) at the isothermal level, [%];

H_f – final hardness, corresponding at the maintaining time at the isothermal level which are considered as a final time for the first stage of transformation of the bainitic reaction. In figure 3 is represented the sigmoidal solid curves of the austenitic transformation during the bainite reaction.
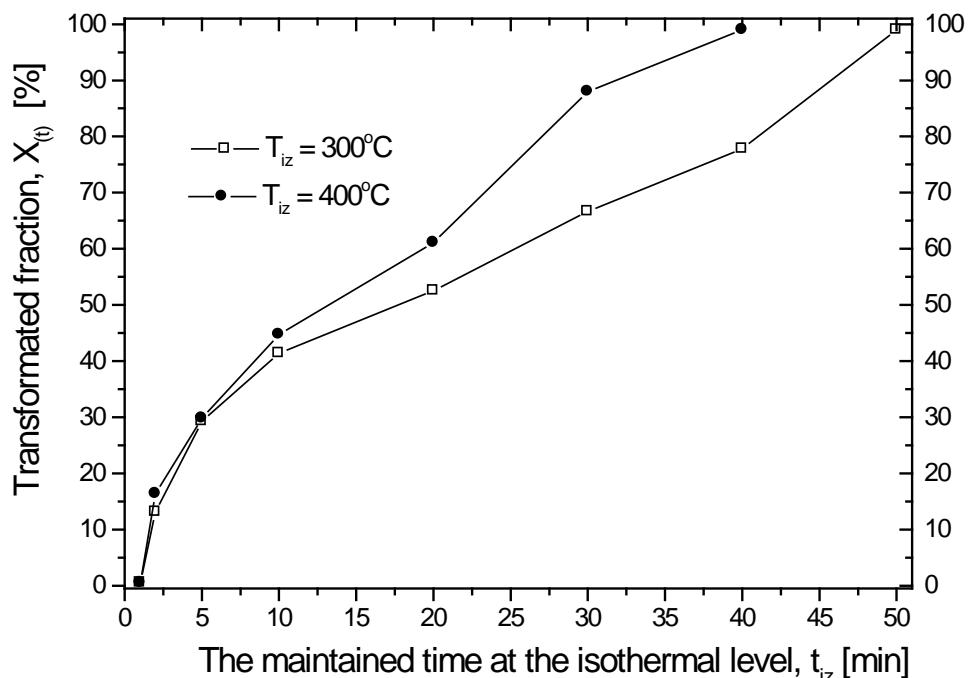
Figure 3: Transformed fraction curves at T_{iz} = 300 and 400°C, for different maintaining time

Like the transformation fraction curves have sigmoid shape, it was used the "Johnson-Mehl-Avrami" equation:

$$X(t) = 1 - \exp(-k\,t^n) \qquad (3)$$

where: X(t) - the transformed fraction;

k - rate constant dependent on temperature;

n - exponent of the reaction.

In order to determine "k" and "n", the natural logarithmic expression was used:

$$\log[-\log(1-X)] = (n\log k + \log\log e) + n\log t \qquad (4)$$

The plot of "log [-log (1-X)]"against "log t" in the isothermal temperature range 300-400°C (3, 4, 5, 6), for the isothermal maintaining time range 1 – 50 minutes, is shown in figure 4 and 5.
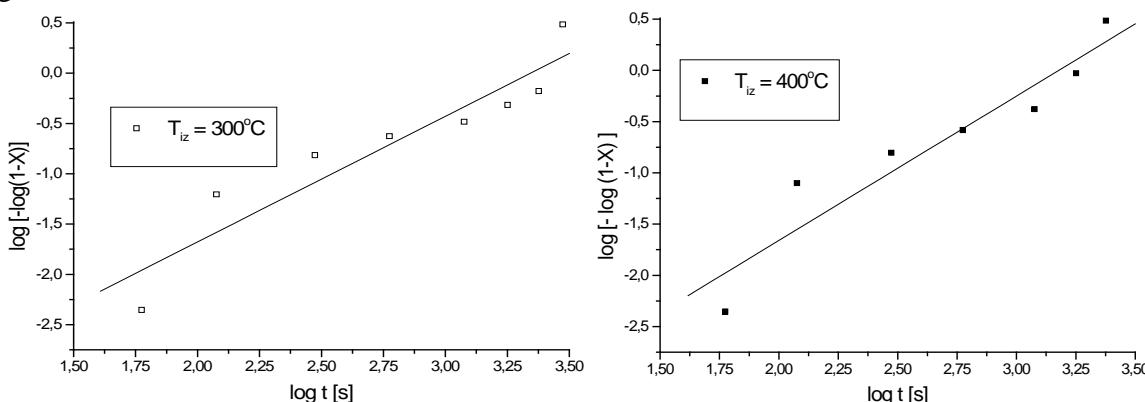
Figure 4: The plot of "log [-log(1-X)] against "logt" in the isothermal temperature 300°C.
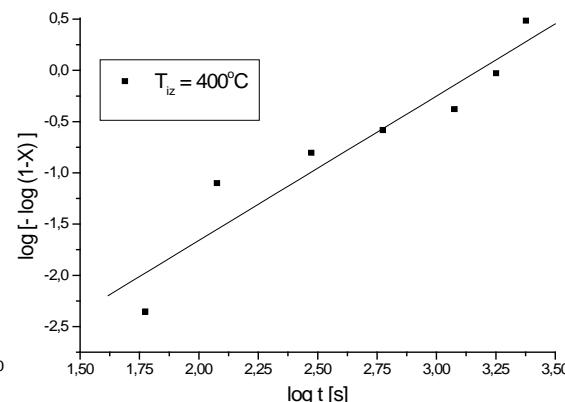
Figure 5: The plot of "log[-log(1-X)] against "logt" in the isothermal temperature 400°C.

The obtained equations from the linear regression adjustment are:

$$Y_{300} = -4.17466 + 1.1248*X, \; R^2 = 0.95; \qquad (5)$$
$$Y_{400} = -4.47785 + 1.4091*X, \; R^2 = 0.95; \qquad (6)$$

Values of "n" and "k" determinate from the slopes and intercepts of the linear regression lines are listed in table 2.

Table 2: *Values of "n" and "k" for the formation of bainite*

Lot	T_{iz} [°C]	n	k [1 / s]
A	300	1.25	4.574×10^{-4}
B	400	1.41	6.671×10^{-4}

According to the international researches (Liu et. al., 1995), if the "n" exponent is between 1 and 2.3 the transformation is interfacing controlled. At the same maintaining time in the isothermal level, the transformation process is different in the each maintaining isothermal temperatures (Guilemany et. al., 1990). The bainitic reaction rate "k" increases when the isothermal temperature increases from 300 to 400° C (Chou et. al., 1992).

Conclusion

The isothermal bainitic transformation in a Ni-Cu S.G. cast iron was studied in the temperature range of 300-400° C and with maintaining time between 1-50 minutes. The main results are summarized as follows:
(a) The kinetics of austenitization of S.G. cast iron, can be described by an Johnson-Mehl-Avrami equation .
(b) The reaction exponent "n"= 1.25 – 1.41 and the transformation is interface controlled.
(c) The bainitic reaction rate "k" increases with increasing isothermal temperature from 300 to 400°C.

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AMINOLYSIS OF Z-4-FURYLIDENE OXAZOLIN-5-ONE DERIVATIVES-CONFIGURATION AND KINETICS

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Abstract

The kinetics of ring opening of (Z)-4-(substitutedarylidene)-2-aryloxazolin-5-ones 1_{a-e} with piperidine in acetonirile has been investigated in the temperature range (25-50^{0}C) which were found to be a second-order reaction, the estimated positive ρ values, thermodynamic parameters and reaction rate constants are consisting with the suggested a stepwise mechanism, where the first stage is a slow perpendicular nucleophilic attack of piperidine on carbonyl group forming the intermediate ($T^{\#}$) passing through a cyclic zwitterionic transition state followed by expelling of the leaving group. As well as the products of the reaction <u>3</u>$_{a-e}$ will be identified and determined their configuration assignments which based on NMR analysis, applying the ^{1}H-NMR additivy increment rules and the gated decoupling technique ^{13}C-NMR ($^3J_{CH}$) which indicates that the compounds 3_{a-e}, exclusively have the Z-configuration.

Keywords: Oxazolinones, azomethine carbon, piperdine

Introduction

Oxazolinones are very important starting materials in synthesis of large organic compounds which posses a wide spectrum of biological activities[1-5].The substituted oxazolin-5-one (1) derivatives were prepared by Plochl-Erlenmeyer or microwave irradiation conditions.[6-10]

The reaction of oxazolinone with amino compounds gave various types of amides[11-15].

In previous work[11-12] the reaction of oxazolinones with cyclohexylamine, β-aminoethanol, isopropyl amine and benzyl amine underwent ring opening to give the corresponding amides, while the latter amine in the presence of anhydrous zinc chloride gave the corresponding imidazolinones[16]. Similarly the reaction of oxazolinones with 2-aminothiophenol in acidic medium gave the corresponding benzothiazols[17], while in dioxane the lactone underwent ring cleavage to form the corresponding benzamides. Hydrazinolysis of oxazolinones with substituted phenyl hydrazines gave the corresponding hydrazides of α,β-disubstituted acrylic acid[18], imidazoline, triazine[19] and phthalazine[20] derivatives.

Condensation of the unsaturated oxazolinones with urea and thiourea gave the corresponding imidazol-5-ones[21]. El-Nagdy et.al[22] reported that the reaction of substituted oxazolin-5-ones with aniline derivatives afforded the corresponding benzoxazin-4(H)-one and quinazoline derivatives while in the presence of anhydrous zinc chloride the corresponding imidazolinones were obtained[23-28]. These compounds exhibited mild anti-convulsant activity in the pentatetrazole test. On the other hand, 2-aryl-H-pyrimidines have been synthesized by the condensation of 1,8-diaminonaphthalenes with oxazolin ones, followed by pyrolysis[29]. Imidazolin-5-one derivatives were synthesized by condensation of oxazolinones with perimidine derivatives, 2-aminothiophenol and 2-aminothiazole which showed bactericidal and fungicidal activity[30-33].

This work was planned as our interest in the reactions of oxazolinones with different nucleophile. The nucleophile chosen for this study is piperidine in acetonitrile, while the oxazolinone contains a new aromatic moiety (furyl ring). The products of the reaction of oxazolinones with piperidine will be identified and determined their configuration assignments which based on NMR analysis, applying the ^{1}H-NMR additivy increment rules and the gated decoupling technique ^{13}C-NMR ([3]J_{CH}) in order to elucidate the mechanism of this important kind of organic reactions. Furthermore the study investigates the effect of substituents having different electronic character in the non-leaving and leaving groups of oxazolinones. The titled reactions will be measured kinetically in acetonitrile solvent, as well as plausible mechanisms will be suggested.

Results and Discussion

The condensation of aromatic aldehydes e.g. 5-substituted furfural with substituted hippuric acid and acetic anhydride in the presence of catalytic amount of sodium acetate afforded the formation 4-furylidene-2-phenyloxazolin-5-ones[1-4] 1$_{a-e}$ Scheme (1).
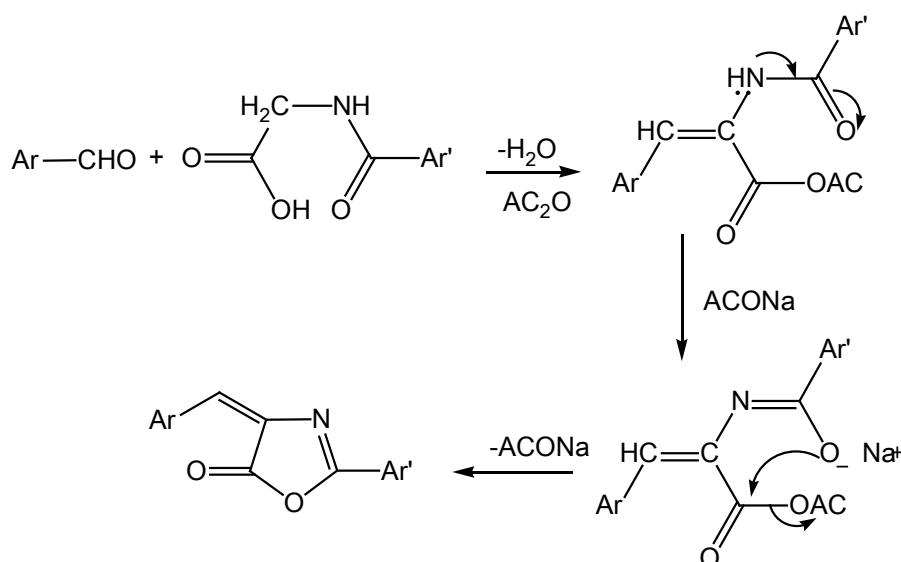
1$_a$, Ar = furyl,   Ar' = C_6H_5 ;   1$_b$, Ar = 5-CH_3furyl, Ar' = C_6H_5 ;

1$_c$, Ar = 5-Clfuryl,   Ar' = C_6H_5 ;   1$_d$, Ar = furyl,   Ar' = 4-$CH_3C_6H_4$;

1$_e$, Ar = furyl,   Ar' = 4-ClC_6H_4.

The furylidene moiety may have either E- or Z- orientation about the exocyclic double bond. Earlier publication reported the presence of E-isomer[34-37]. However, The UV absorption[38-40] resonance, Rahman[41], NMR[42] and X-ray studies[43] indicated that the Z-isomer was thermodynamically stable. However the Z-isomer can be converted into E-isomer by treatment with HBr[44].
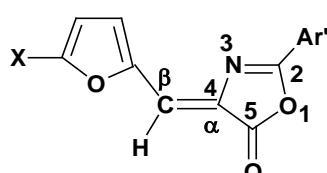
Z-1$_{a-e}$
Fig. (1)

Configuration assignment and structure proof of benzamides $\underline{3}_{a-e}$

The treatment of (Z)-4-(5-sustituted furylidene)-2- aryloxazolin -5-ones$\underline{1}_{a-e}$ with piperidine in acetonitrile gave mainly the corresponding 4-Substituted-N-[2-(5-substituted-furan-2-yl)-1-(piperidine-1-carbonyl)-vinyl]-benzamide, as indicated from the elemental analysis, UV, IR and NMR, equation (1), (see Experimental part).
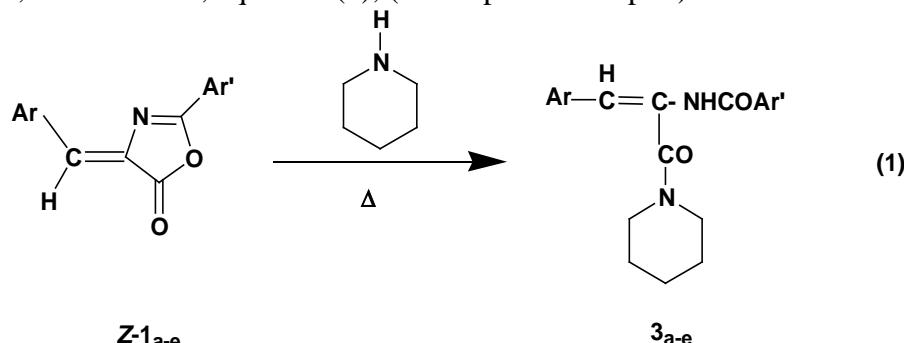
The elemental analysis, UV, IR and NMR indicates the aminolysis ring opening and the mechanism proceeds by nucleophilic acyl substitution reaction. The NMR indicates the formation of exclusively one isomer as shown from the single vinylic proton at C_3 which resonating at δ (6.93-7.09) ppm. The C_2 ethylenic ^{13}C-NMR chemical shift for $\underline{3}_a$ (128.45ppm) resemble those reported for ethyl-α-cyanocinnamates, α-cyano cinnamides, ethyl (α-ethoxycarbonyl) cinnamates[45-46], methyl acrylate and acrylic acid[47]. On the other hand, the chemical shifts of olefinic carbon C_3 showed resonance signals at 148.26 ppm for $\underline{3}_a$ which is less than reported for benzylidene malononitrile[48] and methyl acrylate[49], but agree with the calculated values. Carbonyl carbon C_1 chemical shifts appear at δ 173.28 ppm for $\underline{3}_a$. All these values agree with the calculated values using chem. draw program.

Though compounds $\underline{3}_{a-e}$ can exist as E- or Z-configurational isomers, actually only one form of these isomers was exclusively obtained. This makes the assignment difficult due to the absence of comparison between the two configurational isomers. The more stable form whether the benzamido or piperidino group should be trans to the aryl group can not be decided on steric grounds, this is because in either cases there are a bulky groups in the cis position that gave rise to considerable non-bonding interactions The configuration assignments of $\underline{3}_{a-e}$ compounds were based on NMR analysis. The calculated chemical shifts of vinylic protons for Z- and E- steroisomers by applying the ^{1}H-NMR additivy increment rules[50-52] and the gated decoupling technique[53-54], gave conclusive information concerning the relative configuration of C and H in trisubstituted alkenes[50.53].The calculated chemical shifts of the vinylic protons for $\underline{3}_{a-e}$ are 6.89 ppm for the Z-configuration and 6.52 ppm for E-configuration. These values were in agreement with the Z- configuration for compounds $\underline{3}_{a-e}$ because their vinylic proton is actually resonating at δ (6.93-7.09) ppm, (see Experimental part).

The relatively higher chemical shift of the vinylic proton of Z-isomer than that of the E- one could be attributed to the higher shielding effect of the amido group and/or "anisotropic effect" which lie in the same side of double bond with the vinylic proton of the E-isomer[55]. Furthermore, a more effective factor is the conjugation of olefinic bond and carbonyl group can be assumed to lead to an increase of the positive charge on $C_β$ in the E-isomer, Fig.(2).
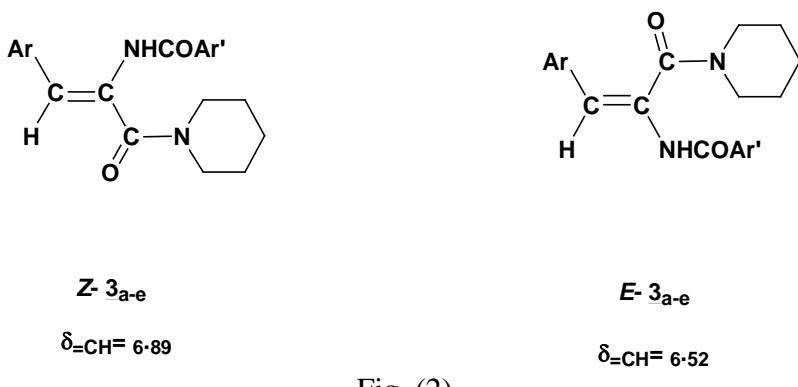
Fig. (2)

Also, the relative configuration of double bond in compounds $\underline{3}_{a-e}$ can be confirmed from $^3J_{CH}$ of the carbonyl carbon at C_1 of ^{13}C signal at 173.28 ppm in the coupled ^{13}C-NMR spectrum. As a result of this coupling, a triplet at 173.28 ppm (J =11.25 Hz) for $\underline{3}_a$ (R= H) was observed.

The $^3J_{CH}$ value = (9-11) Hz coupling points to a cis-configuration[53] of carbonyl carbon (C_1) and olefinic (H_3). Consequently, the benzamido and aryl groups are located in cis-position; and compound $\underline{3}_a$ has the Z- configuration. Similarly compounds $\underline{3}_{b-e}$ exists in the Z-configuration.

Kinetic studies for the reaction of 1_{a-e} with piperidine in acetonitrile

Although unsaturated oxazolinones well known, there have been very few reported studies on the quantitative aspects of their reactivity. The reactions of oxazolinone are usually considered to be a typical example of ester reactions. However, Olson and co-workers[54-55] have been reported that the ring opening reactions of these types of esters in basic and strongly acidic solutions resulted in the expected acyl-oxygen fission (a), while in the neutral or slightly acidic solutions alkyl-oxygen bond fission (b) is the predominating pathway, Fig. (4)
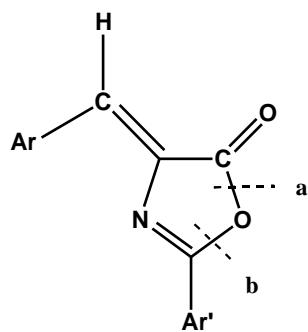
Fig. (4)

Kinetic studies and mechanism for the reaction of $\underline{1}_{a-e}$ with piperidine in acetonitrile

Castro and coworkers[56-58] have been reported a number of mechanistic studies on the aminolysis of esters. These studies showed that most aminolysis of esters proceed by a stepwise mechanism through a zwitterionic tetrahedral intermediate $T^{\pm}$, or concertedly transition state $TS^{\pm}$, depending on the amine, substrate and solvent involved.

Shawali etal[59] proposed a stepwise mechanism with rate limiting break down of a tetrahedral intermediate $T^{\pm}$ for the reaction of an ester with amine in dioxane. Their kinetic results were compatible with the stepwise mechanism involving two reaction pathways , one overall third–order , k_3, process pathway (a). Alternative pathway (b) is second-order, k_2, and proceeds through a concerted mechanism involving a concerted transition state $TS^{\pm}$), Scheme

(2) Linear free energy relationships (LFERS) have been employed as one of the most popular probes for the determination of the reaction mechanism.

zwitterionic intermediate
$T^{\pm}$

Tetrahedral intermediate
T^{-}

concerted

protonted product

Scheme (2)
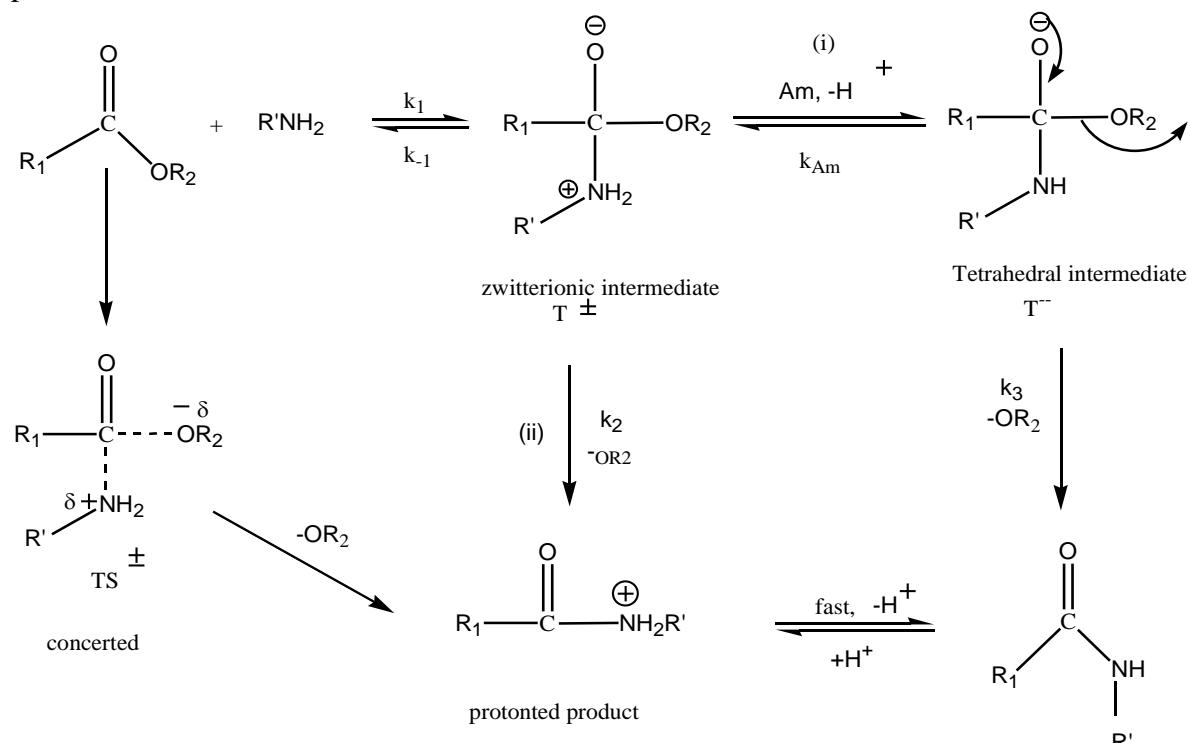
In this work we are interested to study the substituent effect of para and 5- substituents in aromatic rings of both non leaving (Ar) and leaving (Ar') moieties on the reactivity of oxazolinone towards piperidine. The rate constants of the reactions of substituted oxazolinones $\underline{1}_{a-e}$ with piperidine in acetonitrile at 25, 30, 35, 40, 45 and 50^0C were determined, Table (1). The kinetic runs were measured spectrophotometrically where piperidine concentration was in large excess. Under these conditions of pseudo first-order kinetics, rate constants $k_{obs.}$ (sec^{-1}) were obtained. Plots of $k_{obs.}$ (sec^{-1}) versus piperidine concentrations gave straight lines passing through the origin with slopes equal to the second-order rate constants (k_A), indicating that the reaction is not catalyzed by piperidine and the reaction obeys a clean second–order rate law. It is clear from the kinetics data that the electronic effects exert a moderate influence on the reactivity of reaction, Table (1).

The reaction of (z)-4-(substituted furylidene)-2-(4-substitutedphenyl)oxazolin-5-ones$\underline{1}_{a-e}$ .with piperidine depends on the nature of aromatic ring (Ar) of the arylidene moiety which playing an important role in the reactivity of oxazolinone.

The reactivity of (z)-4-(5-chlorofurylidene)-2-phenyl oxazolin-5-ones $\underline{1}_c$ with piperidine is (4 to 6) times faster than that for (z)-4-(5-methyfurylidene)-2-phenyl oxazolin-5-one $\underline{1}_b$. This increasing in the reactivity by introducing electron withdrawing group in aryl ring may be attributed to increase the electrophilicity of carbonyl carbon of oxazolinone in ground state beside it stabilizes the formed negative charge on oxygen atom of activated complex, while electron donating groups have opposite effect.

The aminolysis rates of substituted oxazolinone decrease according to the following order:
5-Cl furyl > 5-H furyl≈ p'-Me phenyl ≈ p'-Cl phenyl > 5-Me furyl .

It is customary to correlate the effect of 5-substituents in the furyl ring with the σ-Hammett constants. Plots of log k_A for these reactions versus σ-Hammett values for compounds 1_{a-c} gave good straight lines at different temperatures with slope (ρ) ranging from + (1.46 - 1.79), In this work, we invoke the mechanistic criteria for the studied reaction based

on the sign of reaction constant ρ in the substrates $\underline{1}_{a-c}$. The estimated ρ values for the reactions of piperidine with oxazolinones are exceptionally moderate and the formed activated complex has an anionic character[60].

Three transition states for acyl-oxygen fission can be proposed to account for the present result: 1) TS_1 represents the transition-state structure for the reaction in which the nucleophilic attack and departure of the leaving group occur simultaneously (a concerted mechanism). 2) TS_2 represents the transition-state structure for the stepwise mechanism in which leaving group departure occurs at rate-determining step. 3) TS_3 the transition-state structure for the stepwise mechanism in which leaving group departure occurs in fast step, Fig. (5).

| | TS_1 | | | TS_2 | | | TS_3 |
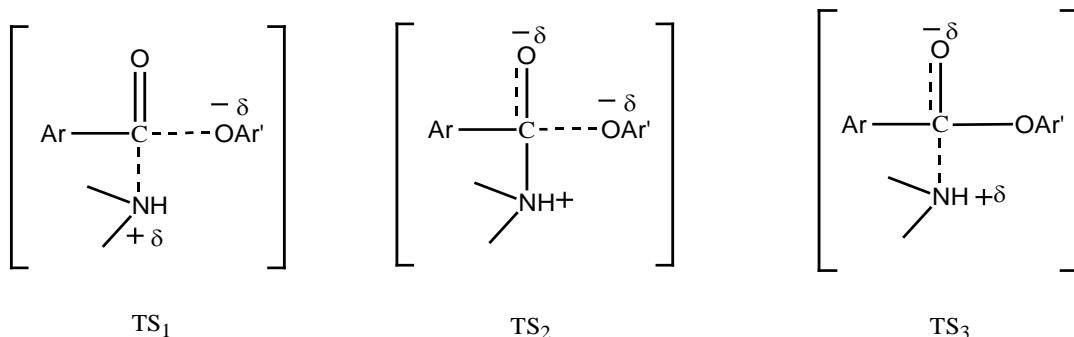
Table (1): Rate constants and activation parameters for the reaction of oxazolinones $\underline{1}_{a-e}$ with piperidine in acetonitrile

Cpd	X	y	$10^2 \times K_A$ l mol^{-1}sec^{-1}						E_a Kcal mol^{-1}	$\Delta H^{\#}$ Kcal mol^{-1}	$-\Delta S^{\#}$ Kcal mol^{-1}
			25^{0}C	30^{0}C	35^{0}C	40^{0}C	45^{0}C	50^{0}C			
1_a	H	H	5.21	8.42	10.62	11.31	12.13	13.80	6.69	6.09	43.93
1_b	CH$_3$	H	2.51	4.31	5.42	6.02	6.59	7.11	7.31	6.71	42.25
1c	Cl	H	13.37	20.03	23.83	25.24	26.93	28.43	5.10	4.51	47.33
	ρ		+1.79	+1.63	+1.57	+1.42	+1.49	+1.46			
1_d	H	CH$_3$	5.71	8.61	11.01	11.51	12.31	14.00	6.21	5.61	45.35
1_e	H	Cl	5.19	7.94	10.92	11.25	12.11	13.71	6.83	6.23	43.45

The aminolysis of oxazolinones $\underline{1}_{d-e}$ which contain (4-Cl and 4-CH$_3$) in the phenyl ring (Ar') of leaving group showed a slight difference in rate constant compared to unsubstituted one 1_a. This slight change in the reaction rate ruled out the concerted mechanism (TS_1) and indicated that the expulsion of the leaving group did not effect by changing the substituent (fast step). So the expulsion of the leaving group is not the rate determining step for postulated stepwise mechanism. The small ρ values for the substituents on the non-leaving groups can explain as follow on the basis of the introduction of the electron withdrawing substituents will stabilize the formed negative charge on oxygen atoms while it destabilizes

the positive charge on nitrogen atom of piperdonium moiety in transition state, thus the net value of reaction constant ρ must equal algebraic summation of the two created opposite charges in preformed transition state (compensated value of ρ value).Therefore, the linear free energy correlation for such reaction can be written as follow.

$$\log\frac{k_{P-X}}{k_{P-H}} = (+ve)\rho_O\sigma + (-ve)\rho_N\sigma = ((+ve)\rho_O + (-ve)\rho_N)\sigma$$

$$\because (+ve)\rho_O \rangle (-ve)\rho_N$$

$$\therefore \log\frac{k_{P-X}}{k_{P-H}} = (\Delta + ve)\rho\sigma$$

The temperature dependence of ρ for the reaction under investigation which fit to the ρσ relationship does not deteriorate as the temperature is changed. Since the nucleophilic attack of piperidine on carbonyl of oxazolinone obeyed Hammett equation, thus: $\rho\sigma = \pm\delta_X$ ΔH/2.303RT and in agreement with the decrease of ρ with increasing the temperature as shown in Table (1).

The thermodynamic parameters of activation and rate data at sex different temperatures are summarized in Table (1). The entropy ($\Delta S^{\#}$) and the enthalpy ($\Delta H^{\#}$) values indicated that these reactions are almost isoentropic and the difference in reactivity is enthalpy dependent (enthalpic control reaction). The negative $\Delta S^{\#}$ values are as expected for bimolecular nucleophilic substitution reaction and explained on the concept of the transition state involves much greater charge separation than that existing in the reactants. Therefore, the change from reactants to the more polar transition state will be accompanied by a considerable loss of solvent freedom causing a consequent decrease in entropy. It was observed that compounds containing electron withdrawing substituents showed more negative $\Delta S^{\#}$ values than that of electron donating substituents. This is presumably explained on the fact that the extent of the bond formation in case electron withdrawing substituents are greater than that of electron donating one in the corresponding activated complex. Further, the formation of rigid cyclic H-bonding transition state reflects the high entropy values in contact to that postulated a stepwise mechanism in which the formation of tetrahedral intermediate is the rate-determining step. Therefore, the large negative $\Delta S^{\#}$ values are acceptable for the formation of the hydrogen bonded, four member cyclic ($TS^{\pm}$) [61], Fig. (6).
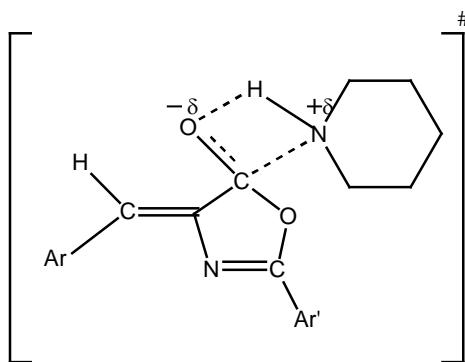
TS$^{\#}$

Fig. (6)

The relatively small $\Delta H^{\#}$ values with large negative $\Delta S^{\#}$ values are consistent with the proposed transition state structure (TS$^{\pm}$). The small $\Delta H^{\#}$ values are due to a large energy gain in C-N bond formation with respect to energy loss in C=O bond cleavage in addition the assistance in the polarization of C=O by the hydrogen bonding.

A linear free energy relationship maintaining its linear form at more than one temperatures implies a constraint on enthalpies and entropies, thus for such studied reaction which showed correlation at more than one temperatures would be obey the following isokinetic, equation (4).

$$\Delta H^{\#} = \beta \, \Delta S^{\#} \qquad (4)$$

Plot $\Delta H^{\#}$ versus $\Delta S^{\#}$ showed a reasonable straight line with a slope for isokinetic temperature β which found to be equal 434 K^{0}(r = 0.99), 464 K^{0}(r = 0.97) for the reactions of substitutedfuryl $\underline{1}_{a-c}$ with piperidine respectively. These isokinetic temperatures are far from those employed in the kinetic runs (25-50)^{0}C. The linear plots of log k_A at different temperatures against $\Delta H^{\#}$ and T$\Delta S^{\#}$ (not shown) beside plots of log k_A at certain temperature against log k_A at another temperature (not shown) and isokinetic plots of $\Delta H^{\#}$ versus $\Delta S^{\#}$ indicated that the reaction series followed the same mechanism. The main factor governed the nucleophilic ring opening of oxazolinone is the activation enthalpy $\Delta H^{\#}$ which tends to be decreased with increasing in substrate reactivity. The estimated positive ρ values, thermodynamic parameters and reaction rate constants for both reactions with piperidine are consisting with stepwise mechanism, where the first stage is a slow perpendicular nucleophilic attack of piperidine on carbonyl carbon forming the intermediate (T$^{\#}$) passing through a cyclic zwitterionic transition state followed by expelling of the leaving group. Finally deprotonation of piperdonium moiety is followed by protonation of benzamido nitrogen afforded the final product, Scheme (3).
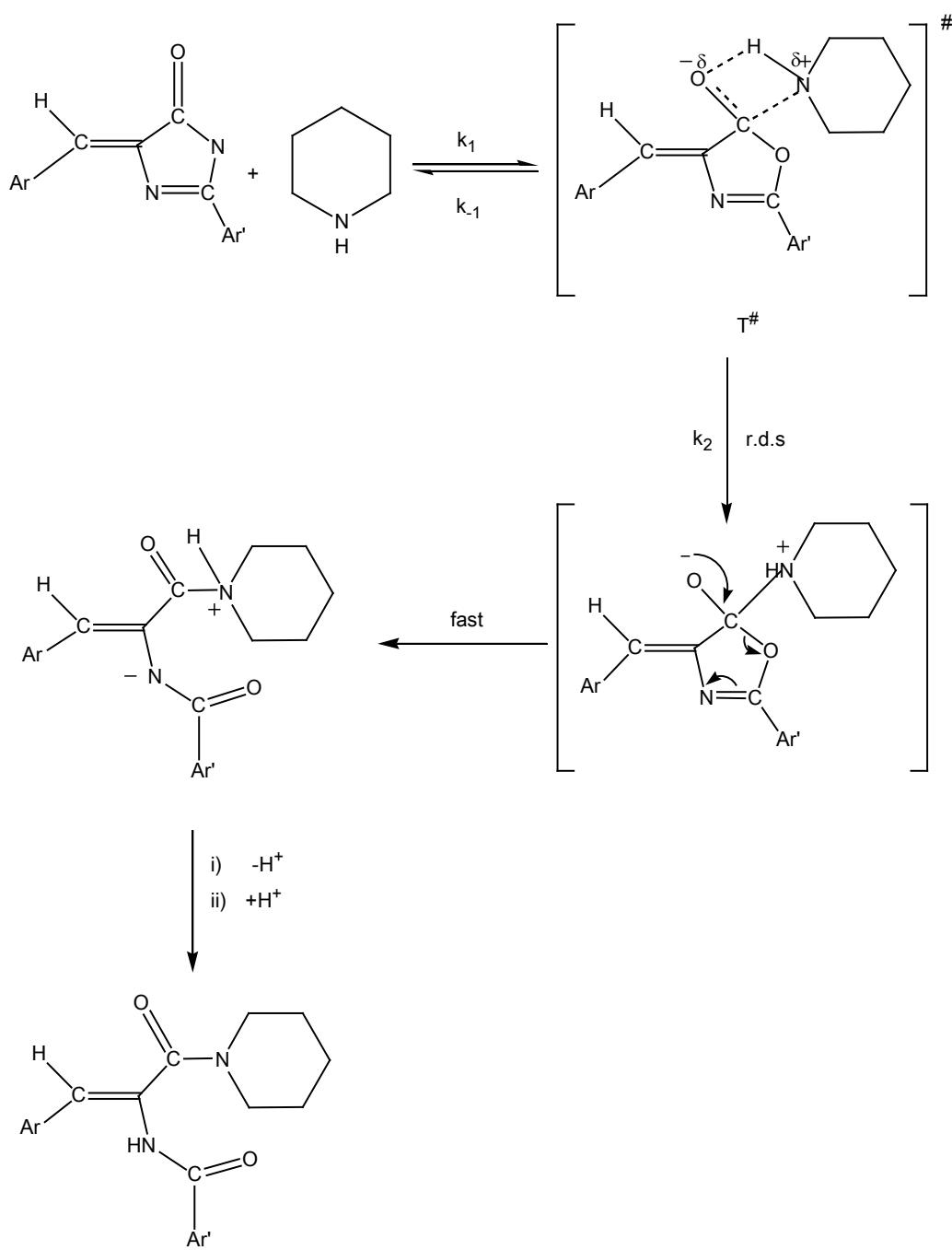
Ar = furyl, 5-CH$_3$furyl , 5-Clfuryl, C$_6$H$_5$, 4-CH$_3$C$_6$H$_4$, 4-ClC$_6$H$_4$, 4-BrC$_6$H$_4$,
    4-CH$_3$O C$_6$H$_4$, 4-O$_2$N C$_6$H$_4$.

Ar'= C$_6$H$_5$, 4-CH$_3$ C$_6$H$_4$, 4-Cl C$_6$H$_4$.

Scheme (3).

Applying steady state conditions to the intermediate [T$^{\#}$]:-

48

$$\frac{d[T^{\#}]}{dt} = 0$$

$$k_1[Oxa][Hyd] - k_{-1}[T^{\#}] - k_2[T^{\#}] = 0$$

$$[T^{\#}] = \frac{k_1[Oxa][Hyd]}{k_{-1} + k_2}$$

since $\dfrac{d[prod]}{dt} = k_2[T^{\#}]$

$$\frac{d[prod]}{dt} = \frac{k_1 k_2[Oxa][Hyd]}{k_{-1} + k_2}$$

where $k_2 \gg k_{-1}$

$$\frac{d[prod]}{dt} = \frac{k_1 k_2[Oxa][Hyd]}{k_2}$$

$$\frac{d[prod]}{dt} = k_1[Oxa][Hyd]$$

where k_1 is the observed rate constant

Experimental section

Piperidine and acetonitrile used are BDH.

a) Synthesis of (Z)-4-(substitutedfurylidene)-2-aryloxazolin-5-ones 1_{a-e}

(Z)-4-(substitutedfurylidene)-2-aryloxazolin-5-ones were prepared and purified as previously reported[1-5].

b) Reaction of substituted oxazolinones 1_{a-e} with piperidine **in acetonitrile**

General procedure: A (0.01mole) of piperidine was added to a solution of 1_{a-e} (0.005mole) in acetonitrile (15 ml). The reaction mixture was refluxed for two hours. The reaction mixture was cooled and poured into cold water. The separated solid was filtrated and crystallized from ethanol to give the corresponding 4-Substituted-N-[2-(5-substituted-furan-2-yl)-1-(piperidine-1-carbonyl)-vinyl]-benzamides 3_{a-e} .
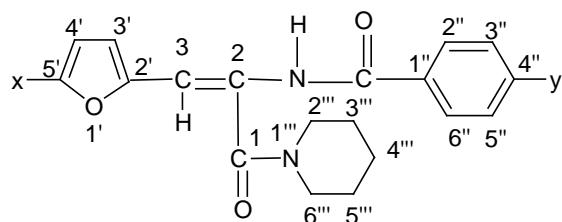
3_{a-e}

N-[2-(furan-2-yl)-1-(piperidine-1-carbonyl)-vinyl] benzamide 3_a: Yield (80 wt %), m.p. (153-155^{0}C). UV (acetonitrile): $\lambda_{max.}$ nm = 302 and 226, ε = 12397, 10315. IR (KBr) ν cm^{-1}: 1597 (conjugated C=C), 1656 (C=O amide), 1675 and (C=O piperidino). ^{1}H-NMR (DMSO-d$_6$) δ ppm: 9.43 ppm (1H, s, NH amide), 8.12 (2H, d, H$_{2'',6''}$), (1H, d, H$_{5'}$), 7.62 ppm (1H, t, H$_{4''}$), 7.42 (2H, t, H$_{3'',5''}$), 6.93 (1H,s, H$_3$ vinylic), 6.58 (1H, d, H$_{3'}$), 2.88 ppm (4H,t, H$_{2'',6''}$) and 2.05 ppm (6H,m, H$_{3'', 4'', 5''}$). ^{13}C-NMR (DMSO-d$_6$) δ ppm: 173.28 (C=O piperidino), 167.10 (C=O amide), 134.67 (C$_2$), 128.45 (C$_3$), 148.26, 122.53, 133.80, 134.48,

125.94 ,111.48 (aromatic carbons) and 56.23, 41.57, 39.22 (piperidine carbons). Calcd. for $C_{19}H_{20}N_2O_3$: C ,70.37; H,6.17; N, 8.64, found : C , 70.43; H,6.11; N, 8.54.

N-[2-(5-methylfuran-2-yl)-1-(piperidine-1-carbonyl)-vinyl] benzamide $\underline{3}_b$: Yield (74 wt %), m.p. (158-160^{0}C). UV (acetonitrile): λ_{max}. nm = 318 and 226, ε = 14423, 11006. IR KBr) ν cm^{-1}: 1589 (conjugated C=C), 1662 (C=O amide) and 1673 (C=O piperidino) . ^{1}H-NMR (DMSO-d$_6$) δ ppm: 9.22 (1H, s, NH amide), 7.88 (2H, d, $H_{2'',6''}$), 7.36 (3H, m, $H_{3'',4'',5''}$), 7.09 (1H, s, H_3 vinylic), 6.73 (1H, d, $H_{3'}$), 6.66 (1H, d, $H_{4'}$), 2.73 ppm (4H,t, $H_{2''',6''}$), 2.11 (3H, s, CH$_3$), and 1.89 ppm (6H,m, $H_{3''',4'',5''}$) . Calcd.for $C_{20}H_{22}N_2O_3$: C, 71.01; H, 6.51; N, 8.28, found : C, 71.23; H, 6.46; N,8.19.

N-[2-(5-chlorofuran-2-yl)-1-(piperidine-1-carbonyl)-vinyl] benzamide $\underline{3}_c$: Yield (84 wt %), m.p. (168-170^{0}C). UV (acetonitrile): λ_{max}. nm = 304 and 227, ε = 14235, 11916. IR KBr) ν cm^{-1}: 1602 (conjugated C=C), 1667 (C=O amide) and 1687 (C=O piperidino). ^{1}H-NMR (DMSO-d$_6$) δ ppm: 8.96 (1H, s, NH amide), 7.79 (2H, d, $H_{2'',6''}$), 7.32 (3H, m, $H_{3'',4'',5''}$), 7.03 (1H, s, H_3 vinylic), 6.33 (1H, d, $H_{3'}$), 6.13 (1H, d, $H_{4'}$), 2.93 ppm (4H,t, $H_{2'',6''}$) and 1.75 ppm (6H,m, $H_{3''',4'',5''}$). Calcd.for $C_{19}H_{19}N_2O_3Cl$: C, 63.60; H,5.30; N,7.81 found : C, 63.52; H,5.35; N,7.85.

4-Methyl N-[2-(furan-2-yl)-1-(piperidine-1-carbonyl)-vinyl]- benzamide 3$_d$: Yield (76 wt %), m.p. (159-161^{0}C). UV (acetonitrile): λ_{max}. nm =272 and 224, ε = 20225, 21000. IR (KBr) ν cm^{-1}: 1598 (conjugated C=C), 1672 (C=O amide) and1677 (C=O piperidino). ^{1}H-NMR (DMSO-d$_6$) δ ppm: 9.37 (1H, s, NH amide), 7.86 (2H, d, $H_{2'',6''}$), triplet at δ 7.47 ppm (2H, t, $H_{3'',5''}$), 7.32 (1H, t, $H_{5'}$)), 7.25 (1H, t, $H_{3'}$),), 7.19 (1H, t, $H_{4'}$), 7.06 (1H, s, H_3 vinylic), 2.93 ppm (4H,t, $H_{2''',6''}$), 2.43 (3H, s, CH$_3$), and 1.94 ppm (6H,m, $H_{3''',4'',5''}$). Calcd.for $C_{20}H_{22}N_2O_3$: C, 71.01; H, 6.51; N, 8.28, found : C, 71.09; H, 6.66; N,8.31.

4-Chloro N-[2-(furan-2-yl)-1-(piperidine-1-carbonyl)-vinyl]- benzamide 3$_e$:Yield (81 wt %), m.p. (167-169^{0}C). UV (acetonitrile): λ_{max}. nm =282 and 223, ε = 20105, 20755. IR (KBr) ν cm^{-1}: 1605 (conjugated C=C), 1662 (C=O amide) and1675 (C=O piperidino). ^{1}H-NMR (DMSO-d$_6$)) δ ppm: 9.63 (1H, s, NH amide), 7.96 (2H, d, $H_{2'',6''}$), 7.53 (2H, d, H $H_{3'',5''}$)), 7.46 (4H, m, $H_{2',3',4',5'}$), 7.02 (1H, s, H_3 vinylic), 3.09 ppm (4H,t, $H_{2''',6''}$) and 2,03 ppm (6H,m, $H_{3''',4'',5''}$). Calcd.for $C_{19}H_{19}N_2O_3Cl$: C, 63.60; H,5.30; N,7.81 found : C, 63.73; H,5.26; N,7.93.

Kinetic measurements
Kinetics of the reaction of oxazolinone derivatives with hydrazine in acetonitrile

The reaction of (Z)-4-(substitutedarylidene)-2-aryloxazolin-5-ones $\underline{1}_{a-e}$ with piperidine in acetonitrile to form the corresponding 4-Substituted-N-[2-(5-substituted-furan-2-yl)-1-(piperidine-1-carbonyl)-vinyl]-benzamides $\underline{3}_{a-e}$, were followed spectrophotometrically at 25, 30, 35, 40, 45 and 50^{0}C using Jasco(V-350UV-VIS) spectrophotometer. The solutions of oxazolinones and piperidine were separately allowed to attain the desired temperature $\pm$ 0.5^{0}C in a thermostated bath before being mixed. Measurements were usually carried by following the decrease of the oxazolinones absorbance with time at wavelength (λ) = 385$\pm$5 nm. The reactions were performed under pseudo first-order conditions where the piperidine concentration was excess compared to that of substrate, [(100:1) to (350:1)]. The first-order rate constants (k$_\psi$) were calculated by the least squares method from the linear plots of ln (A$_{t-}$ A$_\infty$) versus time (t). Plots of k$_\psi$ versus piperidine concentrations gave straight lines passing through the origin with slopes equal to second-order rate constants (k$_A$).

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DEFINING OF PHYSICAL-CHEMICAL PARAMETERS OF KRENA RIVER AS THE POLLUTER OF ERENIKU RIVER

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Abstract

The Krena river based on its length has bigger flow than Llukaci river, and both of them spillat Ereniku river. The purpose of this study is to provide details on the quality of the waterof Krena river and its flow to the Ereniku river. The study and monitoring performed in of this paper annual period january-december 2011gives its physical-chemical results as:Iron,Manganese,nitrites,nitrates,Aluminium,phosphate,consumption of Potassium permanganate,dissolved Oxygen,water temperature,air temperature,pH value etc.Water samples were taken in polyethylene bottles of 500 ml, which initially are well cleaned.Some of parameters were measured at the location of the taken sample, since other analyzes were sent immediately to the laboratory and analyzes were made,based on pH value, conductometric,turbidymetric, spectro photometric etc. The given results show the quality of the pollution of Krena river as result of discharge of pollutants , municipal and industrial.

Keywords: River, Krena , results, study, pollutant

Introduction

Water is a natural resource with limited amounts and unequal time and space distribution. All shapes of life and all human activities depends on water. Water resources are of high importance for human life and economy and are the main source to fulfill drinking water needs irrigation of lands and for industry. Lack of water is considered as socio – economic restrictive factor of a country.

Industrial development and modern urbanism have resulted in the formation of large urban zones, industrial zones and intensive development of agriculture. This has increased the need for water, but also growth of urban and industrial discharges at the rivers with no prior treatment at the same time, decreasing this way the possibility of water self-cleaning (auto purifying)

Today, the need for clean water is considered as one of the biggest environmental global problems. Currently, more than 1.2 billion people in the world have no access to drinking water, and 3 billion people (half world's population), have appropriate sanitary service. More than 200 diseases have origin from the contaminated water. About 6.000 people a day die from the diarrhea diseases. According to World Health Organization it is estimated that every year around 5 million people die by consuming the contaminated water. Basing on actual urbanism trend in the world until 2025, around 3 billion people will need the water supply and more than 4 billion people will need the access to sewage.

In Kosovo like in most of other countries the human health and fulfilling needs are threatened more and more by the bad quality of water or the lack of clean water. It is estimated that Kosovo has limited water resources. Therefore, maintaining, conservation and monitoring of the water quality is one of the biggest environmental challenge for our society.

But stable management of water resources, maintaining of water and improvement of water quality requires special dedication by all responsible factors.

Discarded water from the cities contain itself inorganic and organic dissolved substances or it appears in the form of rotter or suspension.

In this study, there are physical and chemical parameters of Krena river followed during 2011 followed, and from the results we concluded that Krena river is one of the biggest pollutants of Ereniku river. Since, during its journey until uniting with Ereniku river there are sewage waters that are being discharged with atmosphere waters and other pollutants. These are the reasons of one year monitoring of this study.

One way to decrease the impact of human society on natural waters can be done by applying general and "all inclusive" monitoring regime. Monitoring of the water sources will determine the water quality and quantity, in terms of identifying impairments and helping politicians to take decisions on using the land which not only will protect the natural zones, but would improve the quality of life, as well.

Material and methods

Krena river is the river that passes throughout Gjakova City. In this river there are contaminated substances dissolved, such as from: the atmospheric precipitation, sewage waters, industrial waters etc. These contaminated waters disintegrate by decreasing the amount of macerated amount of Oxygen forming in this way eutrophication in the monitored Krena river waters.

Therefore the goal of this study is to give information over the quality of Krena river waters and the contamination that it causes while pouring into Ereniku river.
Water samples were taken in three points (localities): at the IMN Factory (Industry of Building Materials). From each of these three points first samples were taken 50 meters before sewage waters pouring. Second point samples are taken at the place where the sewage waters pour. And the third samples are taken 50 meters after pouring of the contaminated waters pour.

Water samples are taken in the 500 ml polyethylene bottles and the prior use were cleaned well and the sample was kept safe at the temperature 4^0C in the local refrigerator. In the sample taking place were determined these parameters: water temperature, ph value, electrical conductivity, turbidity, potassium permanganate, etc. To analyze the water in the laboratory we used standard methods as prescribed by APHA standard.

Through spectrophotometer UV Hach, Merck's urbidymeter pectraquant 1500 T, we used titrometric, conductometric, pH-metric methods etc.

Results and discussion

The research made in the laboratory of Regional Company for Water supply Radoniqi and some of them measured in the sampling site, during the study are monitored the parameters showed as below.

Table 1.Physic – Chemical analyses of the river Krena results

2011		IMN - River Krena May			IMN - River Krena Avgust		
Parameters		I	II	III	I	II	III
Temperature air	^0C	17.6	11.2	11.4	28.9	29.5	29.9

T°C							
Temperature water T°C	^{0}C	8.2	8.0	7.9	19.1	19.1	19.5
Color	Sh.Co-Pt	23	41	33	6	18	10
Turbidity	NTU	7.7	25.2	13.8	4.3	13.7	8.1
pH value	-	8.24	9.65	8.65	8.08	9.66	8.57
$KMnO_4$ value	mg/dm^3	18.96	85.32	30.02	11.69	79.42	22.17
Electr.conductivity	μs/cm	246	415	318	226	347	278
Total hardness	°dH	7.70	8.54	8.12	7.56	8.12	7.84
Dry residue	mg/dm^3	147.6	249	190.8	135.6	208.2	166.8
CO_2	mg/dm^3	5.61	8.25	6.27	5.06	5.94	5.72
Chlorides	mg/dm^3	8.50	19.14	10.63	7.44	19.14	10.65
Dissolved oxygen	mg/dm^3	10.8	6.9	9.9	10.4	6.7	9.5
Iron(Fe)	mg/dm^3	0.18	1.13	0.44	0.14	1.04	0.35
Manganese(Mn)	mg/dm^3	0.22	0.81	0.39	0.15	0.71	0.31
NH4 + ammonium	mg/dm^3	0.27	1.19	0.62	0.20	1.12	0.53
Nitrites(NO_2)	mg/dm^3	0.018	1.16	0.53	0.011	1.08	0.42
Nitrates NO_3	mg/dm^3	0.46	9.8	4.7	0.24	7.7	3.7
Sulphate	mg/dm^3	43	75	58	32	60	47
Phosphate	mg/dm^3	0.46	11.3	3.9	0.47	10.1	8.9

Table 2. Physic – Chemical analyses of the river Krena results

2011		IMN - River Krena Octobar			IMN - River Krena December		
Parameters		I	II	III	I	II	III
Temperature air T°C	^{0}C	16.5	16.5	16.6	16.7	16.8	16.8
Temperature water T°C	^{0}C	14.6	14.7	14.8	15.0	15.2	15.3
Color	Sh.Co-Pt	9	20	14	8	19	15
Turbidity	NTU	5.9	14.5	9.1	6.1	14.8	9.9
pH value	-	8.14	9.71	8.75	8.17	9.82	8.94
$KMnO_4$ value	mg/dm^3	12.0	69.52	20.54	12.32	71.10	22.17
Electroconductivity	μs/cm	229	379	284	233	381	285
Total hardness	°dH	7.56	8.12	7.98	7.7	8.26	7.98
Dry residue	mg/dm^3	137.4	226.8	170.4	139.8	228.6	171
CO_2	mg/dm^3	5.28	6.05	5.83	5.5	7.15	5.94
Chlorides	mg/dm^3	7.79	19.82	10.28	8.15	20.56	11.6

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Dissolved oxygen	mg/dm^3	10.6	6.8	9.7	10.5	7.1	9.9
Iron(Fe)	mg/dm^3	0.16	10.7	0.38	0.41	1.07	0.39
Manganese(Mn)	mg/dm^3	0.18	0.74	0.35	0.16	0.69	0.26
NH4 + ammonium	mg/dm^3	0.23	0.15	0.54	0.18	1.14	0.47
Nitrites(NO$_2$)	mg/dm^3	0.018	1.11	0.47	0.019	1.07	0.44
Nitrates NO$_3$	mg/dm^3	0.29	7.9	4.1	0.28	7.8	4.2
Sulphate	mg/dm^3	34	62	49	33	67	52
Phosphate	mg/dm^3	0.38	10.2	3.0	0.37	10.3	3.1

Diagram 1, Turbidity, pH value, KMnO$_4$ value, electroconductivity.
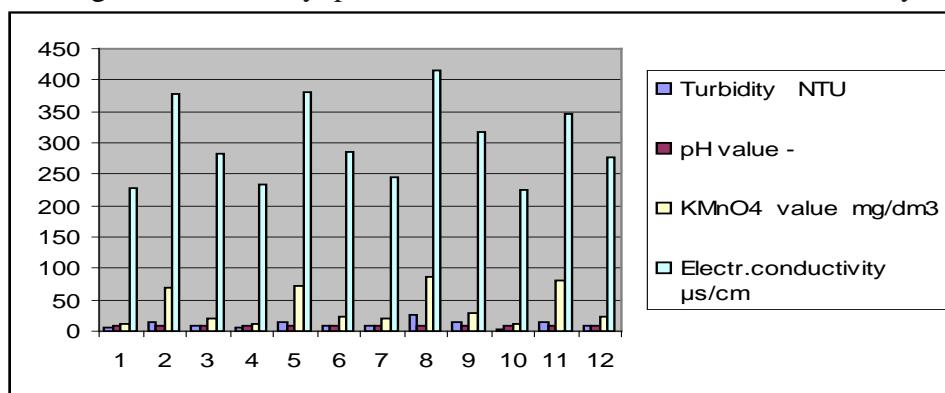
Diagram 2, Dissolved Oxygen, Iron(Fe),Manganese(Mn),NH4 + ammonium, nitrites(NO$_2$).
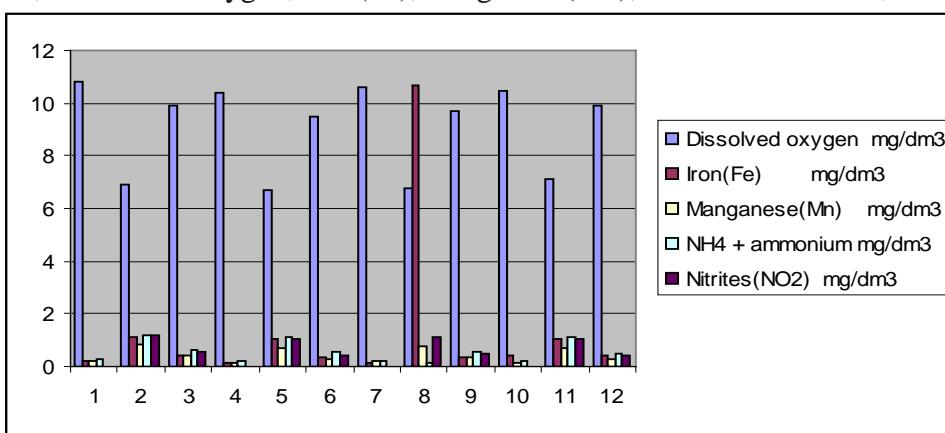
Discussion

During the seasons: spring, summer, autumn and winter of 2011, were made these physic – chemical analyses, in three sites of Krena river in Gjakova. From the tested parameters are: temperature, turbidity, pH value, dissolved Oxygen, KMnO$_4$ consumption, ammoniac, nitrites, Iron,Manganese, etc.

From the analyzes results, temperature is as an important parameter which shows that there are changes from the first site with temperature 7.9^{0}C in december up to higher temperature of 19.5^{0}C which was shown in august month at the third site. These parameters depends from the time, season and the place where the samples were taken. Turbidity vary from 5.9 taken at the first site up to maximum 25.2 taken at the second site, which means that

we are faced with an increase of turbidity. As the result of this increased values are the precipitation and many uncontrolled discharges made throughout Krena river and the municipal discharges.

pH value of 8.08 is marked in august 2011 in the first site of Krena river. Higher pH values appeared in the second site 9.82 in december 2011. Taken as a whole level of pH is not very high ,considering high discharges made into this river.The dissolved Oxygen in water which is very important for ecosystems and for all forms of water life including all the organisms. According to the results values,lowest value is measured in october (6.8 mg/l), and the highest is in spring in may 2011 (10.8 mg/l).

Potassium permanganate consumption is considered as a measure of organic substances content in the water, lowest level of this parameter in the water is marked in summer in august 2011, (11.69 mg/l) in the first site of Krena river. Highest potassium permanganate expenditure is in the second site of the Krena river (79.42 mg/l) in august 2011. Based in these results there are big differences which comes as result of the over-contamination of this water from uncontrolled discharges and sewage waters.

According to ammoniac the lowest level was marked in october at the second site (0.15 mg/l), and the highest level was in august at the second site (1.19 mg/l). Except the everyday discharges, in increasing of this parameter had influented the high temperatures and the lack of the water in the flow of the river's bed itself. Lowest nitrites in the water were marked in october 2011 (0.018 mg/l) in the first site of Krena river, and the highest were marked in the second site (1.16 mg/l) in spring, in may 2011.The presence of Iron vary from 0.16 mg/l in the first site up to 10.7 mg/l in the site 2 and that during october.

Level of Manganese in this water analysis is not that high, while we now that there are permanent discharges of contaminated water in this river, probably it's result of continual flow of this river and does not appear as rotter as Fe and Mn as well.

Conclusion

From the experimental samples taken in the Krena river results in 2011 we have concluded that:

There are river Krena water samples analyzed, in order to determine the physic-chemical parameters.Some parameters were measured at the site of the place of taking the samples , and the other analyses were sent immediately in the laboratory to analyze.The taken results show that the quantity of contamination of river Krena is indicated from discharge amounts of municipal and industrial contaminanters, and these contaminants of the river Krena indicate in contamination of river Erenik as well.It is recommended by the major state institutions to express responsibility at the institutions for water monitoring and maintence, in order to make control over the water, to make the gradual reduction of contamination, degradation and other activities that pose greater risk to the water environment and to build plants for sewage treatment with the aim of protecting the environment especially rivers. And by all this steps we should provide preserving the waters under EU Standards.

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STUDIES ABOUT THE KEY ELEMENTS OF TOTAL QUALITY MANAGEMENT

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Abstract

Total Quality Management is an organizational strategy founded on the idea that performance in achieving a quality education is achieved only through involvement with the perseverance of the entire organization in improving processes permanently. The objective is to increase the efficiency and effectiveness in satisfying the customers. The paper presents some fundamentals aspects about the Total Quality Management (TQM) concept and it is pointed out the 6 key elements for successfully implemented TQM organization: Confidence, Training, Teamwork, Leadership, Recognition and Communication.

Keywords: Quality, management, TQM, critical factors, key elements, models

Introduction

The concept of Total Quality Management (Total Quality Management - TQM) has been proposed by Dr. Edwards Deming in 1940 but its use started in 1985 with the takeover by American principles of working in Japanese industry (Abraham et. al., 1997):
- focus on process improvement permanent, so that processes are visible, repeatable and measurable;
- focus on analyzing and eliminating undesirable effects of production processes;
- consideration of how the users use products in order to improve product;
- expanding beyond concerns of product management.

Total Quality Management (TQM) allows firms to obtain, on the one hand, a high degree of differentiation, satisfying customers' needs and strengthening brand image, and on the other, to reduce costs by preventing mistakes and waste of time and by making improvements in the corporation's processes (Ahire et. al., 1996). TQM is a description of culture, attitude and organization of a company that strives to provide clients with products and services that meet their needs and expectations. This culture involves all the processes as the company did so well in the first, zero defects, zero waste. The concept of quality has undergone several stages, adapting to every level of technology and market requirements (Badri et. al., 1995). Thus, gradually, the selection of finished class performance has been replaced by statistical control of quality parts on-stream, then to extend the process, becoming, through the concept of quality an important factor in delivering products and services (Black et. al., 1996). Charge on a gate of which are increasingly a concern for quality led to the appearance TQM as a full definition concept which has a dimension in time correlate thus competing with the concept and simultaneous engineering (Powell, 1995).

Quality management theory has been influenced by the contributions by quality leaders (Ishikawa, 1976, 1985; Crosby, 1979; Deming, 1982, 1986; Juran, 1986, 1988; Feigenbaum 1991). The research by all these authors shows both strengths and weaknesses, for none of them offers all the solutions to the problems encountered by firms (Dale et. al., 2001), although some common issues can be observed, such as management leadership, training, employees' participation, process management, planning and quality measures for continuous improvement.

Key elements for implement of TQM

To successfully implemented TQM organization should focus on 6 key elements: Confidence, Training, Teamwork, Leadership, Recognition and Communication (Bhat et. al., 2009).

Confidence

It is a result of integrity and ethics of the organization without trust cannot be built within the work of TQM. The trust helps the full participation of all employees. Allows every employee empowerment which leads to involvement and engagement (Chang et. al., 2006).

Allow decisions to be made at levels closest to the problem, encourages risk taking individual and continuous improvement to help ensure that everyone on measurement indicators is made to accuse employees. Trust is essential to ensure customer satisfaction and is one that builds a climate of cooperation essential for TQM. Ethics - It is discipline which transposes each situation in terms of good or bad. Has two components represented the organization's ethics and individual ethics. Organizational Ethics establishes a code of ethics guidelines emphasize that you should join all the employees when operating. Ethics include the individual opinion of what is right and what is bad. Integrity - honesty involved, morals, values, honesty, sincerity and support with facts (Kumar et. al., 2008). It is important that expects and deserves to get the client (internal or external). As opposed to the integrity of character have duplicity. In a duplicity atmosphere, TQM cannot work.

Training

Training is very important for employees to be very productive. Supervisors are responsible for implementing TQM in their departments and to spread the philosophy of TQM among employees operate (Prajogo et. al., 2004). Training programs are important in creating and maintaining an environment for quality improvement, to:
- understand the importance of customer satisfaction and the corporate laboratory objectives.
- be able to contribute effectively to the continuous improvement programme.

Supervisors are solely responsible for implementing TQM within their departments, and teaching their employees the philosophies of TQM. Training of employees who need to refer to interpersonal skills, the ability to work as a team, techniques for solving, the ability to make decisions, performance analysis in order to improve the work, understanding the business is located. You have to be trained to become more efficient and more effective.

Teamwork

To be successful in business teamwork is an essential element of TQM, with the team can find solutions faster and better to the problems that occur in the organization. Teams can provide improvement of processes and activities. The teams people feel more comfortable to highlight problems that may occur and may receive help from colleagues to find and implement solutions. There are mainly three types of teams that TQM organizations have:

A. Quality improvement teams. Temporary teams created in order to analyze the problems that appear or reappear, often are established for periods of 3-12 months.

B. Teams to solve problems. Intended to solve certain problems and to identify the true root causes. Usually they have a duration of life between one week and three months.

C. Work Teams. These are small working groups comprised of skilled workers who share the same tasks and responsibilities.

These teams use concepts such as: employee involvement, self leadership, quality circles. These teams meet one or two hours per week.

Leadership

Probably the most important element of TQM. Appears everywhere in organization. Leadership in TQM means that the manager must have the vision to inspire, to trace the strategic directions that would be understood and implemented by all employees that will lead subordinates. For TQM to be successful in business supervisor must be dedicated leadership subordinates. A leader must understand the TQM, believe in his principles and to demonstrate this fact by faith every day. Supervisor to ensure that strategies, philosophies, values and goals are transmitted down the organization in order to provide focus, clarity and direction.   Effective leadership starts with the development of a mission statement, followed by a strategy, which is translated into action plans down through the organisation. These, combined with a TQM approach, should result in a quality organisation, with satisfied customers and good business results.

A key factor is that TQM must be introduced and led by management at the highest level. Personal involvement and commitment is absolutely necessary from the top management in determining values and goals for all levels in line with company objectives and define the systems, methods and measurable indicators to achieve these goals.

Communication

Communication is one that unites all these concepts. This acts as a vital link between all elements of TQM. Communication is there a common understanding of the ideas so that it emits and the one who receives them. TQM success is conditioned by the communication between all members of the organization, suppliers and customers. Superiors should create and maintain channels of communication through which to receive and transmit information about TQM processes. Sharing of accurate information is vital. For a credible communication is absolutely necessary that the message be clear that the interpretation of receptor to be in the sense in which the broadcaster has intentionally.

Recognition

This is the last element of the system, it should be given both for and suggestions for performance, both for teams and individuals.
Employees shall endeavor to obtain recognition for themselves and for their teams. Detection and recognition of individual contribution is the most important duty that each supervisor has. Then when people recognized the merits of producing major changes in terms of self respect, productivity, quality and quantity of effort for each task.
Recognition is the greatest impact when it is close can be a reward or just a message from top management.

Models for the representation of TQM

It was proposed several models for the representation of TQM, in accordance with definitions given by different researchers (Stancu, 2004).

Model Oakland (1989) proposes that TQM representation of a pyramid in the supply chain to customer-supplier of quality systems, tools of statistical quality control method of teamwork. These are integrated to support communication by stimulating the cultivation of a new industrial crops and immediate employment of all managerial structures.

The model focuses on meeting customer requirements in the external and the internal (which is translated by satisfying the requirements of any recipient of services or track the flow of production), the firm commitment to quality that has to start from the high level of management and should be reflected until the last level. This commitment is found both in quality investments for the specific field of activity, and by increasing the risk taken in an effort to get success (Kakkar et. al., 2007).

A good quality management system covers all major aspects of business such as management, conception, design, materials, manufacturing processes, qualifications, distribution of products and services. TQM requires a continuing review of compliance with agreed standards of clients and performance tracking tools with statistical control of processes. The "team work" model involves promoting the idea of continuous and sustained improvement, and implementation in the organization.

Model SOHAL (1989) suggests that quality improvement continues to come from an integrated approach to quality control action plans at various operations during the business cycle.

The principal elements of the model are:

- focusing the customer: the objective of all of the organization should improve the quality of processes and services delivered.
- engage management to build a culture and an environment of quality, expressed by changing attitudes and expectations and supported by the measurement and quality control.
- total staff participation from the base to the peak, the problems associated with understanding the processes in the sense of moral responsibility and membership.
- use of statistical techniques for analysis of correlated data and to solve various problems.
- a systematic process of solving problems using the cycle execution-check-action-and concentration items on clients business process.

Three dimensional model proposed by Price and Gaskill. This model is to:

- the size of products and services, and the degree to which a customer is satisfied with our products and services;
- personal dimension and the degree to which a customer is satisfied relationship with the organization providing personnel;
- size processes and the degree to which the supplier is satisfied with the internal working processes, which are used to develop products and services provided to the client.

The three dimensions are considered together and reflect the organization and request that it can evaluate, analyze and can only improve business.

In terms of scope of TQM, there are implementations in the different areas are: protection of health education and research; government agencies; the environment; banks; manufacturing.

The difficulties encountered in implementing TQM come most often from:

- lack of sufficient involvement of top management;
- resistance to change;
- insufficient training and education;
- the poor communication;
- lack of resources, high costs.

For the enterprise stimulation and implementation of the TQM, the European Foundation for Quality Management (EFQM) has developed starting with 1991, European Quality Award – EQA. Developing this reward system, was achieved with the help of European Organization for Quality and European Commission. The pressure of new conditions in the world economy, globalization of market demand orientation and relaxation dynamics of technology and resources, orientation and expectations of customers, forcing the application of appropriate managerial concepts, this being a condition of competitiveness.

By entering the European Quality Award, is meant by the European Foundation for Quality Management (EFQM) the stimulation and implementation of the TQM.

Conclusion

TQM refers to an integrated approach by management to focus all functions and levels of an organization on quality and continuous improvement.

Over the years TQM has become very important for improving a firm's process capabilities in order to achieve fit and sustain competitive advantages. TQM focuses on encouraging a continuous flow of incremental improvements from the bottom of the organization's hierarchy.

TQM is not a complete solution formula as viewed by many – formulas cannot solve managerial problems, but a lasting commitment to the process of continuous improvement.

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DETERMINATION OF PHYSICO-CHEMICAL PARAMETERS OF WATER IN BIOLOGICAL MINIMUM IN THE LAKE "RADONIQ"

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Abstract

Artificial lake of Radoniqi is raised in dam of river Përrua in north of the town of Gjakova , in village Radoniq , main source of supply with water is "Lumbardhi i Deçanit" it secure with water near 90%.Goal of this study was to analyzed concentration of physical parameters, chemical and metals in the water of Lake Radoniq and their impact on water quality. Rating of physical parameters, chemical and metal is important to determining the environmental condition of waters. The general content of metals, organic substances in water provides valuable information not only for the general level of pollution in the water, but also helps in determining the pollutant source.In this study that has been done over the years 2011,2012, has been presented results of physical-chemical parameters and metals like: Fe,Pb,Zn,Al in the water of Lake Radoniqi that after treatment this water is used for human consume.

The results that has been obtained show that the water of the lake "Radoniq" is water with good quality , but the presence of some metals such as Cd, Pb, Zn, etc. in the lake water makes us think about their sources and to search for a better solution. Therefore required continuous monitoring and deeper analyze for quality of water. Certainly water needs to be treated in technological process so it can be used for human consume.

 Biological minimum is designed under the lake, where water discharges collected from all seen that certain parameters of water quality by biological minimum is almost the same features as the lake naturally seen a lower presence of dissolved oxygen , what is more than normal because of the depth of approximately - 68 m. Therefore, it requires continuous monitoring and deeper analysis of water quality.

Keywords: Metals,water, method, analyzis, lake, parameters.

Introduction

Water is a natural resource with limited and uneven distribution in time and space. All forms of life and all human activities are dependent on water. Water resources are of great importance to human life and economy and are the main source of meeting the demand for drinking water, for irrigation of lands and industries. Lack of water is considered as a limiting factor of socio-economic development of a country.

Modern industrial development and urbanization have resulted in the formation of large urban areas, industrial zones and the development of intensive agriculture. This has increased the need for water, but also the growth of urban and industrial discharges into rivers

without any prior treatment, thereby reducing the   possibility of self-purification (auto purification)   of   water.

The need for clean water, today is considered as one of the biggest problems the global environment. Currently, more than 1.2 billion people worldwide have no access to drinking water while some 3 billion people (half the world's population) do not have adequate sanitation services. More than 200 diseases are originating from contaminated water and about 6,000 people a day lose their lives just by diarrheic diseases.

According to the World Health Organization, an estimated 5 million people die each year from the consumption of contaminated water. Considering the current trend of urbanization in the world by 2025, nearly 3 billion people will need water supply and more than 4 billion for access to sanitation. In Kosovo, as in many countries, human health and meeting their needs is increasingly threatened by the poor quality or lack of clean water.

Material and methods

In order to determine the physico- chemical analysis and heavy metals in biological minimum lake " Radoniq ".Samples for water analysis has been tested in water are inorganic analytical laboratory RWC " Radoniq ." For this purpose the method is implemented : by atomic absorption spectrophotometers SAA , Perkin ELMMER , NOVA60 photometer Merck , titrimetrike method , gravimetric etc . Samples of water are taken in bottle of 1000 ml, bottle was from polyethylene well cleaned,transport and storage of samples are done with little   refrigerator   for   saving   temperature   between   4-7°C.

Samples of water are brought immediately in laboratory to analyze. The physical parameters that has been analyzed are: Temperature, Turbulence, Value of pH, Electrical conductivity these parameters has been rated in the place where samples has been taken through mobile device.

Water samples were taken in the lake at the bottom of the lake or biological minimum depth of - 68 m .

Water samples were taken in 1000 ml bottle cleaned well initially , and immediate, are brought into the lab to analyze these parameters analizired : Spending $KMnO_4$, Nitrites , Nitrates , Sulphates , phosphates , metals such as Fe,Mn,Pb , Cd , Zn , Cu , , etc. . Where were analyzed by atomic absorption spectrophotometry with SAA who previously do by elements required calibration and wavelengths of each element , in terms of other parameters such as temperature , turbidity , pH value , conductivity , dissolved oxygen , scaled in sampling site with portable devices .

Table 1. Results of physico-chemical analysis of water-in Biological Minimum Analyzed in 2011.

Parameters	Units	Results	Standards
Temperature	^0C	**5.9**	
Turbidity	- NTU	**2,03**	ISO 7027:1999

Vlera-pH	-	**8,19**	ISO 10523:2008
Calcium	mg/l	**40,6**	ISO 6059:1984
Magnesium	mg/l	**5.8**	ISO6059:1984
Iron	mg/l	**0.04**	ISO 6333:1986
Manganese	mg/l	**0.064**	ISO6333:1986
Nitrogen Amonia	mg/l	**0.86**	ISO 6333:1986
Chlorides	mval/l	**1.5**	ISO 9297:1989
Nitrates	°dH	**0.9**	ISO 7890-2:1988
Sulphates	°dH	**7.9**	ISO 9280:2000
Phosphates	°dH	**0.04**	ISO 6878:2004
Dissolved Oxygen	mg/l	**6.2**	ISO 5814:1990
ExpenseKMnO4	mg/l	**4.16**	ISO 8467:1993
Lead	mg/l	**0.001**	APHA 3111B
Cadmium	mg/l	**<0.005**	APHA 3111 B
Chromium	mg/l	**0.001**	APHA 3111 B
Cuprum	mg/l	**<0.1**	APHA 3111 B
Nickel	mg/l	**0.001**	APHA 3111B
Zinc	mg/l	**0.02**	APHA 3111 B

	2011
Temperature	5.9
Turbidity	2.03
pH value	8.19
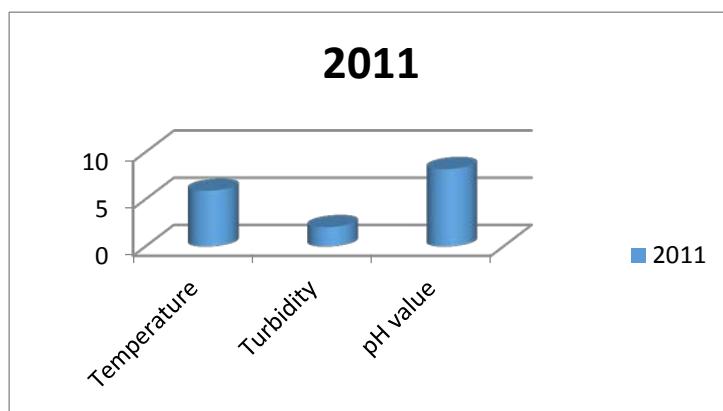
Figura 1. values of physical parameters of water

Expense KMnO4	4.16
Dissolved oksygen	6.2
Fe	0.04

Mn	0.064
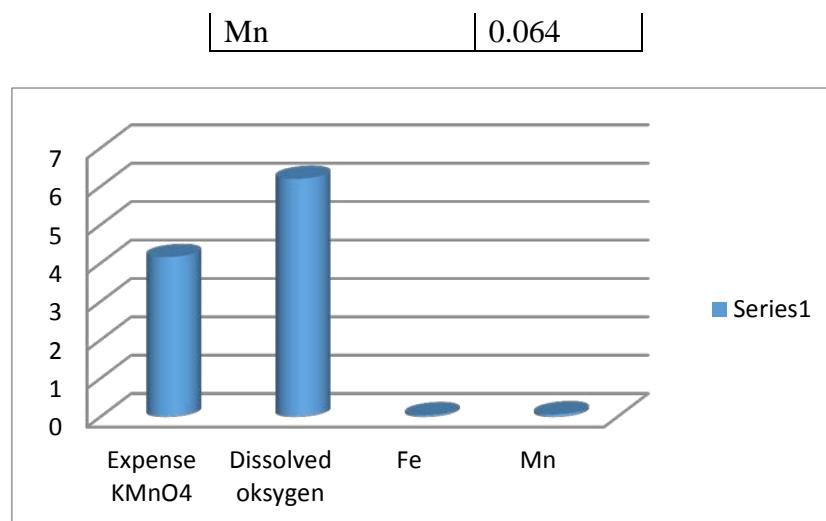
Figure 2. values of chemical parameters of water

Table 2. Results of physico-chemical analysis of water-
In Biological minimum,analyzed in 2012

Parameters	Units	Results
Temperature	^0C	**5.7**
Odor	-	**Pa**
Taste	-	**pa**
Color	Co-Pt scale	**Pa**
Turbidity	NTU	**2.83**
Ph value	-	**7.86**
Expense KmnO$_4$	mg/dm^{3}O$_2$	**3.68**
Conductivity	μs/cm^2	**172**
M-alkality	mval/l	**22.5**
Total Hardness	°dH	**6.58**
Ca	°dH	**5.88**
Magnesium	°dH	**0.7**
Dry residue.	mg/dm^3	**123.2**
CO$_2$	mg/dm^3	**4.95**
Chlorides	mg/dm^3 Cl	**4.89**
Dissolved Oksigen	mg/dm^3 O$_2$	**6.4**
Iron	mg/dm^3 Fe	**0.08**
Manganese	mg/dm^{3}Mn	**0.06**
Nitrogen Amonia	mg/dm^3 NH$_3$-N	**0.09**
Nitrites N-NO$_2^-$	mg/dm^3 NO$_2$-N	**0.0045**
Nitrates N-NO$_3^-$	mg/dm^3 NO$_3$-N	**<0.6**
Sulphates SO$_4$$^{2-}$	mg/dm^3 SO$_4$	**16.5**
Phosphates PO$_4$	mg/dm^3 PO$_4$	**<0.05**

Year	2012
Temperature	5.7
Turbidity	2.83
pH value	7.86
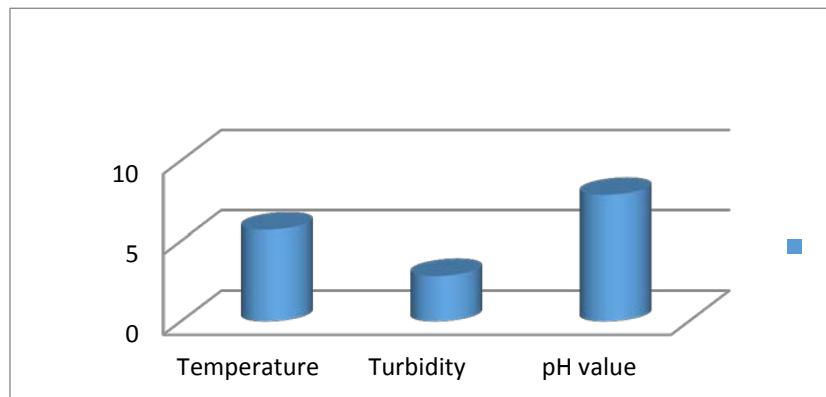
Figure 4. values of physical parameters of water

Expense KMnO$_4$	3.68
Dissolved Okxigen	6.4
Fe	0.08
Mn	0.06
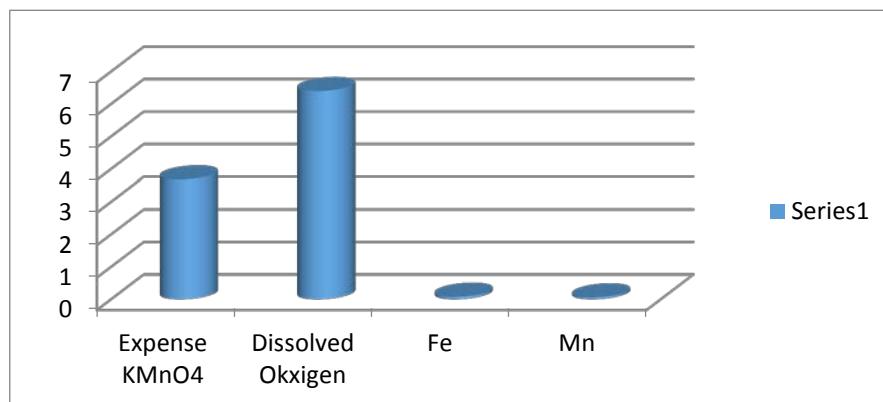
Figure 5. values of chemical parameters of water

Table 3. Results of physico-chemical analysis of water-
In Biological minimum,analyzed in 2013

Parameters	Units	Results
Temperature	° C	7.5
Turbidity	NTu	0.67
Taste		pa
Ph value		7.70
Expense KmnO$_4$	mg/dm^3	5.37
Conductivity	µS/cm	207.0

M-alkality	mval/dm^3	22.5
Total Hardness	° dH	7.28
Ca	° dH	5.46
Magnezium	° dH	1.82
Dry residue.	mg/dm^3	124.2
Chlorides	mg/dm^3	4.25
Dissolved Oksigen	mg/dm^3	7.8
Iron	mg/dm^3	0.02
Manganese	mg/dm^3	0.022
Nitrogen Amonia	mg/dm^3	0.05
Nitrites N-NO$_2^-$	mg/dm^3	0.003
Nitrates N-NO$_3^-$	mg/dm^3	0.6
Sulphates SO$_4^{2-}$	mg/dm^3	15
Phosphates PO$_4$	mg/dm^3	0.6

Parameters	Results
Temperature	7.5
Turbidity	0.67
pH value	7.7
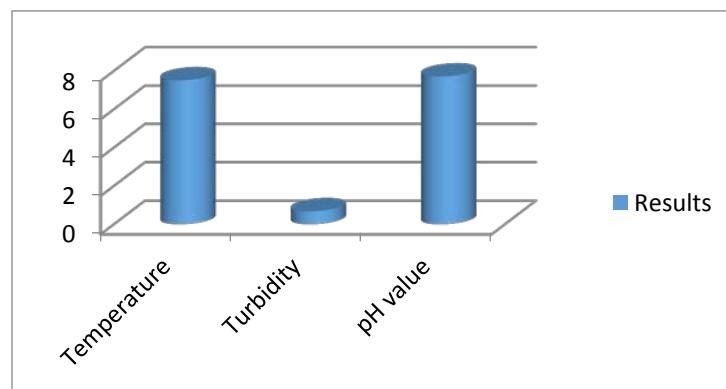
Figure 5. values of physical parameters of water

Parameters	Results
Expense KMnO4	5.37
Dissolved oksigen	7.8
Fe	0.022
Amonium N-NH3	0.05
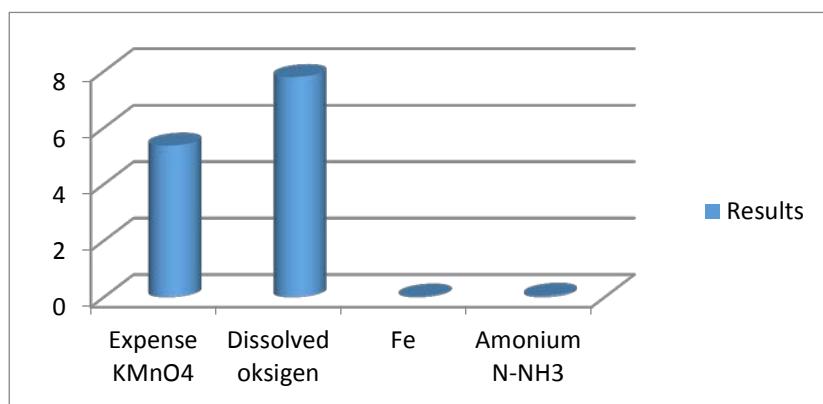
Figure 6. values of chemical parameters of water

Conclusion

The results of water analysis conducted during 2011,2012 and 2013 in the waters of Lake " Radoniq" show fluctuations of physical and chemical parameters, starting with the temperature, which during the month of February 2011 we have a reduction in temperature of up to 5,7 ℃, while during July and August there's an increase up to 7.5 ℃, which is normal and   it   varies   by   seasons   of   the   year   .

Turbidity: the water in Lake shows growth during months of April, May, June, because of the water flow when the turbidity is around 2.03 NTU, and in May and Jun it goes up to 3.67 NTU. This change is a result of high water flow to bring Lumbardhi of Decan terms of turbidity of water in biological minimum it shows an increase especially when large flow of water from melting snow and rainfall from turbidity have and change which is also observed in biological minimum or end of the lake a depth of -68 mPH value: It is the most important parameter because this parameter regulates the balance of CO_2 and water carbonates, and this parameter shows how the water will be treated. PH value parameter in our   case   is   7.86   to   7.70,   and   is   within   standard   for   drinking   water   .

Nitrites and phosphates show a gradual increase especially during the months of April, May and June as a result of uncontrolled discharges made by population along the canal for water supply to the lake.

The presence of organic matter such as potassium permanganate spending, it's within the   normal   limits.

Also, the metals Fe, Mn, Zn, Al, Pb,Cd,Cu are within the permissible limits for drinking water, which means that what we are dealing with a good quality water, but such waters need further treatment in the technological process and special attention be paid to process of Floculation, coagulation,decantation, filtration and chlorination of water to eliminate the bacteria that are present in the lake water Radoniq. These processes are implemented promptly and with great success in water treatment Plant in RWC "Radoniq " in order to offer consumers the best quality water.

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COMPARISON OF RADON LEVEL CONCENTRATION IN SOILS WITH THE NATURAL RADIONUCLIDES CONTENT IN SOME REGIONS OF IONAIN COASTAL AREA, IN ALBANIA

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Abstract

In this study we present the results taken in south-eastern part of the country, in Ionian coastal area. This study is realized into regions, in the some places in Ksamil town and Uji i Ftohte-Qeparo areas. The main sources of radon gas indoors are entirely related to the geological environment. The measurements of Radon can be realized in several ways such as: radon and permeability in soil; measurements of natural radionuclides (^{40}K, ^{238}U, ^{232}Th) on the ground and soil; radon concentration level in water; measurements radon indoor in dwellings; radon level and soil permeability. Measurements (soil and permeability) have been realized using the Luka-s method. Tests have been carried out indoor at short and long measurement, using active defector with time interval 24h-72h and passive radon detectors in 3months time interval, respectively. The level of in soil Radon concentration has values from 10kBq/m^3 up to160kBq/m^3. From the interpretation of radon level according to Czech Classification, together with permeability of the soils results that in the two studies areas, Ksamil and „Uji i Ftohte- Qeparo", the radon risk areas are present in 50% up to 60% of the studied area.

Keywords: Permeability, radon, soil gas, red clay

Introduction

Nowadays, fear of the population on radioactivity is focused on artificial radiation sources, especially on nuclear facilities. Most people do not suspect that the greatest exposure to the population is caused by natural sources. So, two of the components of radon in houses and terrestrial gamma, give 63% of dose of general exposure which human gets. From the point of view of human exposure, only some natural radionuclides are important. All geological formations are composed of various elements, among them uranium and thorium.

Their content in rocks and soil is different, depending on different types of rock. Two natural radionuclides, ^{238}U and ^{232}Th, in their process of disintegration contain a gaseous element, Radon, respectively ^{222}Rn and ^{220}Rn. These gaseous elements are released and come towards the surface and the houses constructed on these geological formations. Products of their disintegration are radioactive, especially those of Rn-222. Disintegration of Radon-222 in indoor environments, gives some daughters products, where the most important are isotopes of polonium and bismuth. This products are very small particles of material which during the process of respiration are accumulated in the lungs. In high concentrations they increase the probability of lung cancer (UNSCEAR, 2000).So, rocks and soil are the main source of radon. The radon risk maps serve preferably for determination the level of potential radon release from bedrock. However, the radon entry into houses is strongly influenced by the building quality of the house (Barnet, 1994) Based on geological knowledge and

measurement of radon gas in the soil and permeability, are compiled the radon risk maps, which provide a very important roadmap, for making anti-radon measures.

Geological settings

The Ksamili area and the wider belong to the Ionian tectonic zone, and is composed from carbonatic formation of Lower Jurassic (J_1), represented mainly from limestone with thin up to middle interlayer thicknesses, and rarely from conglomerate interlayers. All those geological formations belong to the eastern part of the Butrinti anticline. The Plio-quaternary deposits on the studied area are represented from clays (terrarosa formations) and vegetables soils of Quaternary. The Plio-quaternary deposits are mainly situated inside the town area and belong the laky type or intermediate deposits (laky-alluvium-laky prolluvium). The thickness of these deposits is from 0.5 m up to 6-8m, figure 1a and 1b.

a

b
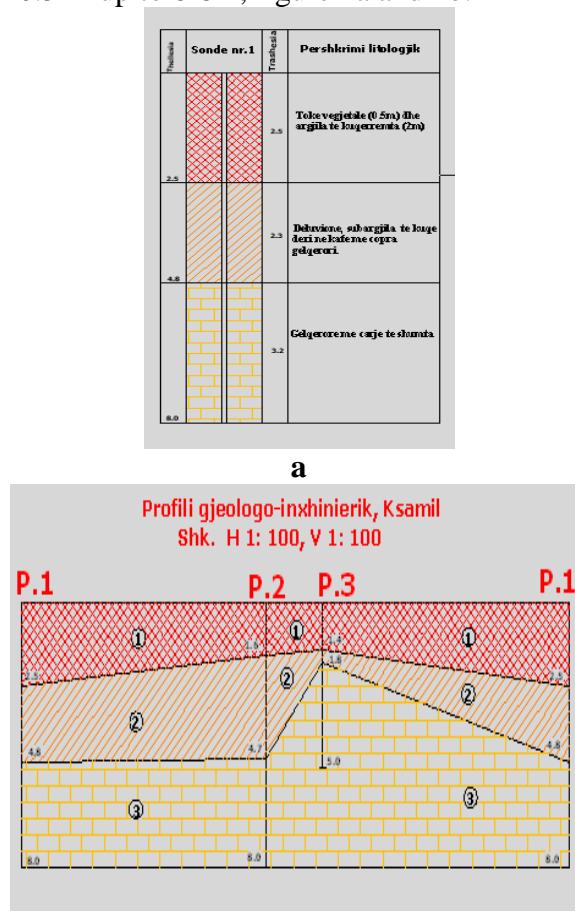
Figure 1: The lithology of the Ksamili region. A) The lithological column of the Ksamili region. B) Geological cross section from engineering geology works carried out 1) Terrarosa; 2) clayey soils, limestone boulders; 3) Limestone.

The determination of the thickness of terarosa deposits is somehow difficult in that area, that can be studied with engineering geological-geophysical works. In many cases they are covered from alluvium cones and as a consequence they cannot be seen in the surface. In figure 1, we see the thickness of the terrarosa given by geophysical and geotechnical studies in the area which is 0-2.5 m (Photo. 1).

Photo 1: View of a building above thick terrarosa formation

Methodology

In every place, 12-15 test site measurements of the volumetric activity level of Radon concentration in soils (A_vRn) (Matolin, M., 1996), together with permeability(K) measurements has been carried out. Measurement time for the determination of a_vRn is realized 6 minutes after the sample was taken, or after taking the sample from the soil throughout Janet Syringe using Lukas camera of the Instrument Luk-4. The air samples are taken in depth 80-85 cm from the earth surface, according to the well-kown Luka-s methodology (Matolin, M. 1994). The measurement of the soil permeability of the soils was done with the Instrument RADON-JOK (Neznal et al., 1996).

Assurance quality of the data

The used instruments on this study has been calibrated periodically in the National Metrological Center of Czech Republic in Pribram (fig. 2).

Figure 2: Transfer data from Equipment to p.c

Results
In soil Radon measurements

In the Ksamili town is studied an area with 3.34 km2, with 30 places, in which are determined 430 values of volume Radon activity (a_vRn) and 90 values of permeability coefficient. From the interpretation of results we conclude that there are 5 level groups of a_vRn: there are not low levels smaller than 10kBq/m^3; middle levels from 10 up to 20kBq/m^3, belong to 3 places; increased levels from 20.01 up to 30kBq/m^3, are taken in 5 places; high levels from 30.01 up to 50kBq/m^3 are taken in 5 places; very high levels from 50.01 up to 70kBq/m^3 belong to 9 places; extremely high levels from 70.01 up to 100 kBq/m^3 are taken in 7 places. Whereas in the Uji i ftohte-Qeparo region, are realized 18 insitu measurments, in some sectors where terra rosa deposits.

The nature of radioactive emanation field

The study of natural radionuclides and that of the nature of radioactive emanation field in Ksamili area, has shown that it is complex and composed with ((Rn-222dhe Rn-220)

and in any case it is only clean field of Rn-222 as consequence of Thorium concentration predominance. The typical cases of the field nature are shown in (fig. 3).

a   b
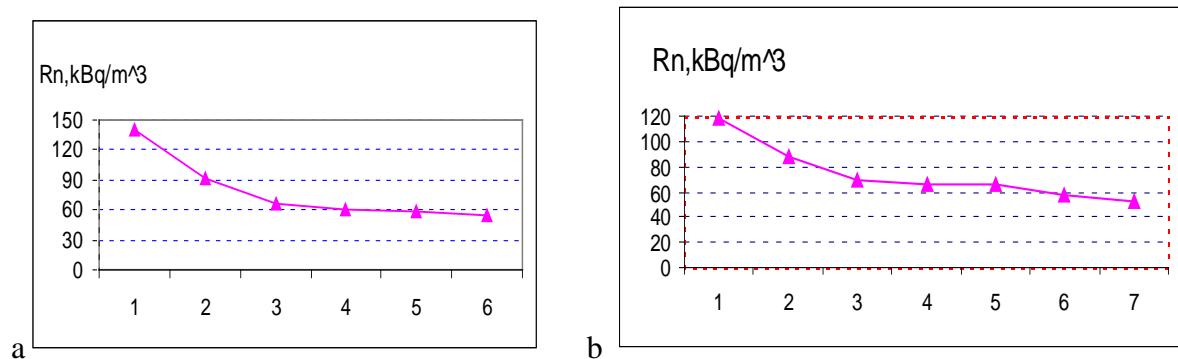
Figure 3: Study of Radioactive field, area ksamil.   a) place 5, K = 0.7%; eU-238 = 8,4ppm; Th-232 = 14.7ppm. b) place 14, K =1.1%; eU-238 = 7.5ppm; Th-232 = 17ppm.

Determination of permeability

The processing of the data according to group levels of permeability are presented in figure 4. So, 50 % of the measurements belong to the group with high permeability smaller than 23s, the other part belongs to the group with middle up to high permeability (23.1 up to 36sek.) or 26.7% of the measurements, and in 10 places that make 33.3 % of the studied area belong to the group with middle permeability from 36.1 up to 200sek.
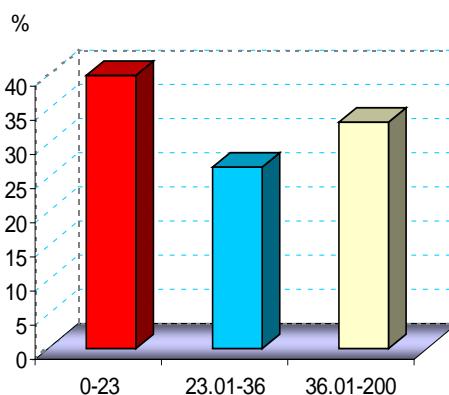
Figure 4: Histogram of permeabillity distribution, area ksamil

The results of in soil radon concentration levels and the permeability in Uji i Ftohte-Qeparo region are given in figures 5 and 6.
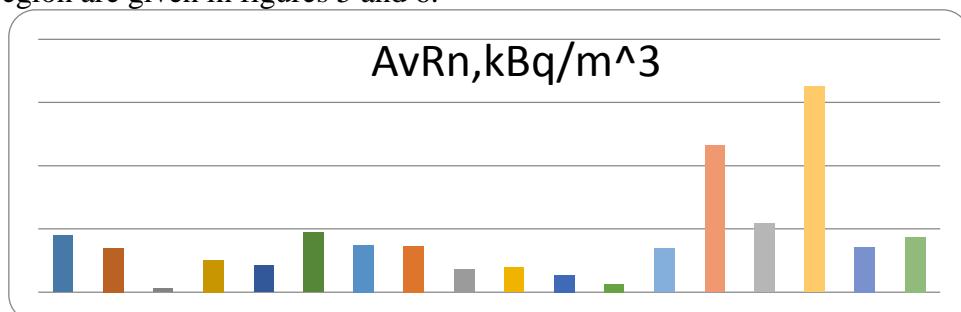
Figure 5: The distribution of radon level conentration in some places of terra rosa developments in Uji I Ftohte – Qeparo area.
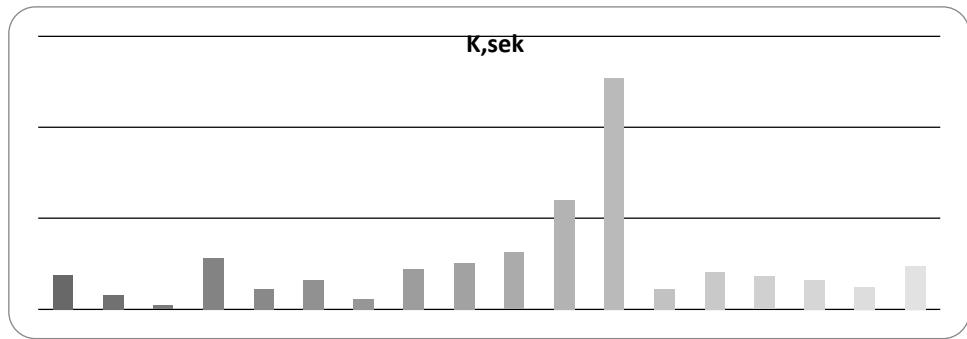
Figure 6: The distribution of in soil permeability, in some places of terra rosa developments in Uji i Ftohte – Qeparo area.

The classification of in-soil Radon risk

In figure 7a and b, are presented the results of Radon risk in Ksamil and Uji i Ftohte – Qeparo areas. Only in one place there is low Radon risk, 14 places are of middle risk and 50% of the area or 15 places show high risk. We point out that in the places with high Radon risk, the level of Radon concentration goes up to $100kBq/m^3$.

a)   b)
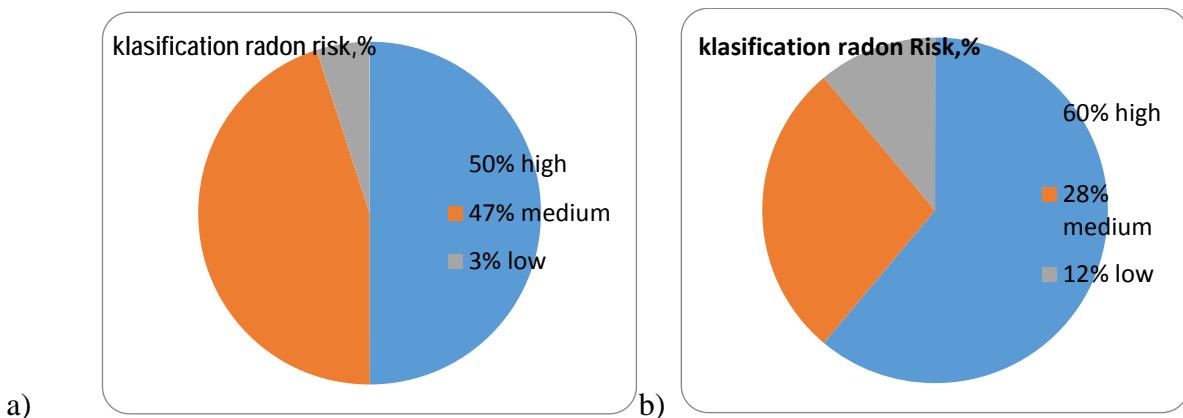
Figure 7: Histogram distribution of in soil Radon risk.
a) in Ksamili area b)Uji i Ftohte – Qeparo area.

The level of indoor radon concentration

Indoor radon measurements are realized in some places, in area Ksamil, with the short term methodology using active detectors Fritra-2 and AlphaGuard. Indoor monitoring is realized during 24 hours with a continuous cycle of measurements. In figure 8a and b, are shown the graphical presentation of indoor radon concentration in two places. As seen from graphs, high level of radon are met which is above the norm. But, the levels of indoor radon concentration on those places should have been much more higher, taking into account the high in soil Radon concentration. This is explained from known different factors that effect the behavior of Radon gas.
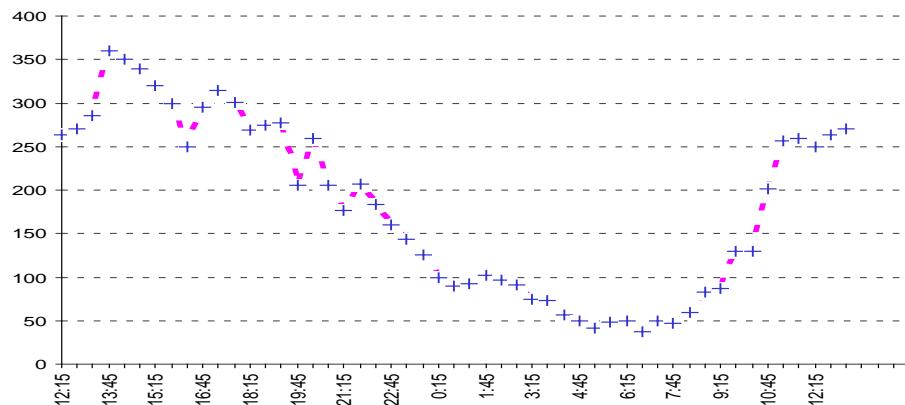
a
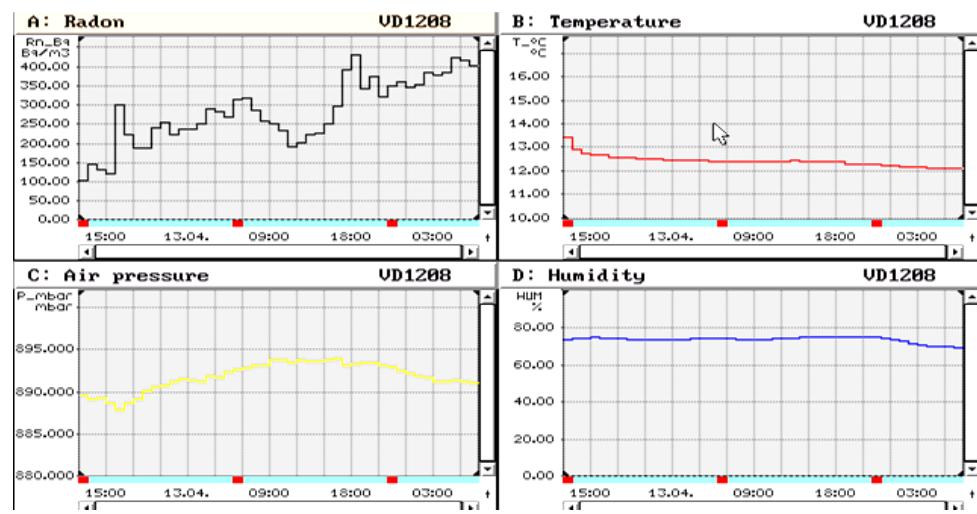
b

Figure 8:   Monitoring of indoor Radon concentration inside two houses, a,b.
In the map of Radon risk on the Ksamili area are present three categories of Radon risk (fig. 9)
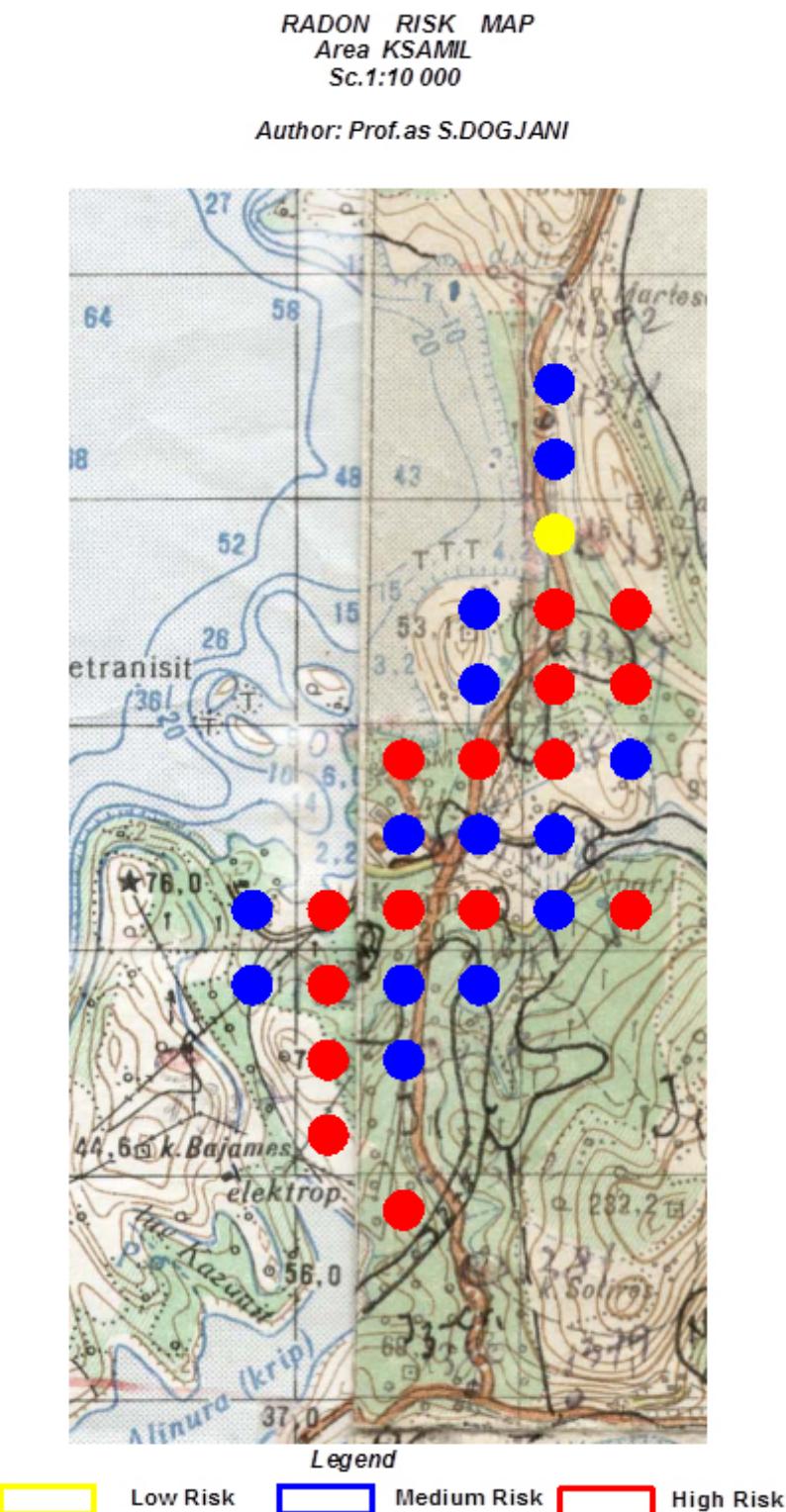
Figure 9: Radon Risk Map, Ksamil area

Discussion

We think that in the studied area(Ksamil), in some places of measurements, due to different spatial extent terrarosa, we see low values of Radon concentration. This phenomenon is shown in figure 6, where there is an unconformity of radon level concentration, with the level of Radon from eU-238, measured with the instrument NaITl,Kristal3x3Inc (fig. 10).
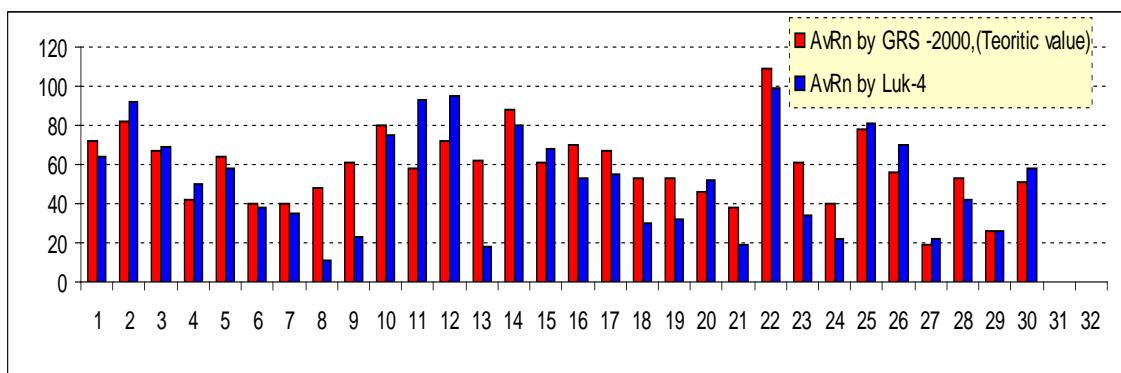
Figure 10: The distribution of Radon level and the natural radionuclides in the places of measurements, area ksamil

Conclusion

      The presence of terrarosa in several parts of coastal Ionian area in Ksamili town as well, provokes high levels or in soil radon concentration.

In cases where the thickness of clayey cover is above 1m, high levels or radon concentration are met.

      We recommend that the constructions have to be build taking into account the anti-radon measures.

Terrarosa should not be used as a filling material of building basement.

Acknowledgment

      We thank the AGS, and Ministry of Environment of Albania that made possible the financial support of the field work.

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EXPERIMENTAL DEMONSTRATION OF THE TIME-IRREVERSIBLE THERMAL EVOLUTION PROCESS AND SOME OF ITS CONSEQUENCES

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Abstract

Using a recently developed technique of synchronous differential temperature measurements (Titov & Malinovsky 2005), the existence of the thermal surface energy (TSE) and of thermal hysteresis effect has been demonstrated in metallic gauge blocks (GB). The TSE (described here) is observed if there are inputs of energy and momentum of external electromagnetic (EM) field to material artefact and the heat source is not symmetrically located relative to the artefact surface. The TSE, linearly related to the Poynting vector of the EM field, presents the energy of the oriented motion of the coupled field-particles system inside artifacts. The TSE results in a thermal hysteresis effect, which is irreversible in time and has no symmetry in space. As the principle of superposition is shown not to be valid for EM fields in case of TSE, the hysteresis loop for the continuous sweep in time converts into a spiral, in which the form and the magnitude of the each cycle are slightly different from the ones of the adjacent cycles. In confirmation of the preceding theoretical result (Stroud *et al* 1972), the number of influence parameters in case of the field-particle system is found to be absolutely enormous, so that the thermal evolution process has, practically, infinite number of the existence and manifestation modes. Our studies present also an experimental confirmation of the basic results of the series of theoretical papers, initiated by R. H. Dicke (1954), in which the interaction of the ensemble of atoms with the electromagnetic field is analyzed.

Keywords: Temperature, hysteresis, evolution in time and space

Introduction

In recent years, important advances of temperature measurements in a standard range close to 293K were reported: the resolution of temperature measurements of ~1μK was achieved (Titov, Malinovsky & Masssone 2001); the agreement between the different water triple point (WTP) cells (which are nowadays the unit defining temperature standards) can be obtained at the level of ~3μK (Titov & Malinovsky 2005); the long term stability of temperature measurements of 9μK per year has been demonstrated (Titov & Malinovsky 2011). When these advances are combined with the multi-channel synchronous detection technique (MSDT) ((Titov & Malinovsky 2005)), in which the modulation of the input energy is performed in one of the measuring channels by changing the current in the platinum resistance thermometer (PRT) and the *induced variations of temperatures* are detected synchronously by other channels, we acquire a unique opportunity for the detailed studies of the process of heat propagation in material artefacts. Additionally, MSDT offers vast possibilities for precise studies of the non-linearity of thermal systems. Indeed, the ratio of the temperature variations of ~20mK, induced easily by a PRT, to the temperature of ~2000K (when the physical properties, including thermal, of materials change significantly) is $1*10^{-5}$,

while the MSD-technique has the demonstrated precision below $1*10^{-8}$ (Titov & Malinovsky 2005). So, *there is an opportunity to check experimentally if the model assumptions of some well-established physical theories, such as Thermodynamics or Fourier thermal conductivity theory (TCT), are still in agreement with the new level of temperature measurements*.

Such studies are acquiring special importance when we recall A. Einstein's observation (1905) that "*classical thermodynamics can no longer be looked upon as applicable with precision...For the calculation of the free energy, the energy and the entropy of the boundary surface should also be considered*". In the other fundamental paper, entitled "A Theory of the Foundations of Thermodynamics", A. Einstein (1903) writes: "*Let the system be isolated, i.e., the system considered should not interact with other systems*", and further there: "*Experience shows that after a certain time an isolated system assumes a state in which no perceptible quantity of the system undergoes any further changes in time; we call this state the stationary state*". So, in accordance with A. Einstein, Thermodynamics deals only with isolated systems, and when, additionally, all the transient processes have already finished in this system.   Some very important theoretical observations can be found in a popular University text-book (Sivukhin 2008b), where it is specially emphasized that the thermodynamic temperature can be regarded as a function of state, *only if it is assumed* that for quasi-static processes (that are widely used in thermodynamic theoretical analysis) the number of the influence parameters is equal to the number of the parameters, which are used for the description of the system under the thermal equilibrium conditions. D. V. Sivukhin (2008a) gave the definition of the thermal surface energy (TSE) as the energy of boundary zones, located between the macroscopic parts of the system, in which the quasi-equilibrium thermal conditions are realized. It is argued in ((Sivukhin 2008a) that the TSE is proportional to the area of the contact between the two sub-systems, and that *the internal energy of the system can be considered as additive, only when the value of the TSE is regarded as negligible*. It is also specially noted in (Sivukhin 2008a), that the thermal conductivity process presents a typical example when a relatively slow process can not be considered as a quasi-static process. This gives a clear indication that the notion of temperature in TCT (Sivukhin 2008c) cannot be associated with the thermodynamic temperature. From these sources it appears that the thermodynamic concept of temperature has to be used with great care, but, unfortunately, there is no other, more general definition of temperature in theoretical Physics.

Another important observation dealing with TCT we find in (Eckert & Drake 1972, p.46, where in the first chapters of a thick text-book it is emphasized that TCT is based on the result of a *single, one dimensional, steady-state experiment*, with the help of which the heat flux density in a material artifact is considered to be defined solely by the temperature gradient inside the artifact. So, the parameter, T, which enters the Fourier TCT, could hardly be regarded as a thermodynamic temperature. First, the presence of the temperature gradient shows that the system is not closed. Second, TCT calculates the heat transfer process, and it means that the system under consideration is not in the state of thermal equilibrium, and this is another violation of A. Einstein requirement for the applicability of thermodynamics and its concept of temperature. Evidently, only new precise experiments can help to establish the relation between the concept of thermodynamic temperature and the "experimental" temperature as a general measure of thermal energy, which has been used by mankind for centuries.

In this paper, we present the new results of the studies, reported in (Titov & Malinovsky 2013) where, for the first time, the existence of the thermal surface energy (TSE) has been demonstrated. TSE presents the energy of the oriented motion of charged particles and of the guided electromagnetic (EM) field , which is propagating inside material artifacts, accompanying a non-uniform motion of charged particles (Jackson 1999: Griffiths 1999). It is

shown that TSE arises when there is an input of the thermal energy (positive or negative) to the system, and the parameters of TSE (its magnitude and the direction of its increase) are defined by the Poynting vector of the external EM field produced by a heat source. So, on one hand, we can say that TSE appears as a result of the EM field pressure (Sivukhin 2008f), or in other words, TSE is the consequence of the continuity of the EM momentum and of the equation (2.21) in (Loudon, Allen & Nelson 1997) that is written for the coupled field-particle system. On the other hand, we can also say that the TSE presents another form of the fundamental collective R. Dicke effect (1954), which is related to the interaction of EM field with an ensemble of charged particles and which has been studied in the series of papers (Stroud *et al* 1972; Wineland, Drullinger & Walls 1978; Cummings & Dorri 1982). In the particular case of the system under consideration, the collective effect corresponds to very low levels of excitation of atomic system, when as a result of the effect of trapping of EM radiation in the atomic system (Dicke 1954), the number of particles in the ensemble should become a crucial parameter in the description of interaction in the field-particle system (Stroud *et al* 1972; Cummings & Dorri 1982).

The most important results of these studies are the following. First, it is experimentally shown that TSE results in the thermal hysteresis effect, which similar to the well-known hysteresis effects in ferromagnetic (Sivukhin 2008d) and ferroelectric (Sivukhin 2008d) materials, is irreversible in time and has no symmetry in space. Second, with very high signal-to-noise ratio it is demonstrated that *the principle of superposition is not valid for TSE*, so that any two heat sources are in continuous, ever-lasting, non-linear interaction with each other through the TSE, which arises in the material artifacts under the irradiation of their surfaces by the EM radiation of the heat sources. The thermal hysteresis effect and the violation of the superposition principle for thermal fields lead to the evolution in time of thermal system, which presents a "self-ordering" process. In this evolution process, the parameters and properties of the artifact (such as the wave momentum density and the total-energy density inside artifact together with their current densities, as defined in (Loudon, Allen & Nelson 1997), as well as the mass transfer of particles, the level of stresses and deformations inside the artifact) are all under continuous changes as a result of the constantly varying in time external conditions. The key features of the thermal evolution process are that these properties of the artifact are specific for any particular point as well as for the specific time moment, and *the number of influence parameters, necessary for the description of the evolution process and TSE, is absolutely enormous under the achieved accuracy level of the experimental studies*. High-resolution measurements have demonstrated that for thermal systems (which are always open systems) neither the total energy (of the EM field and of the charged particles), nor the wave momentum can be considered as conserved quantities. By the presented experiments we show that the effects of the energy and momentum transfer from the system can be observed for the measurement time intervals of about a few minutes, only.

Experiment

The main features of our experimental set-up can be seen on the inset of Fig.1, where a 100-mm gauge block (GB) is located horizontally on three polished spheres inside a closed Dewar. The air temperature in the laboratory is precisely controlled, so that typical diurnal variations are usually within 50mK. Two temperature sensors (thermistors R6 and R3) are equipped with copper adapters, which cover the whole width (35 mm) of the GB.

Thermistors are, practically, identical and are installed parallel to the gauging surfaces of the GB (Fig.1). A 100-Ohm platinum resistance thermometer (PRT), also equipped with a copper adapter, is located exactly between the adapters of the thermistors.

We use the newly developed MSD technique (Titov & Malinovsky 2005) to measure

simultaneously, with high precision the variations of temperatures in the channels that are induced by the modulation of the current in the PRT at the locations of the thermistors R6 and R3. Synchronous measurements of temperatures and of thermal velocities are realized by the program, whose print-screen for the duration of 1.4 period of the modulation cycle is presented in Fig.1. The duration of the cycle is ~140 minutes: ¼ of the cycle the PRT current is kept at the level of 5mA (heating period); for the ¾ of the cycle duration the current is 1mA (cooling period). The PRT is connected to a programmed precision bridge Mi-T615 (Canada), so that the accurate temperature measurement of the PRT is always available. Meanwhile the thermistors R6 and R3, belonging to channels 1 and 2, respectively, are connected to precision multi-meters HP-3450A, so that synchronous differential temperature measurements between the channels 1 and 2 with the resolution of 1-2μK can be achieved, as a result of high sensitivity of the thermistors relative to PRT and very fast measurement procedures of the multi-meters in comparison with the bridges. The trace in Fig.1 with a faster response time corresponds to the measured PRT resistance. The two other traces show the variations of the resistances of the thermistors with negative thermal coefficients. As a consequence of the used geometry, the system is extremely sensitive to any asymmetry in heat fluxes along the surface of the GB in the direction of the longest side of the GB, as the thermistors are calibrated to measure the temperature of the artifact surface in the close vicinity of its adapter (Titov & Malinovsky 2005). With the two cursors of the program (shown in Fig.1 as triangles), we specify the desired part of the record, and the program calculates the mean values of the temperature and of the temperature rate in each channel, using the calibration equations (temperature versus resistance) for each channel that are in advance stored in the program.
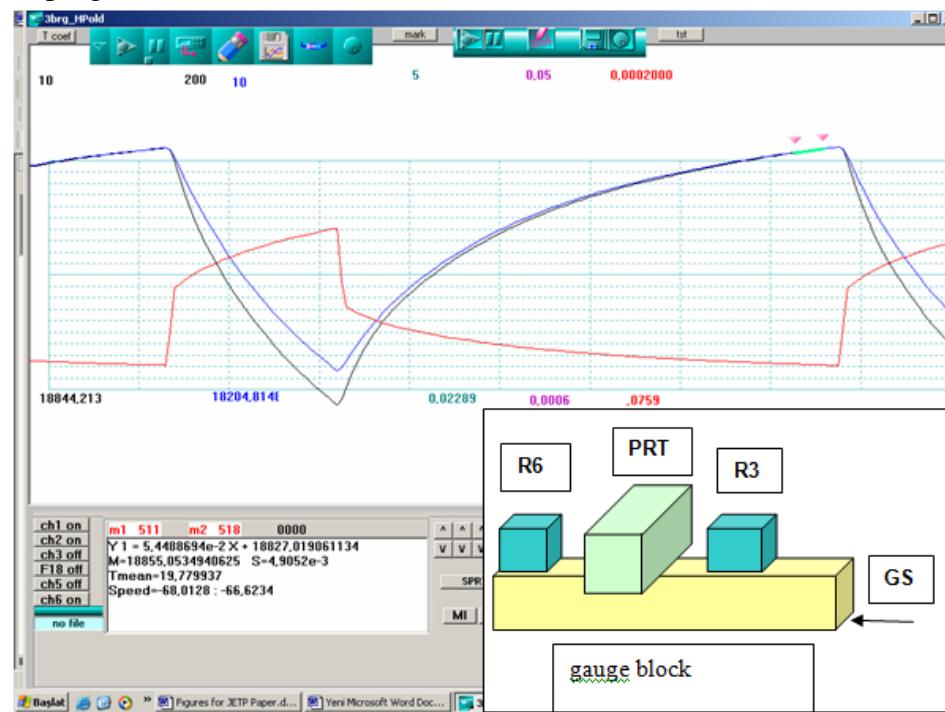
Fig.1. Simultaneous records of the resistance variations of the platinum thermometer (PRT) and of the two thermistors R6 and R3, which are located symmetrically relative to the PRT on the surface of the gauge block (see insert). During the modulation cycle, the current in the PRT is kept at the level of 5mA for ¼ of the modulation period, and it is kept at 1mA for the rest part of the period. As the sensitivities of the thermistors are equal, these records demonstrate that the induced temperature variations in the channels are different! The location of one of the gauging surfaces of the block is shown by an arrow.

In two separate windows, the program displays the initial and final moments of the measurement time interval that are defined by the position of the cursors on X-axis of the record. The larger window of the program shows the mean values of the temperature and of the temperature rate, obtained in one of the channels during the specified measurement time interval. The information about the results of the measurements in all of the channels for the sequence of the desired time intervals is written by the same program in a special file. These files contain the data of synchronous differential temperature measurements between the channels 1 and 2 as a function of time, and that information is presented separately for high and low levels of the modulation current in the PRT, so that it can be processed using the MSD technique. The plots in Figs. 2, 4, 6 present the examples of the application of the MSD technique to the data of such files. The procedure of the calibration of the PRT and thermistors is described in detail in (Titov *et al* 2005) and the application of the MSD technique is outlined in (Titov & Malinovsky 2011). Here, we note that the records of Fig.1 correspond to measurements on a steel block with 10-mm separations between the adapters of the thermistors and the adapter of the PRT.

An observation of a paramount importance can be inferred from the plots of Fig.1: though the separations of thermistors from the heat source are the same, the *induced temperature variations in the channels are different.* This means that the thermal transfer process is not symmetric in space, similar to the domain build-up processes in ferromagnetic (Sivukhin 2008d) or ferroelectric materials (Sivukhin 2008e) under the application of the external fields. This also means that the basic assumption of the Fourier TCT is in contradiction with the experimental results obtained by the variation principle, the most general and powerful in experimental Physics. Indeed, from the corresponding temperature measurement results of Fig.1 we find that for the last 30 minutes of the cooling part of the cycle at I=1mA, which is presented first in this figure, the mean temperature, recorded by the thermistor R6, was 466μK higher than the mean temperature, obtained from the thermistor R3. The mean temperature difference between the channels 1 and 2, recorded for the last 30 minutes of the cooling period, we shall denote by **T[1,2]**. For the next cycle, shown in Fig.1 and marked by two cursors, this temperature difference **T[1,2]** was ~ 469μK, so that the stability of these points was within 4μK. The points, corresponding to the last 30 minutes of the cooling part of the modulation cycle (at I=1mA), we shall call *the reference points*.
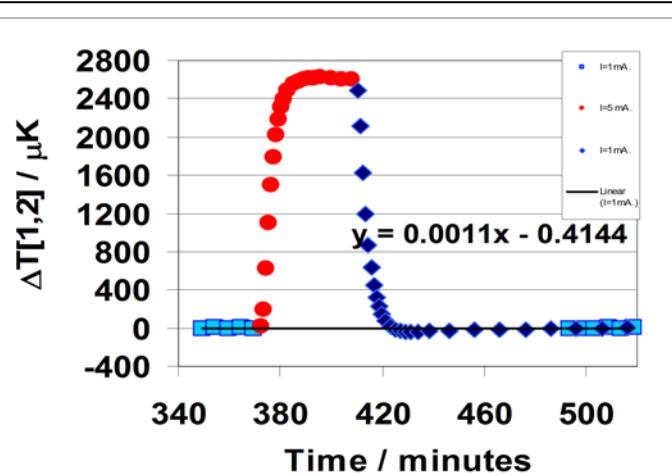
Fig.2. The dependence on time of the thermal surface energy (TSE), represented by the difference in the induced temperature variations **ΔT[1,2]**, recorded in the two thermistor channels 1 and 2 during one modulation cycle. Dots and rhombi show the experimental points, obtained during the heating and cooling periods of the modulation cycle, respectively. Squares correspond to the reference points for the two adjacent cycles, and the linear fit to these points is shown as a solid line, with the corresponding expression presented in the inset.

In Fig.2, corresponding to the experimental conditions of the records of Fig.1, these reference points are marked with rectangles, and the measurement time for the reference points was chosen 5 or 10 minutes. A linear fit, obtained for all reference points of the record of Fig.2, is shown as a solid line, which is very close to abscissa axis. The inset of Fig.2 contains the equation of this linear fit. From this equation we find that for the initial time of the record (X=350min.) the fit value is -0.02μK, while for the end of the record (X=480 min.) it gives the value of 0.11μK. So, all the values of the reference function, given by the fit equation and representing the systematic offsets, are well below ±1μK for the whole time interval of this observation. The random spread of the data points relative to this fit is also very small: a standard deviation of a single reference point relative to the linear fit is less than 3μK.

Using this fit as a reference, we can determine very precisely the difference between the simultaneous measurements of temperatures, realized by the channels 1 and 2 for the whole duration of the modulation cycle. This temperature difference, which is measured relative to the fit for the reference points, is denoted here by the quantity **ΔT[1,2]**. The experimental points of Fig.2, presented as dots, demonstrate the time dependence of the difference in the temperatures of the channels 1 and 2, when *these temperature variations are induced by the increased value of the PRT current* (I=5mA) during the heating period of the modulation cycle. The measurement time intervals are 2 and 4 minutes at the beginning and at the end of the heating period of the cycle, respectively. It follows from Fig.2 that for all data points of the heating period the quantity **ΔT[1,2]** is positive, surpassing by orders of magnitude the standard deviation for the reference points. The maximum value of the quantity **ΔT[1,2]** is equal to 2620±3μK, while the systematic offset of the reference function is   within   ±1μK.

Fig.3. Variations in time of the difference between the induced temperature velocities, recorded by the channels 1 and 2, **ΔV[1,2]**, that are observed during the heating period (I=5ma) of the modulation cycle (dots) and during the cooling period (I=1mA) of the modulation cycle (rhombi). These variations are measured relative to the reference points, shown as squares. The solid line shows the linear fit to the reference points, with the corresponding equation of the fit presented in the inset.

It should be specially emphasized that the induced temperature difference **ΔT[1,2]** is a vector quantity. Its positive value indicates that the amount of thermal energy, delivered from the PRT during the heating period of the cycle to the unit volume of the material artifact in the vicinity of the thermistor R6, is larger than the corresponding amount of the thermal energy, delivered to the unit volume of the artifact in the vicinity of the thermistor R3. Thus, this experiment has given a first clear demonstration that, in spite of the fact that the thermistors are located on the surface of homogeneous artifact at the same distance from the

heat source, the average flux of the thermal energy in the direction of the nearest gauging surface of the artifact is substantially higher than the average flux of energy to the bulk material away from the gauging surface, when a positive input of energy to the artifact is realized from the heat source (during the heating period) and the heat source is located closer to one of its gauging surfaces. And it should be specially noted that the larger average flux of thermal energy in the direction of the nearest gauging surface occurs when for all time intervals of the heating period, the temperature difference between the PRT and R6 was smaller than the difference between the PRT and R3, so that the projections of temperature gradients in the direction of R6 were definitely smaller than the corresponding projections of the temperature gradients in the direction of R3. So, we can infer from Figs. 1 and 2 that at the initial stages of the heat transfer process there is an additional flux of thermal energy, which cannot be related to the thermal gradients in the artifact, as it supposed in TCT.

Similar to the induced temperature difference **ΔT[1,2]**, we can introduce the induced difference in temperature velocities **ΔV[1,2]**, corresponding to the positions of thermistors R6 and R3. The dependece of **ΔV[1,2]** on time is presented in Fig.3 under the experimental conditions of Fig.2. Here, it is worth reminding that the difference in thermal velocities **ΔV[1,2]**, presented in Fig.4, is also a vector quantity. The positive value of **ΔV[1,2]** means that the thermal power, delivered to the unit volume of the artifact material, is larger in the vicinity of R6 thermistor, relative to the power, delivered to the unit volume of the artifact in the R3 vicinity. The dots in Fig.4 demonstrate the dependence on time of the difference in the induced temperature velocities, recorded by the channels 1 and 2 and obtained during the heating period of the modulation cycle. For the heating period, the quantity **ΔV[1,2]** is positive, so that the thermal power, delivered to the unit volume in the vicinity of the gauging surface, is larger than the power delivered to the unit volume, which is located symmetrically relative to the heat source but in the opposite direction, away from the nearest gauging surface. As shown in (Titov & Malinovsky 2013), the quantity **ΔV[1,2]** is defined by the difference in the total-energy fluxes arriving to the corresponding elementary voumes of the artifact through the boundary surfaces of these volumes. The comparison of the plots of Figs. 2 and 3 shows that the excessive energy flux in the direction of the boundary (gauging surface) does exist only during a short time interval of the heating period of the modulation cycle. The result of paramount importance is that the energy fluxes, propagating in a homogeneous material in opposite directions from the heat source, are not equal when the heat source is not symmetrically located on the surface of the artifact (Titov & Malinovsky 2013). When all three thermometers were moved together without changing their separations along the side surface of the gauge block the antisymmetric dependence of the quantity **ΔV[1,2]** on the displacement of the heat source relative to the center of the side surface was observed (Fig.4). The plots of Fig.4 were obtained for a 100-mm tungsten carbide (TC) gauge block. The comparison of the Figs. 3 and 4 shows that the process of the build-up of TSE is about 3 times faster than the process in the steel gauge block.
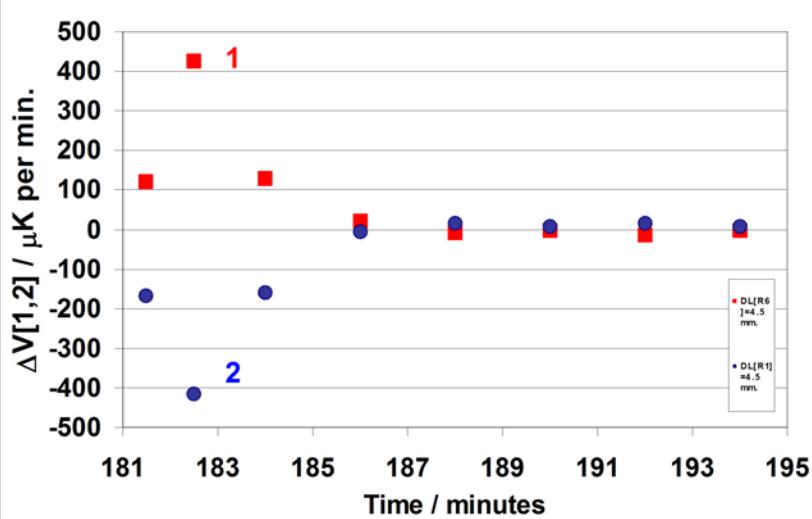
Fig.4. The dependences of the quantity **ΔV[1,2]** on the time interval, elapsed after the increase of the PRT modulation current, for two opposite cases of the thermistors positions: dependence 1 (shown by squares) corresponds to the separation of the R6 thermistor of 4.5mm from one of the gauging surfaces of the block, while the dependence 2 (shown by dots) corresponds to the case when the measuring system as a whole was shifted along the surface of the block, so that the separation of 4.5mm of the thermistor R3 from the other gauging surface was realized.
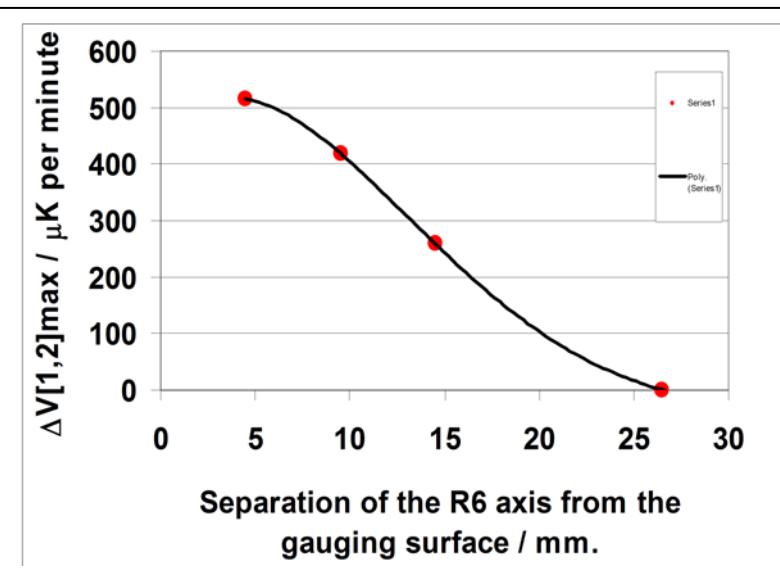
Fig.5. The dependence of the maximum value of the quantity **ΔV[1,2]** on the separation of the axis of the thermistor R6 from the nearest gauging surface. The zero value of the quantity **ΔV[1,2]** corresponds to the symmetric position of the PRT on the block surface.

The excessive energy flux, responsible for the creation of TSE (characterized by **ΔT[1,2]**), is observed in the vicinity of the boundary and falls rapidly with the increase of the distance of the temperature sensor from the gauging surface. The corresponding experimental curve for the the maximum value of the quantity **ΔV[1,2]** for the steel block is shown in Fig. 5. When described by the Gaussian curve, the dependence of Fig.5 is characterized by the mean square value of about 13.7mm. The other fundamental property of the excessive energy flux (characterized by the vector quantity **ΔV[1,2]**) is the linear dependence of its maximum value on the Poynting vector of the external EM field, created by

the energy dissipation in the PRT (heat source). The corresponding dependences are presented in Fig.6 for two different positions of the thermistor R6 from the gauging surface of the   steel   gauge   block.
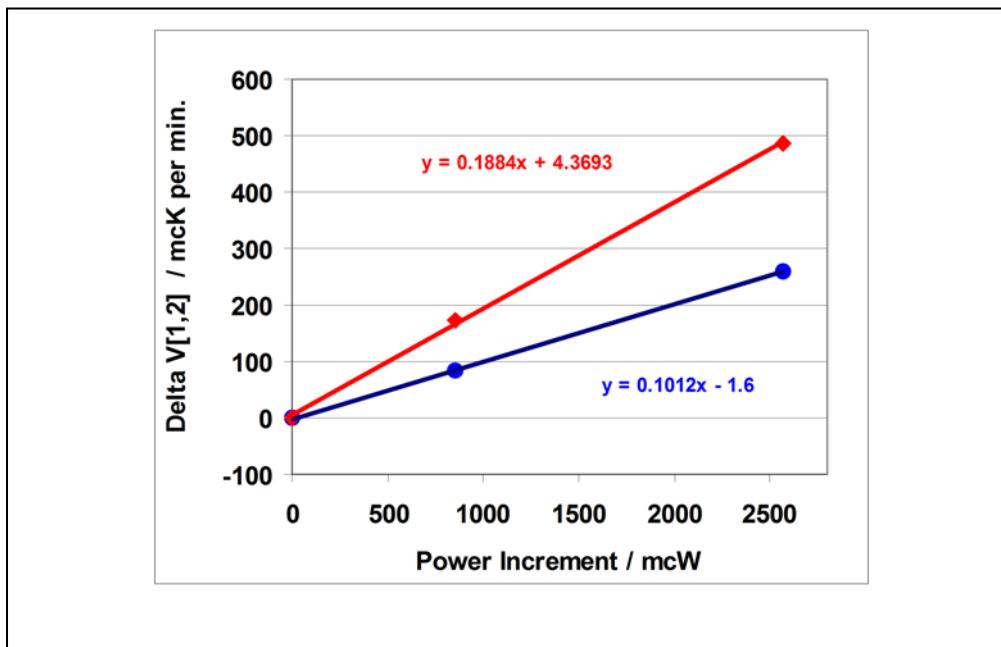
Fig.6 The effect of the PRT power increment on the quantity $\mathbf{\Delta V1,2]}$. Dependences 1 and 2 correspond to the separations of the R6 axis from the nearest gauging surface of L=4.5mm (dots) and L=13.5mm (squares), respectively. The decrease of the magnitude of the energy flux with the increase of the R6 separation from the nearest gauging surface is clearly demonstrated by the dependences (1) and (2).

It is shown in (Titov & Malinovsky 2013) that the experimental curve in Fig.2 is equivalent to a hysteresis loop, and the corresponding thermal hysteresis loop is presented in Fig.7. The area, enclosed by the loop, defines the additional energy, dissipated into the environment by the gauge block and R6 adapter surfaces relative to the correspondent surfaces of the gauge block and R3 adapter (located symmetrically relative to the heat source) during one cycle of the periodic process of Fig.2. Similar to the hysteresis effect in ferroelectric materials, the thermal hysteresis process is irreversible in time, as in accordance with (Feynman, Leighton & Sands M 1964), the backward play of the record of the process, presented in Figs.2 and 6, gives the evident contradiction with the Clausius-Plank formulation of the second fundamental principle of thermodynamics (Sivukhin 2008b). So, the thermal hysteresis effect, characterized by the quantity $\mathbf{\Delta T[1,2]}$, has no symmetry in space (Fig.4) and is irreversible in time, in complete agreement with the studies of the hysteresis effects in ferromagnetic and ferroelectric materials (Sivukhin 2008d, 2008e).

The other fundamental property of the thermal hysteresis effect is that the principle of superposition is not valid for any two heat sources, affecting the temperature of the artifact. This is the consequence of the corresponding property of the thermal surface energy (Titov & Malinovsky 2013) and the general property of the nonlinearity of the ensemble of atoms, interacting with electromagnetic fields (Ramsey1963). For the case of the TSE, characterized by the quantity $\mathbf{\Delta T[1,2]}$, the effect of nonlinearity is demonstrated in Fig.8. Here, it is shown that the temperature variations, induced by the increase of the modulation current in the PRT and detected by two thermistors, located symmetrically on the artifact surface relative to the heat source, are affected by the presence of the energy flux, which is produced in advance in
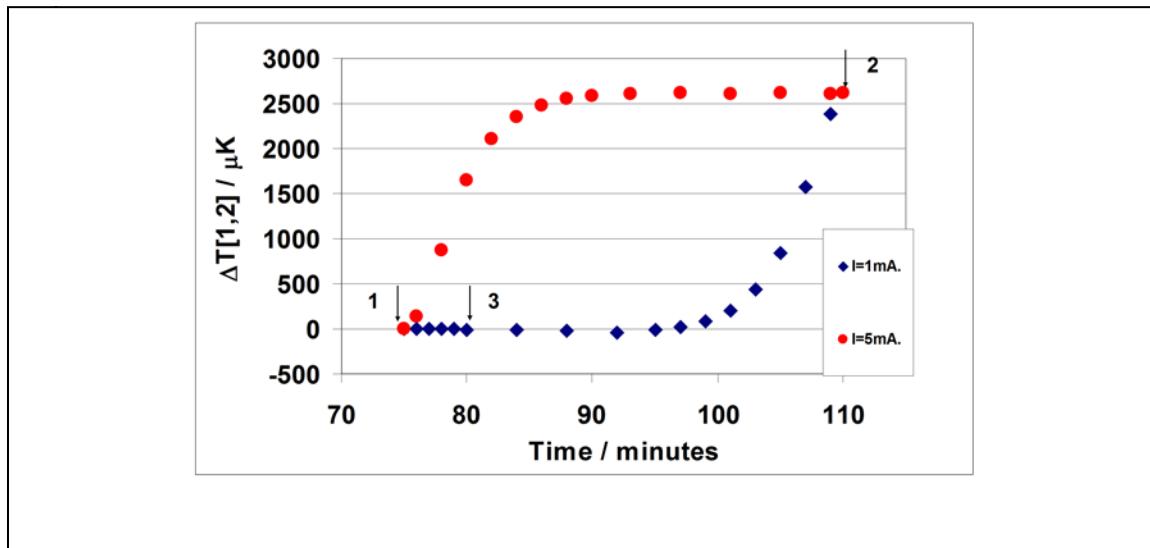
Fig.7. The thermal hysteresis loop for the quantity **ΔT[1,2]** that corresponds to the temperature records of Figs. 1 and 2. The heating period of the cycle (between the arrows 1 and 2) is shown by dots, while the cooling period of the modulation cycle (between the arrows 2, 3 and 1) is presented by rhombi.

the aretifact by an auxiliary heat source and which results in the temperature difference between the locations of the thermistors **T[1,2]** (that is measured as a mean value for the last 30 minutes of a cooling period of the modulation cycle). As it follows from Fig.8 (when the scales are chosen equal in both coordinates), the nonlinearity of the thermal system, under the conditions of the present experiment, exceeds 1% (in accordance with the linear fit presented in the figure).
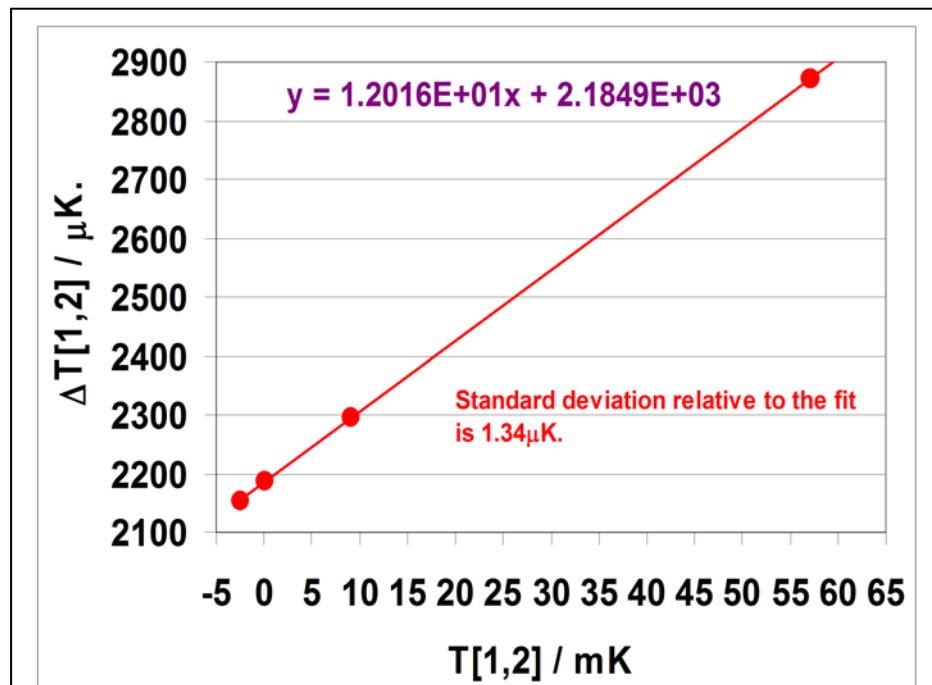
Fig.8. The dependence of the quantity **ΔT[1,2]**, measured 13 minutes after the increase of the PRT modulation current in steel gauge block, on the temperature difference **T[1,2]** between the positions of the thermistors R6 and R3.

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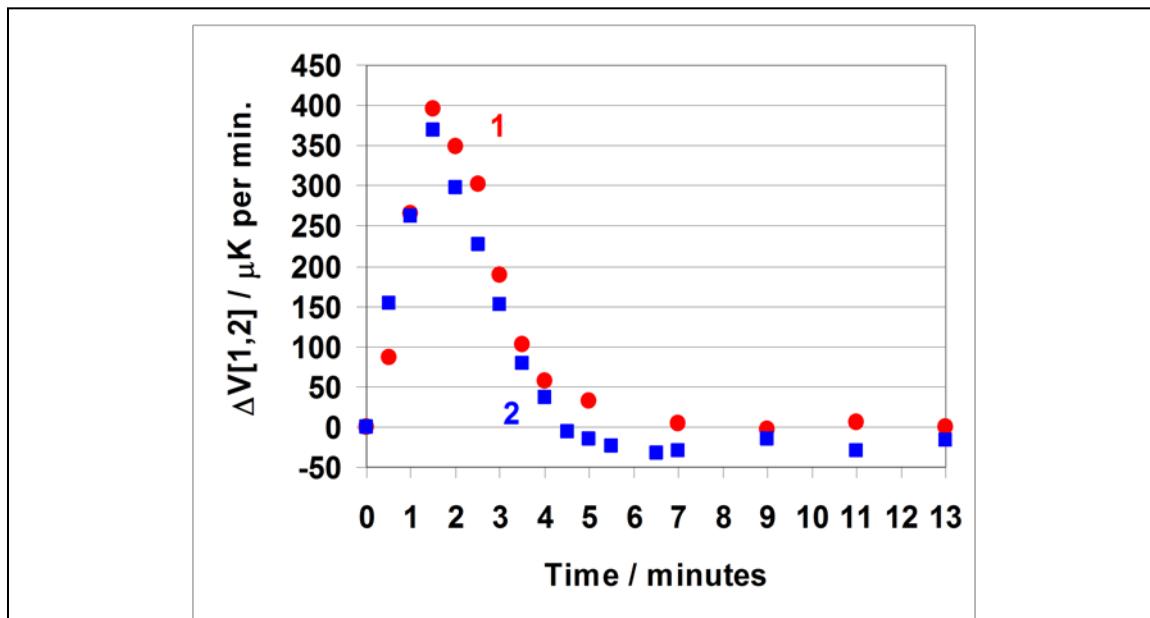
Fig.9 The dependencies of the quantity **ΔV[1,2]** on time for the first 13 minutes of the heating period that were obtained for the tungsten carbide gauge block for the temperature differences between the locations of the thermistors **T[1,2]** of -0,2mK (dependence 1; dots) and -17.2mK (dependence 2; squares). Note that the thermal evolution process is described by a complicated function of time, which is specific for the selected points inside the artifact and whose form and magnitude depend on the direction and magnitude of the constant heat flux, created in advance by an auxiliary heat source.

The nonlinearity of thermal systems in combination with the thermal hysteresis effect results in the existence of the thermal evolution process, which has no symmetry in space and is irreversible in time, naturally acquiring the properties of the thermal hysteresis effect. Under the presence of another heat source, (as a consequence of nonlinearity of the system following from Fig.8) the hysteresis loop of Fig.7 will slightly change its form and magnitude, so that the purely periodic process, presented in Fig.1, will transform into the spiral-type curve. Every next cycle of this spiral will be slightly different in magnitude and in shape from the previous cycle, as a result of constantly changing external thermal conditions. And it should be noted here that at the resolution of temperature measurement of about 1μK, which is typical for this experiment, the thermal radiation from the Sun is inevitably detected by all thermometers, in spite of temperature controlled laboratory and the additional passive thermal isolation with Dewar. So the external thermal conditions for the gauge block with attached thermometers are continuously changing in time, simply as a result of the Earths rotation relative to the Sun. Besides that, taking into account that the energy from the Sun is propagating through a turbulent atmosphere, and that the number of macroscopic parameters needed for description of turbulence is infinite (Sivukhin 2008a), we arrive at the conclusion that the thermal evolution process is characterized by the infinite number of influence parameters and has an infinite number of manifestation modes, in the general case. Clearly, the characterization and description of the thermal evolution process is becoming dramatically complicated with the increase of the accuracy of thermal measurements.

The evolution process is specific for any particular point inside the artifact (Figs. 1 and 5) and is specific for any particular time instant (Figs. 1 and 6). The effect of the external heat source on the induced difference in temperature velocities (recorded simultaneously by channels 1 and 2) is demonstrated by Fig.9. Here, the dependences 1 and 2 correspond to two independent experiments, performed under the quasi-stationary conditions for two levels of dissipated power in the auxiliary heat source, producing the desired quasi-stationary value of

the temperature difference between the channels **T[1,2]**. Each data point in Fig.9 corresponds to the mean value of **ΔV[1,2]**, obtained by averaging over 4 cycles with the duration of each cycle of about 140 minutes. The uncertainty of measurement of each point is less than the dimension of the symbol of the data point in the plot. The other very important feature of this experiment is that the temperature difference **T[1,2]**, produced by the auxiliary source, by more than two orders of magnitude larger than the typical variations of the quantity **T[1,2]**, produced by the uncontrolled variations of the external thermal conditions during the modulation cycle. Thus, this experiment demonstrates that each external heat source gives the corresponding contribution to the variations of the thermal evolution process inside the artifact that is defined by the magnitude of the Poynting vector of the external EM field, produced by this source. As the number of material partners, with which any selected material artifact is in constant interaction through EM field, is always enormous, the number of the influence parameters for the thermal evolution process is always huge, resulting in a huge number of the existence and the manifestations modes of the thermal evolution process (Titov & Malinovsky 2013). This conclusion is in agreement with the fundamental result of (Stroud et al 1972), where it is shown that for the ensemble of atoms, interacting with the common EM field, among the influence parameters (defining the resultant EM field) is N radius-vectors, specifying position of each atom, and another N vectors, characterizing the orientation of each atom in space. In case of macroscopic sources of EM radiation, the number of influence parameters is even much larger, as the properties of the surfaces, structure, composition and properties of the artifact material are inevitably influencing the parameters of the radiated field. With the increase of the accuracy of measurements the number of influence parameters, which has to be taken into consideration, increases absolutely dramatically. It can be shown that the number of influence factors in all natural processes is infinite, as in the case of the thermal evolution process. This is in agreement with the fundamentals of the Ancient Indian (Jain) philosophy that the number of modes of existence and manifestations of real processes is infinite, while the cognition possibilities of human beings are quite limited. The present studies also present some experimental confirmation (Titov & Malinovsky 2013) of the basis of the classical German dialectics. In thermal measurements we have two types of energy. The first one corresponds to the oriented motion of the field-particle system that results in the mass, charge and energy transfer inside the material artifact (with inevitable change of the properties of the artifact). The other one, which can be associated with a random fluctuation process (characterized by non-measurable deformations and mass displacements in the artifact), represents the amount of energy, accumulated in a previous epoch under the influence of the huge number of influence parameters. As it follows from Fig.5 the conversion of the oriented motion into random, which occurs as result of the artifact's interaction with environment, is quite fast. In this process (which is usually called synthesis, when using the terminology of German philosophers), the excessive momentum is transferred to the environment by EM field, as the consequence of the fact that an artifact presents always an open system.

Conclusions

The basic properties of the thermal evolution process – the lack of symmetries in space and in time, taken together with the infinite number of influence parameters - are in agreement with the studies performed in different areas of Natural sciences. In astronomy, for example, the concept of the arrow of time was introduced in 1927 by Arthur Eddington, and the distinguished direction of time, according to A. Eddington,, was be determined by the study of organizations of material objects in the Universe. The regular astronomical observations of the Earth's rotation (Guinot 2011) not only demonstrate the irreversible in time character of the motion of the planet, but also indicate to the infinite number of

influence factors that makes the theoretical predictions very difficult. The asymmetry in space of the properties of the thermal radiation in Universe has been established with the help of radio-telescopes (Smoot, Gorenstein & Muller 1977). In Biology, the time irreversible character of changes is known from the time of the discovery (1858) by Ch. Darwin and A. R. Wallace of "The Tendencies of Species to Form Varieties, and the Perpetuation of Varieties and Species by Natural Means of Selection". And the examples of the asymmetry in space, known from Molecular Biology, are found even in text-books on physics (Feynman, Leighton & Sands 1964).

The thermal evolution is the simplest evolution process in which only the energy and the momentum of the EM radiation are absorbed in material object. The absorbed quantities result in the changes of the properties of the artifact and initiate the processes of wave-momentum, energy, mass and charge transfer in the material object, accompanied by the creation of stresses and deformations inside the artifact.

The presented studies give the experimental confirmation of the theoretical results of the whole series of papers dealing with the interaction of ensemble of atoms with a common EM field, including the space asymmetry (Dicke 1954), the irreversible character in time (Dicke 1954; Stroud et al 1972) and a huge number of influence parameters for the process (Stroud et al 1972).

The results of our studies are in deep agreement and present an experimental backing to the fundamentals of the Jain philosophy, which gives the clews to the interpretation of the famous observation of A. Einstein:"No amount of experimentation can ever prove me right; a single experiment can prove me wrong", or to one of the favourite maxims of Niels Bohr that the negation of a profound truth is also a profound truth (Hans Henrik Bohr 1967).

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ENFORCEMENT OF OCCUPATIONAL SAFETY AND HEALTH REGULATIONS IN NIGERIA: AN EXPLORATION

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Abstract

This Paper examines the enforcement of occupational safety and health (OSH) regulations; it validates the state of enforcement of OSH regulations by extracting the salient issues that influence enforcement of OSH regulations in Nigeria. It's the duty of the Federal Ministry of Labour and Productivity (Inspectorate Division) to enforce the Factories Act of 1990, while the Labour, Safety, Health and Welfare Bill of 2012 empowers the National Council for Occupational Safety and Health of Nigeria to administer the proceeding regulations on its behalf. Sadly enough, the impact of the enforcement authority is ineffective, as the key stakeholders pay less attention to OSH regulations; thus, rendering the OSH scheme dysfunctional and unenforceable, at the same time impeding OSH development. For optimum OSH in Nigeria, maximum enforcement and compliance with the regulations must be in place. This paper, which is based on conceptual analysis, reviews literature gathered through desk literature search. It identified issues to OSH enforcement such as: political influence, bribery and corruption, insecurity, lack of governmental commitment, inadequate legislation inter alia. While recommending ways to improve the enforcement of OSH regulations, it states that self-regulatory style of enforcing OSH regulations should be adopted by organisations. It also recommends that more OSH inspectors be recruited; local government authorities empowered to facilitate the enforcement of OSH regulations. Moreover, the study encourages organisations to champion OSH enforcement, as it is beneficial to them; it concludes that the burden of OSH improvement in Nigeria is on the government, educational authorities, organisations and trade unions.

Keywords: Enforcement, Nigeria, occupational safety and health, regulations

Introduction

Enforcement of regulations is very vital in ensuring the efficacy of regulations. Thus, researchers (like Anderson 2007; Idubor & Osiamoje 2013) opine that regulations without proper enforcement are tantamount to no laws. In that Idubor & Osiamoje (2013) postulate that lack of strict enforcement of OSH regulations enables non- compliance to OSH regulations. Whereas non-compliance to OSH regulations is a major contributor to the poor state of OSH in Nigeria, Diugwu et al. (2012) maintain that the failed OSH management system in Nigeria is due to the non-functional OSH regulations and provisions. On the other hand, it is argued that enforcement and compliance with OSH regulations are not the stand-alone steps for improving OSH, as improving organisational culture can also improve OSH. However, it is worth noting that the benefits of proper enforcement of OSH regulations are evident in countries with remarkable health and safety records like the UK, USA, Germany

and many other developed countries, which in turn support Anderson (2007); Diugwu et al. (2012); Idubor & Osiamoje (2013) arguments substantially.

Anderson (2007) believes that as the main objective of OSH legislation is to prevent accidents and ill health in the workplace, there should be effectiveness and accountability in the enforcement of OSH rules and regulations. The Nigerian Federal Ministry of Labour and Productivity (Inspectorate Division) enforces OSH regulations while the National Council for Occupational Safety and Health will enforce the Labour, Safety, Health and Welfare Bill of 2012 in Nigeria when passed into law. So far, the efficacy and accountability of The Federal Ministry of Labour and Productivity in the enforcement of OSH regulations in Nigeria are evidently questionable and poor, especially in the construction industry. Perhaps, this is because OSH enforcement is not the principal practice in Nigeria (Okolie & Okoye 2012).

This is exemplified by studies by researchers such as (Diugwu et al. 2012; Idubor & Osiamoje 2013; Idoro 2008, 2011) that demonstrate the ineffective and nonfunctional state of the OSH regulatory system in Nigeria. The series of plane crashes, collapse of buildings, and high accident and fatality rates inter alia in Nigeria are further evidence. Given the recent increased infrastructural development in Nigeria, which will worsen the already failed OSH as accidents, injuries and fatalities will increase and the role of effective enforcement in achieving optimum OSH, it is pertinent to investigate the salient causes of the poor level of OSH enforcement in Nigeria, so as to improve OSH; deplorably, researchers have overlooked this area. Against these backdrops, this paper examines the enforcement of OSH in Nigeria.

That would help to demonstrate and highlight the state of OSH regulations enforcement in Nigeria; thus, yielding positive results and helping to build confidence. Most importantly, this paper unearths the salient issues to enforcement of OSH in Nigeria and further examines them. It concludes by recommending ways of improving the level of enforcement of OSH by stating that the onus of improving OSH is on all stakeholders.

Conceptual Clarification
Occupational safety and health (OSH)

OSH is an interdisciplinary area that involves protecting the health, safety and welfare of people in the workplace (Kalejaiye 2013) and others that may be affected directly or indirectly by the activities at the workplace. There are sets of rules, regulations, legal instruments or provisions that help in actualising the above; for the purpose of this study, they are called OSH regulations.

Enforcement

According to Cambridge dictionary (2013), enforcement is described as the act of ensuring that people obey a law or comply with it. Based on the above definitions, enforcement of OSH regulations is described as the act of ensuring observance to OSH laws hereinafter.

Enforcement of OSH Regulations

Literature reviewed so far reveal that OSH regulations enforcement approaches are identified as reactive approach and the proactive & collective participatory approach.

Reactive approach

This approach of enforcement involves inspection of workplaces to detect flaws and make recommendations for improving the state of OSH (Makhonge 2005); in that employers or factory owners in most developing countries including but not limited to Nigeria, Kenya wait for the enforcement authority to point out contraventions before steps are taken. Furthermore, should the OSH offence be highly rated, the offender may be charged to court

(Makhonge 2005); this opines that it is corrective and does not encourage full participation of all in organisations and stakeholders in various industries. Thereof, Makhonge (2005) argues that consequently, organisations take only basic steps in terms of OSH compliance.

However, Makhonge (2005) further stresses that this is a traditional approach that was proved to be ineffective in Kenya; therefore, corrective measures have been taken in other to rectify the limitations. The argument is that when this technique is deployed against OSH regulations violation, which it seeks to correct, it may be too late, as injuries, accidents or fatalities may have occurred. Thus, suggesting that this approach does not fulfill the requirement of OSH enforcement, which seeks to prevent accidents, injuries or fatalities at large.

Proactive and collective participatory approach

Makhonge (2005) demonstrates that this approach of enforcement is more adequate than the reactive approach. In that it seeks to ensure compliance before the violation of the regulations by: introduction of safety advisers in organisations; introduction of competent and effective safety and health committee in organisations; encouraging self regulatory approach; mandatory formulation of safety polices and appointing competent safety persons who are responsible for safety issues in the organisations. Also, it seeks to deter organisations from defaulting by active participation of all in the organisations and engages support from the regulatory authority; thereby, protecting the health, safety and welfare of the workers. This suggests that this approach is preventive and collectively participatory in nature; it is similar to what obtains in developed countries and some developing countries; better still, most of its features obtain. For instance, the Labour, Safety, Health and Welfare Bill of 2012 in Nigeria involves the participation of the Nigerian Institute of Safety Professionals, National Council for Occupational Safety and Health, OSH committees, safety and health representatives, employers, research institutes, principal contractors and the education sector. It places due responsibilities on OSH committees and the safety & health representatives at grass-roots by having them monitor, regulate and maintain the safety of the employees in the workplace. The logic here is that OSH is the responsibility of all; as such, the Bill seeks to indulge the participation of all; perhaps, by aiming to be comprehensive and avoiding some limitations of the existing Factories Act.

The Nigerian Status Quo
OSH in Nigeria

OSH in Nigeria is traced back to the slave trade period. According to Kalejaiye (2013), records show that the medical examination board of the Liverpool infantry introduced occupational health in Nigeria in 1789. Kalejaiye (2013) further reports that this board was saddled with the responsibility of promoting the health of the British slave dealer in Africa. He also pens that after these early stages, the health service was established by Colonel Luggard (who was once the Governor-General of Nigeria) to care for the health and welfare of the colonial administrators and British soldiers; then, after many years, due to the poor working conditions of workers, occupational health services were introduced in some Nigerian industries, and the Occupational Health Legislation Act established. Kalejaiye (2013) asserts that due to the impact of increased mechanisation on the health and welfare of workers, the occupational health unit in the Federal Ministry of Health and the Institute of Occupational Health in Oyo state Ministry of Health were established.

Nigeria signed the Geneva Convention in 1981 (Adeogun & Okafor 2013), yet 32 years on, implementation of proceedings of the convention is insignificant.

Adeogun & Okafor (2013) report that OSH in Nigeria is still at infancy; in the same way, Diugwu et al. (2012) and Okolie & Okoye (2012) maintain that OSH in Nigeria is poor.

For instance, although there are no reliable accident data in Nigeria (Idoro 2008; Okolie & Okoye 2012), a study by Ezenwa (2001) over a 10-year period (1987-1996) of fatal injuries reported to the Federal Ministry of Labour and Productivity (Inspectorate Division) shows that out of 3183 injuries reported, 71 were fatal. In fact between 1990 and 1994, the overall fatality rate as recorded by the Ezenwa (2001) is 22% of the above reported cases. This explains why Idoro (2011) in a study of 42 construction contractors in Nigeria, found that in 2006 the best safety record is 5 injuries per worker and 2 accidents per 100 workers. These records are high (Idoro 2011) whether compared to other countries or not. However, this is not a true representation of what obtains in Nigerian factories (Ezenwa 2001) because the records are worse than stated above, as the poor OSH regulatory system in the country does not encourage mandatory reporting of accidents (Ezenwa 2001; Idoro 2008), which OSH regulations require. However, Diugwu et al. (2012) blame the big gap in OSH in Nigeria on the dysfunctional health and safety laws in the country. As a result, all the sectors in the country are clearly unregulated (Diugwu et al. 2012).

OSH legislation in Nigeria

The inception of OSH regulations/bills in Nigeria runs from the introduction of the Labour Act of 1974 to the passage of the Labour, Safety, Health and Welfare Bill of 2012 (which awaits the presidential assent). A bill is a formal statement that is designed to be a new law but is under debate before it is voted on (Cambridge dictionary 2013). After voting, it may also need presidential assent to fully complete the process of becoming a law or legislation. During the above period, the Factories Act of 1987 (now known as Factories Act of 1990), which Kalejaiye (2013) reports as a substantial revision of the Factories Act of 1958 (i.e. colonial legislation), the Workman's Compensation Act of 1987, the Labour Act of 1990, the Workman's Compensation Act of 2004, the Employee's Compensation Act of 2011 (which repeals the Workman's Compensation Act of 2004) were introduced; some of these laws are criticised as inadequate. For instance, the Factories Act of 1987 does not include the construction industry in the definition of its premises (Diugwu et al. 2012; Idoro 2008, 2011); consequently, the industry remains unregulated. Idubor & Osiamoje (2013); Okojie (2010) contend that the severities of penalties stipulated by OSH laws in Nigeria are insignificant; in that offenders are not deterred by the penalties. Thankfully, the new Bill (The Labour, Safety, Health and Welfare Bill of 2012) addresses all the above issues, as it includes the construction industry in the definition of its premises and stipulates severe penalties for violation. This bill covers both the formal and informal industrial sectors in Nigeria. It seeks to repeal the Factories Act and serve as a comprehensive OSH legislation for the workplace.

Enforcement of OSH regulations in Nigeria

The Labour, Safety, Health and Welfare Bill of 2012 empowers the National Council for Occupational Safety and Health to: enforce and implement OSH measures in the workplace; promote the protection of lives & properties; promote OSH awareness; carry out inspection of the workplaces and monitor the compliance of all regulations or other OSH measures enshrined in the Bill. Correspondingly, the Nigerian Social Insurance Trust Fund Management Board implements the Employee's Compensation Act of 2011, which makes provisions for compensation for any death, injuries, and diseases or disabilities due to employment. In the mean time, The Factories Act Cap 126, laws of the federation of Nigeria 1990 enables the Inspectorate department of the Federal Ministry of Labour and Productivity to enforce the minimum standard requirements of the Factories Act of 1990 in Nigeria. The enforcement processes require issuing of warning or notices to offenders, after which the lower level of enforcement, which includes the sealing of a defaulting factory, takes place (Okojie 2010). Regrettably, this is not practicable in Nigeria in that the resources required are

under estimated and not made available. In affirmation, Okojie (2010) reports that the sealing of premises, which is a form of enforcement rarely happens in Nigeria. Also, Adeogun & Okafor (2013) note that unhealthy exposures to risks of workers in organisations make it evident that OSH laws are not enforced in Nigeria. The argument therefore is that there should be daily inspection of workplaces by the factory inspectors and monthly reports to the Federal Ministry of Labour and Productivity (Okojie 2010), but this is farfetched. Moreover, Ezenwa (1997) in Ezenwa (2001) found that the annual average of factory inspectors from 1987 to 1994 is 55.75 (where the annual average of registered factories in Nigeria from 1987 to 1994 is 4923), and Okojie (2010) states that there are only 60 factory inspectors in Nigeria. These create room for pondering as to why more enforcement officers cannot be employed. Nigeria is the most populous country in Africa with a population of over 165 million, so 60 inspection officers are far too few to enforce the OSH regulations in Nigeria. It is therefore not misleading to assert that lack of person power and lack of commitment to ensuring better enforcement in the part of the enforcement authorities hinder optimum enforcement of OSH regulations.

Equally important, a study by Diugwu et al. in 2012, shows that majority of construction workers in Minna, Nigeria (if not in the whole country) are not aware of the body responsible for enforcing OSH regulations in the industry. In the study, about 79.5 % of the respondents could not identify the correct body responsible for OSH enforcement in Nigeria. This suggests lack of knowledge as per OSH and its ineffective enforcement. Granted that there is proper enforcement of the OSH regulations across Nigerian industries, the workers will be aware, as they must have heard of or seen the enforcement taking place. In view of these highlighted deficiencies, it is pertinent to further examine the key issues to enforcing OSH regulations in Nigeria; thus, the subsequent section addresses this.

Key Issues to Enforcement of OSH Regulations in Nigeria
Lack of skilled person power

In light of the arguments above by Ezenwa (2001), Diugwu et al. (2012) and Okojie (2010), it is evident that lack of skilled personnel is a major determinant to effective enforcement of OSH program in Nigeria. This view is further supported by Omojokun (2013), who identifies insufficient enforcement officers among the challenges to effective food regulation and enforcement in Nigeria. In like manner, Rantanen (2005) earlier asserts that an insufficient number of competent occupational health services experts hinders the development of occupational health services globally. However, Makhonge (2005) points out that a self-regulatory style of enforcement (where safety and health committees are formed in workplaces with the responsibilities of regular inspections and monitoring of workplaces) helps to improve enforcement. Should that be the case, the standard of enforcement may differ; especially, in the construction industry where there is no uniformity of regulations. In affirmation, Anderson (2007) asserts that there should be uniformity in the standard of enforcement. To this end, Makhonge (2005) suggests that adequate training can improve competence of safety and health committee members so as to achieve optimum enforcement. The argument is that if the enforcement authority established by law to enforce the laws is found wanting; in other words, cannot fulfill the purpose of establishment, little is expected of organisations that in most cases do not value safety not to talk of establishing safety and health committees. Be it as it may, adequate number of skill person power is essential for OSH enforcement improvement.

Political influence

Rantanen (2005) maintains that the global decline in the development of occupational health service is primarily political. Similar argument is made by Okojie (2010) in regard to

Nigeria in that political influence has been seen as the major hindrance to the enforcement of OSH in Nigeria: maintaining that political influences handicap the enforcement officers from carrying out their duties. This is because powerful people or persons in high or influential positions in the country own most of the Industries and factories. In support, Idubor & Osiamoje (2013) also note the effects of political influence on OSH in Nigeria. The main setback of this is that the rich and highly placed people in Nigeria influence the activities of not only the OSH enforcement officers, but also other enforcement officers e.g., police. In like manner, Onyeozili (2005) contends that people in government and highly placed persons prevent the course of justice by shielding criminals from justice. He further demonstrates the influence of people in power as argued above as the major handicap to policing in Nigeria. This calls for the question as to why the politicians (law makers) promulgate laws and hinder its enforcement.

Severity of penalties
      As above, prior to the passage of the Labour, Safety, Health and Welfare bill of 2012 (which awaits presidential assent), the penalties for violation of OSH laws can be said to be lenient. In particular, according to Idubor & Osiamoje (2013), the penalty stipulated by the Workman's Compensation Act is as low as 2000 Naira (which is equivalent to £8 where 250 Naira = £1), or the premium payable for one year (whichever is greater) when an employer fails to insure the employees against death or injuries; as against the Labour, Safety, Health and Welfare Bill of 2012, which stipulates severe penalties of up to 500,000 Naira for individuals, and 2 million Naira for corporate organisations for violating OSH measures. Okojie (2010) argues that these insignificant penalties stipulated by the OSH laws do not guarantee compliance in any way. Suggesting that penalties should serve as indirect instruments for enforcement of OSH regulations; that way, it can serve as deterrent to offenders.   At present, the penalties imposed are so insignificant that they do not deter offenders even when enforced. This opines that the penalties stipulated by the Factories Act in Nigeria might incapacitate the laws and make a mockery of the legal system, thereby hindering enforcement.

The judicial system
      The long time spent by the judicial system of Nigeria on cases impedes OSH development (Idubor & Osiamoje 2013). As a result, people do not have faith in the judicial system; therefore, most OSH cases do not go to court. Besides, the enforcement authority may be discouraged from taking the cases to court as it will take time and they will spend a lot of money, after which the course of justice may be perverted. However, Idubor & Osiamoje (2013) demonstrate the need for enforceable laws, as laws that are not enforceable are as good as not making one. In view of the above, it is inferred that the judicial system may not serve the purpose of establishment, as it does not encourage enforcement; therefore, it can be said to hinder enforcement.

Corruption and bribery
      The corruption level in Nigeria is high as Transparency International (2012) ranks Nigeria 139 out of 176 in terms of corruption perception index. No wonder Onyeozili (2005) notes that the regulatory institutions and the police have been proved to be corrupt. Surely, this may hinder effective enforcement in the country as the activities of authorities responsible for enforcing the laws are seen as questionable. As an illustration, Idubor & Osiamoje (2013) cite an instance where companies with poor OSH practices get pass marks after inspection because they bribed the enforcement officers. Consequently, organisations will not comply with OSH regulations, as they know the easy way out. These suggest that the

enforcement officers may engage in the enforcement process because of selfish financial reasons and not to achieve the aims of the regulations thereby not ensuring compliance.

Nevertheless, whether the rationale for enforcing OSH regulations is for selfish financial reasons or to achieve the aims of the regulations, the facts are that: the efficacy of OSH regulations enforcement is poor; corruption and bribery hinder effective enforcement of regulations; the authorities that tackle corruption in Nigeria appear not to be doing enough.

Inadequate funding

The enforcement authority needs money to recruit more persons and train them, run the affairs of the ministry and ensure the provision of adequate facilities; hence, Ezenwa (1997) in Ezenwa (2001) argues that inadequate number of technical equipment and transport facilities hinder the enforcement of OSH regulations in Nigeria. The argument here is that if the ministry experiences insufficient funding, adequate enforcement will be farfetched; it may also contribute to corruption. Idubor & Osiamoje (2013) concur to this factor as a hindrance to the enforcement of OSH regulations. In support, Rantanen (2005) notes financial constraints as one of the factors that hinder the development of occupational health services.

Inadequate legislation

This is exemplified by the non-inclusion of the construction industry in the definition of premises in the Factories Act of 1990 (Diugwu et al. 2012; Idoro 2011). Consequently, construction firms adopt regulations from the UK (Idoro 2008) or US, and these regulations are not enforceable in Nigeria. As such, the enforcement authority do not have jurisdiction over such premises. Idoro (2008) states that the limitations in the Factories Act obstruct the improvement OSH in the construction industry. This leaves the workers in the construction industry at mercy of fate.   Secondly, the Factories Act of 1987 (now known as Factories Act of 1990) does not address factory hygiene issues, which recognise workplace serious health issues (Kalejaiye 2013) and does not require the use of Personal Protective Equipment (PPE) in the construction industry (Diugwu et al. 2012). In fact, Diugwu et al. (2012) maintain that the OSH statutory regulations in Nigeria are ineffective and inadequate.   The catch here is that the efforts of the government in addressing these lapses are not impressive. In particular, it took many years to recognise and address the limitations of the Factories Act and pass the Labour, Safety, Health and Welfare Bill 2012. This does not signify governmental commitment to OSH. As authors above assert that the limitations of these laws hinder effective enforcement and this paper demonstrates that the efforts of the government toward addressing the limitations remain questionable, it can be inferred that lack of governmental support or commitment hugely contributes to the low level of OSH enforcement in Nigeria.

Lack of governmental commitment

As demonstrated above, this hinders the improvement of OSH in Nigeria (Diugwu et al. 2012); this is exemplified by the long time being spent by the President to assent to the Labour, Safety, Health and Welfare bill 2012 and the lack of OSH attention inter alia. These signify that the government is not committed to improving OSH. It is more than a year since the senate passed the Labour, Safety, Health and Welfare Bill 2012, yet it still awaits presidential assent. Such issues are vital and should receive sporadic attention. Every moment that the construction industry or other workplaces remain unrecognised by unenforceable regulations, or the penalties for violation remain insignificant, more injuries, fatalities and accidents occur. Such acts sf lack of commitment by the government may be why Rantanen (2005) asserts that the low prioritisation level of occupational health in national health policies contributes to the decline in the development of occupational health services.

Additionally, Diugwu et al. (2012) study, which demonstrates the minimal impact of the government in managing and regulating OSH in the construction industry in Nigeria, further confirms lack of government's support to OSH. In the study, Diugwu et al. (2012) note that the medium for disseminating information by the government is ineffective because not all their respondents have access to the Internet.

Insecurity

High level of insecurity characterise Nigeria e.g., bomb explosions, kidnapping. As a result, the security of enforcement officers is questionable; hence, Okojie (2010) notes that factory inspectors may be molested while carrying out their duties. However, the Labour, Safety, Health and Welfare Bill of 2012 makes provisions for the security of enforcement officers that believe that their security may be at risk while carrying out their duties, but what happens outside the course of carrying out their duties poses great concern. The catch here is that due to political influence on the police, the corrupt police system (Onyeozili 2005), the lack of faith people have in the police, the molested enforcement officers may not report to the police as they expect little from the police. Especially, when the influential politicians mastermind the molestation. While it can be argued that the enforcement officers can be insured against such, the question is which insurance company will do such and at what cost?

Inadequate information

There is consensus that Inadequate Information affects the improvement of OSH in Nigeria (Diugwu et al. 2012; Idubor & Oisamoje 2013; Idoro 2008, 2011; Okojie 2010). To illustrate this, Okojie (2010) reports the dearth in OSH information in the Federal Ministry of Labour for the past five years as a major concern. In contrast, Okojie (2010) argues that multinational oil and gas companies strive to improve OSH, protect their images, and conform to their international corporate companies' policies in line to their head offices outside Nigeria. Whilst the Federal Ministry of Labour is directly responsible for enforcing OSH legislation in Nigeria, not enough information is shared with the separate entities that make up the Ministry; hence, the inspectorate divisions are not well equipped in order to plan on the necessary steps for better enforcement practices. The multinational companies' ability to transfer OSH policies from their countries of origin into Nigeria's oil and gas industry in order to improve their OSH standing is an added advantage. Therefore, helping multinational companies' such as Shell, Texaco inter alia to boost their safety cultural stand both in Nigeria and on the international stage.

Technology & economic growth

The literature reviewed suggest that the existing OSH laws are not up to date; they do not address some hazards posed by new technologies; they are not recognised in some industries and workplaces that came into existence as result of the current economic growth. In support, a presentation at an International Labour Organisation Conference in 2006 highlights rapid economic developments and new technologies/processes as challenges faced by OSH in Nigeria.

Culture

Be it organisational culture, national culture, safety culture, all may affect the enforcement of OSH regulations. This is because according to Adeogun & Okafor (2013), safety culture is when safety is the priority concern of people working in an organisation; however, stressing that an organisation can only be identified with safety culture after it has developed to a certain stage. In that in the absence of adequate regulations and proper

enforcement, if organisations have safety culture they should adopt the self-regulatory style of enforcement as suggested by (Makhonge 2005) to help improve OSH.

The culture of non-implementation of policies in Nigeria, especially in the regulatory authorities has left the effectiveness and efficacy of most policies questionable as this research establishes above. The way things are done (i.e. culture) in government organisations in Nigeria do not support proper enforcement e.g., the inspectors often give excuses like lack of vehicles to visit sites reported to be violating OSH regulations. The contention here is addressing violating OSH regulations, as well as ensuring that there is adequate institutional culture that will act as a platform for effective implementation of government policies at large.

Highlights: Key Issues to Enforcement of OSH Regulations and Recommendations.

For the purpose of clarity, this section highlights the key issues to   enforcement of OSH regulations and recommendations in a tabular form; the next section discusses ways of improving OSH in Nigeria.

Key issues to enforcement of OSH regulations in Nigeria	Ways of improving OSH enforcement in Nigeria
Lack of skilled person power Political influence Severity of penalties The judicial system Corruption and bribery Inadequate funding Inadequate legislation Lack of governmental commitment Insecurity Inadequate information Technology & economic growth Culture	Recruitment and training of enforcement officers by the enforcement authority. Adoption of self-regulatory style of enforcement by organisations. Introduction of enforcement of OSH regulations at local level. Making provisions for adequate OSH information. Development and adoption of Approved Code of Practice (ACOP). Updating and revising OSH regulations as required by relevant authorities.

Note: The issues and recommendations highlighted above are not arranged side by side.

Table 1: Summary of key issues to enforcement of OSH regulations and ways of improving enforcement of OSH regulations.

Source Designed by Authors.

Ways of Improving OSH in Nigeria

As seen above, enforcement of OSH in Nigeria is poor and ineffective. With the high level of infrastructural development in Nigeria, accident, injury and fatality rates will also increase if nothing is done to improve OSH in Nigeria. As a result, more should be done to improve enforcement of OSH regulations, as this will improve the status of OSH. Below are some of the recommendations of this paper for improving the enforcement of OSH in Nigeria.

Recruitment and training of enforcement officers will improve enforcement of OSH regulations. The population of Nigeria is over 165million; however, the number of enforcement officers is very low. Therefore, if more trained professionals are recruited and trained as OSH inspectors and enforcers that will boost OSH enforcement in Nigeria.

In the absence of proper enforcement of OSH regulations, organisations should adopt self-regulatory style of enforcement, as optimum OSH improve the images of the organisations, and enable the organisations to maximise profit.

Enforcement of OSH regulations at local level is surely a way of improving OSH in Nigeria. Local government authorities should be involved in the enforcement of OSH regulations as done in the UK. Currently, the planning departments of many local government councils ensure that all buildings in the local government have approved building plans. A similar department made up of trained OSH inspectors should be set up to carry out inspection of workplaces at local level.

As adequate information is vital in ensuing optimum OSH, provisions for adequate OSH information is pertinent, perhaps through information technology: mobile phone technological means of reporting accidents and unsafe practices can be adopted in Nigeria.

This study also recommends the development and adoption of Approved Code of Practice (ACOP) as applicable in the UK, as they will help in compliance and preventive (i.e. proactive) enforcement of OSH regulations. The Enforcement authority can develop these ACOPs. ACOPs are approved guidelines that help organisations, individual and employees to comply with OSH regulations and indirectly ensure proactive enforcement.

OSH regulations should be updated and revised as required to avoid having outdated regulations or regulations with plenty limitations.

Conclusion

The aim of this paper is to examine the OSH regulations in Nigeria and to unearth the issues hampering its enforcement. It demonstrates the ineffective nature of the enforcement of OSH regulatory protocols in Nigeria.

The paper also establishes a conscious view by authors that the absence of effective enforcement of OSH regulations in Nigeria by those responsible and the authority in particular motivates the call for effective self-regulatory enforcement system to be adopted. Given the rapid economic growth and infrastructural development in Africa and Nigeria in particular, the absence of the state involvement in OSH promotion and enforcement is of great concern. Therefore, requires prompt attention otherwise the economic growth may be hampered. Likewise, organisations should understand the importance and benefits of compliance with OSH in the work environment as enabler to increased safety, productivity, competitive advantage, accident and fatality reduction and above all the consequences of tarnished images of the organisation and that of the country at large. Especially, with the digital world where growing application of information technology (social network), which delivers information on the instant can damage the reputation of nations and industries at large.

Despite the dearth in OSH literature in Nigeria, sizable quality reviewed papers were found in the continent that examine the following issues that influence the enforcement of OSH regulations in Nigeria. Issues such as: political influence, inadequate funding, culture, and inadequate information. While recognising the impact of economic growth and infrastructural development in Nigeria, the paper unearthed that technology and economic growth increase the hazards in workplaces; therefore, creating some workplaces that are unrecognised by the existing OSH regulations and making the OSH regulations outdated; thus, hindering OSH regulations enforcement. Furthermore, other major limitations to optimum enforcement of OSH regulations identified by this study are: bribery & corruptions,

low level of skilled person power, insecurity, lack of adequate legislation, lack of governmental commitment and severity of penalties.

However, the responsibility rests on the government to improve the state of the OSH in Nigeria, along with active participation of the trade unions, professional bodies, educational institutions and employer to play significant roles. Above all, the proactive and collective participatory approach to enforcement of OSH regulations should be practiced at optimum in combination with the recommendations above so as accelerate OSH improvement. It is paramount that OSH take center stage in Nigeria; therefore, requiring more to be done apart from passing of the Labour, Safety, Health and Welfare Bill of 2012.

Suggested Area of Further Study

As there is only one OSH enforcement body in Nigeria, a case study should be conducted to further identify factors that influence the enforcement of OSH nationally. This review paper is just a stepping-stone for further research and will act as a compliment to the required case study; however, case study on its own may not be the means to an end as it could also be biased. This is because the Federal ministry of Labour and Productivity (Inspectorate Division) may not provide correct information, or may provide only favourable information.

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EVALUATION OF ROAD MARKINGS RETOREFLECTION MEASURING METHODS

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Abstract

Modern traffic demands the safe movement of vehicles under normal conditions and especially at night and in reduced visibility (fog, rain, sleet, etc.). Quality and quantity of participants visual guidance in traffic directly depends on the visibility and the reflective properties of road markings are of crucial importance. Using the latest methods and procedures of testing road markings a high and constant quality level can be achieved, and thus the security level of individual roads can be raised.. One of the most important elements for testing the quality of road markings is testing day and night visibility of road markings. These tests can be done in two ways: method for static test of road markings reflection (daytime and night-time visibility) and dynamic method for testing retroreflection of road markings (night-time visibility). Aim of this article is to describe and evaluate mentioned methods for measuring retroreflection of road markings.

Keywords: Road markings, retroreflection, static method, dynamic method

Introduction

A typical pavement marking material consists of binders, pigments, fillers, and glass beads. Binders are responsible for the thickness of marking material and adhere to the road surface, pigments distribute color throughout the mix, and fillers impart durability to the mix.

The retroreflective effect of pavement markings is made possible with the help of small glass beads which are added by dropping them on the marking during the application of material in liquid form. The retroreflection process in a glass bead occurs in three steps. As the light ray enters a bead, it gets refracted or bent. Once inside, it gets reflected in the material in which the bead is embedded, and then gets refracted a second time while leaving the bead surface. Retroreflected luminance, R_L (referred to as retroreflectivity in this paper) is an important characteristic of pavement markings because retroreflectivity is a surrogate measure of pavementmarking nighttime visibility. Pavement markings with higher retroreflectivity are assumed to provide higher levels of visibility during nighttime conditions.   EN 1436 defines a standard of measure of retroreflectivity for dry pavement markings using a static and dynamic retroreflectometer. This Norm is adapted from standards originally set by the European Committee for Normalization (CEN). The standard clearly defines the requirements of a portable retroreflectometer to simulate nighttime visibility for an average driver in a passenger car. The measurement geometry of the instrument should be based on a viewing distance of 30 meters, a headlight mounting height of 0.65 meters directly above the stripe, and an eye height of 1.2 meters directly over the stripe. These measurements create a entrance angle between the headlamp beam and pavement surface of 1.24 degrees and an observation angle of 1.05 degrees. The key parameters of the standard are shown in Figure 1.
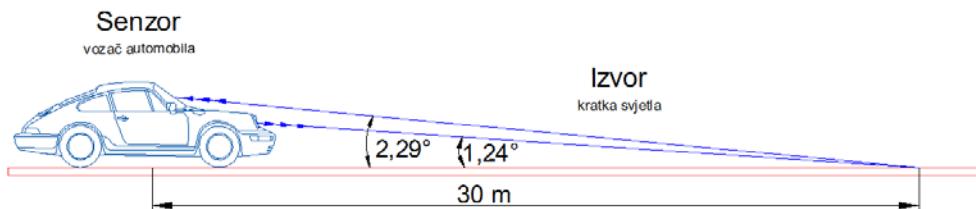
Figure 1. Standard 30-Meter Geometry Replicated by Retroreflectometers
Source: By Authors

Measuring retroreflection of road markings can give the road authorities an inside look at how road markings are performed, in which condition they are, and how well conductors do their job. With this inside look, road authorities can create a plan of restoration based on measurement results. Roads that, according to measurements results, have satisfying retroreflection will not be restored until their retroreflection decreases below minimum levels. Restoring the road markings in this way can reduce road maintenance costs.

Measuring of road markings retroreflection

The evaluation of road markings performance was introduced in the European Union through the standard EN 1436 in August 1997. In particular, EN 1436 specifies the performance for the road user of white and yellow road markings, based on luminance (colour), day-time visibility, night-time visibility and skid resistance. The standard introduces also the importance of wet-night visibility road markings and describes the methods of measuring the various performance characteristics.

The standard EN 1436 defines different classes of performance for road markings: the managing authorities of road networks can introduce a certain class of performance, in their public tenders for the installation of road markings, depending on the compromise between road users' needs and the available budget. A short description of the parameters addressed by EN 1436 is reported below. Reflection in daylight or under road lighting Q_d is the property of the marking which describes the brightness of its colour. Q_d measures, true to scale, the luminance (day visibility) of a road marking. The observation angle of 2.29° corresponds to the viewing distance of a motor car driver of 30 m under normal conditions (see Fig. 1). The illumination is diffused light. Reflection in daylight or under road lighting Q_d is measured using a retroreflectometer.

Reflection under vehicle headlamp illumination R_L (commonly named retroreflection) is the ability of a road marking to reflect light from vehicle headlights back to the driving position of a vehicle. Retroreflected light is reflected back toward the source (headlight) but it must spread out slightly in a very narrow cone or the driver would not be included within it and the sign or marking would not be seen by the driver. R_L measures, true to scale, the retroreflection (night visibility) of a road marking. Also in this case, the observation angle of 2.29° corresponds to the viewing distance of a motor car driver of 30 m under normal conditions. The illumination angle is 1.24° (see Fig. 1). Reflection under vehicle headlamp illumination RL should be measured in dry wet and rain conditions with a retroreflectometer.

Retroreflectivity of road marking have a signifficant effect on safety. Therefore, the presence road markings must be recognized and marking retroreflectivity performance should also be recorded. A sizeable body of literature describes activity in this area (Austin, 2004; Fletcher et al., 2007; Maerz and Niu, 2003a,b; Mandli, 2005; Pardillo-Mayora and Hatzi, 1996; Rasdorf et al., 2005, 2007, 2006; Sitzabee, 2008). This literature is describing measuring of road markings retroreflection, from different aproaches and standards. But main common thing is that they recognize two main methods of measuring road markings

retroreflection, static (with handheld device) and dynamic (with device mounted on moving vehicle).

Department for Traffic Signalization on Faculty of Traffic and Transport Sciences, University of Zagreb has been performing dynamic testing of road markings retroreflectivity on the Croatian state roads since 2010. In collaboration with Croatian Roads Ltd., intervals of retroreflection values (R_L) are made so that the quality of road markings can be evaluated.

These intervals are related to the state of line (restored or existing) and line type (type I and type II). Minimum values that certain types of lines in certain states must satisfy are defined in technical terms Croatian Roads Ltd.

Table 1. Minimum values of retroreflection for restored lines type I

Visibility and state of pavement	Minimum value	Interval (mcd·m^{-2}·lx^{-1})
Nighttime visibility, dry pavement	RL ≥ 200	180 ≤ RL ≤ 220
Daytime visibility, dry pavement	Qd ≥ 130	110 ≤ Qd ≤ 150

Source: Guidelines and technical requirements for the works on renewing road markings, Croatian Roads Ltd.

Table 2. Minimum values of retroreflection for restored lines type II

Visibility and state of pavement	Minimum value	Interval (mcd·m^{-2}·lx^{-1})
Night time visibility, dry pavement	RL ≥ 300	270 ≤ RL ≤ 330
Daytime visibility, dry pavement	Qd ≥ 160	140 ≤ Qd ≤ 180

Source: Guidelines and technical requirements for the works on renewing road markings, Croatian Roads Ltd.

Table 3. Minimum values of retroreflection for existing lines type I

Visibility and state of pavement	Minimum value	Interval (mcd·m^{-2}·lx^{-1})
Night time visibility, dry pavement	RL ≥ 100	90 ≤ RL ≤ 110
Daytime visibility, dry pavement	Qd ≥ 100	90 ≤ Qd ≤ 110

Source: Guidelines and technical requirements for the works on renewing road markings, Croatian Roads Ltd.

Table 4. Minimum values of retroreflection for existing lines type II

Visibility and state of pavement	Minimum value	Interval (mcd·m^{-2}·lx^{-1})
Night time visibility, dry pavement	RL ≥ 150	130 ≤ RL ≤ 170
Daytime visibility, dry pavement	Qd ≥ 130	110 ≤ Qd ≤ 150

Source: Guidelines and technical requirements for the works on renewing road markings, Croatian Roads Ltd.

According to the Technical terms, if restored road markings after the dynamic measurements do not satisfy minimum values additional static measurements must be performed. If at first static measurement, road marking continues to fail it is necessary to

perform additional measurements and if even then road marking does not satisfy the Contractor must perform application of new road marking at their own expense. Problem with the current way of analyzing retroreflection quality of road markings is the term ''state of road marking'' and intervals for each state (restored and existing). Making differences between the restored and the existing lines prevents comparison of two measurements carried out in the same year on the same road. For example, Figure 2. shows the results of measurements performed on national road on 27th of April in 2012, when the line state of was "existing", while Figure 3. shows measurements results of the same road carried out on 22nd June in 2012, when the state of line was "restored".
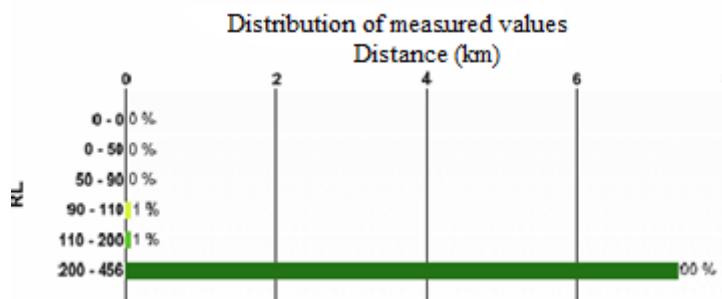
Figure 2. Results of measurement of road markings retroreflectivity on the national road, line state: existing
Source: Department for Traffic Signalization, Faculty of Traffic and Transport Sciences
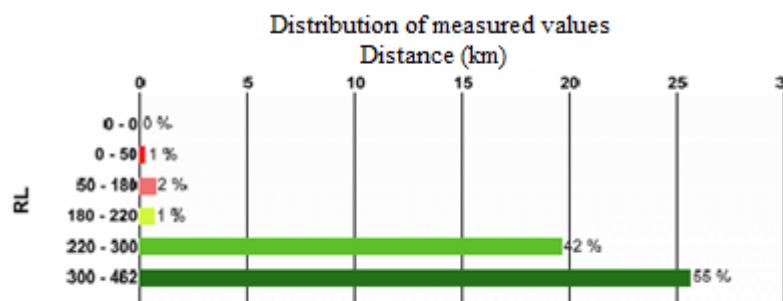
Figure 3. Results of measurement of road markings retroreflectivity on the national road, line state: restored
Source: Department for Traffic Signalization, Faculty of Traffic and Transport Sciences

From this example, it can be concluded that the comparison of measurement results before and after the restoration is almost impossible (Babic et al., 2012). Also, minimum levels of retroreflectivity after restoration should be increased to prolong the lifetime of road marking, to increase visibility at night and in wet conditions and with that to increase traffic safety overall.

Static methods for measuring retroreflectivity of road markings
Handheld retroreflectometers are used for static measuring of pavement markings retroreflectivity by illuminating the pavement marking surface and then measuring the retroreflected luminance. Static testing of road markings can be done by using the static retroreflectometer (Fig. 4.). Weighing of device is 52x218 mm. The device simulates the visual distance markings on the pavement 30 meters from the eyes of drivers, with an eye height of 1.2 m and 0.65 m height of the lights from the road surface. Daily visibility module

Q_d is expressed and measured in mcd•m^{-2}•lx^{-1} observed at an angle of 2.29 ° at a distance of 30 m and represents the value of the diffuse scattered light received by the observer. Night-time visibility or value expressed by the coefficient of retroreflection R_L and measured in mcd•m^{-2}•lx^{-1}. For measurement night visibility device measures retroreflection luminous rays from the study area at an angle of 2.29 °, the input light angle of 1.24 ° and at a distance of 30 m with a low beam. Measurements are performed according to European standards EN 1436, Materials for Road markings- Characteristics required for road users. Static testing of day and night visibility can be done by two methods: According to "Kentucky" method (old one), and according to new guidelines and technical requirements of the test procedure, ie. measurement and valuation of derivative road markings shall be carried out in accordance with the German regulation ZTV M 02.
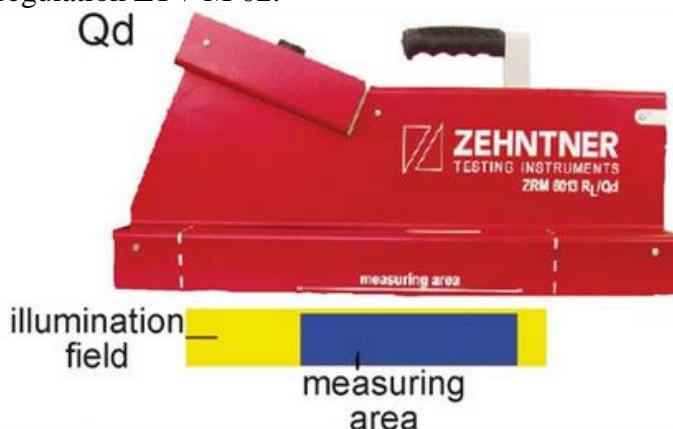
Figure 4. Device (static) for measuring retroreflection of road markings
Source: http://www.zehntner.com/products/product-list/obsolete-products/zrm-6013-retroreflectometer#pictures
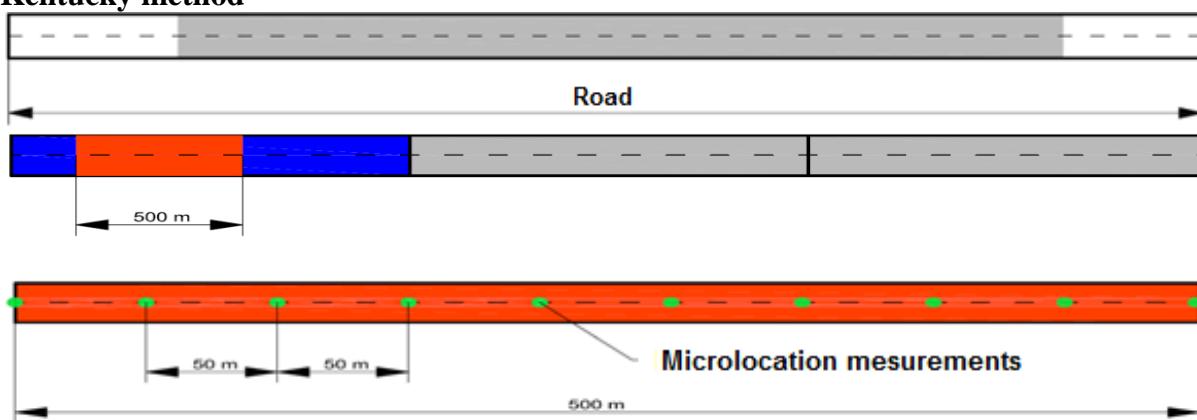
Kentucky method

Figure 5. Measurement principle according to Kentucky method
Source: Prepared and adapted by the authors

In Kentucky method, measurements are performed on a single zone of 500 m on each section, where the section is part of the label performed from one team in one day. Start measuring zone is in the first third of the length of the section. In each zone shall be 10 measurements at distances of 50 m. For all 10 microlocation's is carried out by three measurements and obtained an average value of these measurements is taken as authoritative.
The main disadvantage of this method is that the test is performed only in the first

third of the test section, where you cannot get the value of retroreflection of complete testing section.

Method in accordance with the German regulation ZTV M 02

ZTV M 02 includes measuring the thickness of dry paint film, the assessment day and night visibility derived labels in dry conditions, night-time visibility in wet conditions and the slip resistance expressed in units of the SRT and the measurements are carried not earlier than 30 and no later than 60 days after execution road markings. The scope of measurements of longitudinal labels is determined by the daily execution of the working group that performed on pavement according. In the diary, for section of road that is necessary to assess, must be specified data when the works are executed and with what daily effect (especially for the central and especially for the edge line), and the number of measurement sequences is determined by the following table (Table 5.).

Table 5. Number of measurement sequences

The length of longitudinal markings done in one day (km)	The length of the other markings done in one day (m2)	Number of measuring sections
< 1	< 120	1
1 – 5	120 - 600	2
>5 – 10	> 600 - 1200	3
> 10	>1200	4

Source: Prepared and adapted by the authors

Measurement sequences are selected according to the principle of randomness. Within each segment measuring selects five (5) measuring points (Fig. 6.). For full labels longitudinal measurement points are distributed at 100 m in length at equal intervals (beginning, 25 m, 50 m and 75 m in the end). For discontinuous measurement of longitudinal labels are allocated to the middle point of each other full lines. In relation to the Kentucky method, it is possible to take sequence in the end of testing section, and can get a more realistic view of retroreflection on the entire section.
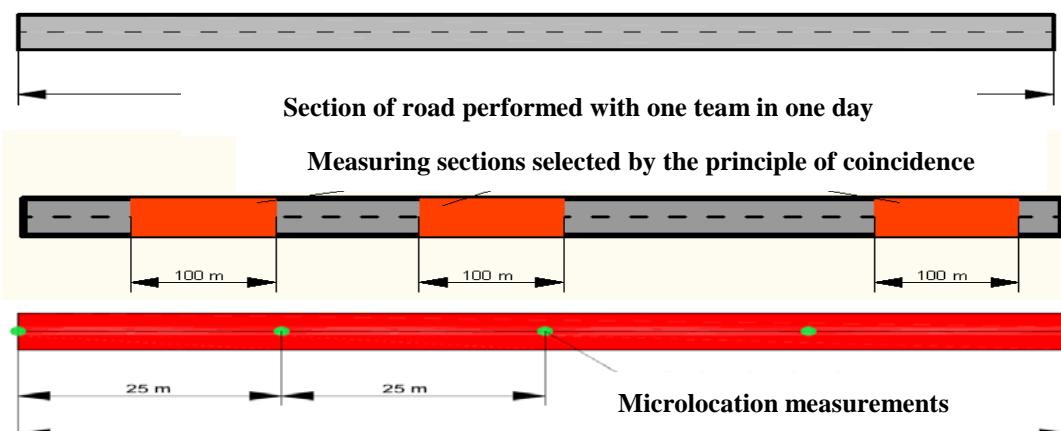
Figure 6. Measurement principle according to ZTV M 02
Source: Prepared and adapted by the authors

Dynamic method for measuring retroreflectivity of road markings

Dynamic method for testing retroreflection of road markings involves the measurement of night visibility with dynamic measuring device throughout its length. It can be performed with dynamic retroreflectometer which is installed on a vehicle measuring and thus allows continuous measurement of the night visibility (R_L) road markings while driving vehicles. Principle of measuring visibility at night with dynamic retroreflectometer is the same as in static measuring device, ie at measuring the night visibility of the device measures retroreflection of light rays from the study area at an angle of 2.29 °, the angle of input light of 1.24 ° and at a distance of 30 m at short lights.

Figure 7. Measurement vehicle with dynamic retroreflectometer
Source: Prepared by the authors

The dynamic retroreflectometer has following features:

• Measurement of road markings night visibility R_L in the day and night conditions

• It is suitable for measuring all kinds of night visibility of road markings, and profiled benchmark to 9 mm

• It is suitable for measuring night visibility in dry and wet conditions

• Has an integrated surveillance cameras, takes pictures automatically every 25 m, and also has the ability of shooting photos manually

• It has a built-in GPS system that captures the movement of vehicles and has sensors for measuring temperature and humidity

• Has the possibility of sending and processing data in a RetroGrabber software package and the ability to switch data into .xls format that allows statistical analysis of measured values.

Measurements are done in a way that the measuring vehicle moves along the road surface and reads the coefficient of road markings retroreflection along which it moves.

Before the measurements it is necessary to select the length of the measurement interval at which the device will measure the average value of each measurement section (ie the length of the measurement interval of 100 is set, this means that the device while measuring the shares for every 100 m will give an average value of visibility in this night measurement interval). Our experience shows that the optimal length of measurement interval is 50 or 100 m.

On the, Department for traffic signalization , Faculty of Transport and Traffic Sciences, University of Zagreb we have developed the new software (Fig. 8.) that will significantly enhance and accelerate the course of preparing reports and interactive viewing the results of measurements.

Main advantages of the newly developed software:

- On-line review of the results on an interactive map, complete with a report made
- data entry and data delivery to end user
- eliminating the use of CDs or DVDs that have been used as a medium for the delivery of results
- ability to analyse data from previous years with more recent data
- enter the amount of reconstructed line on a particular road in a given county by the contractor marks on the road
- currently easier business end users with better insight into the current state
- Automatic itinerary (software itinerary creation) in a given county, according to the amount of reconstructed line on a particular road
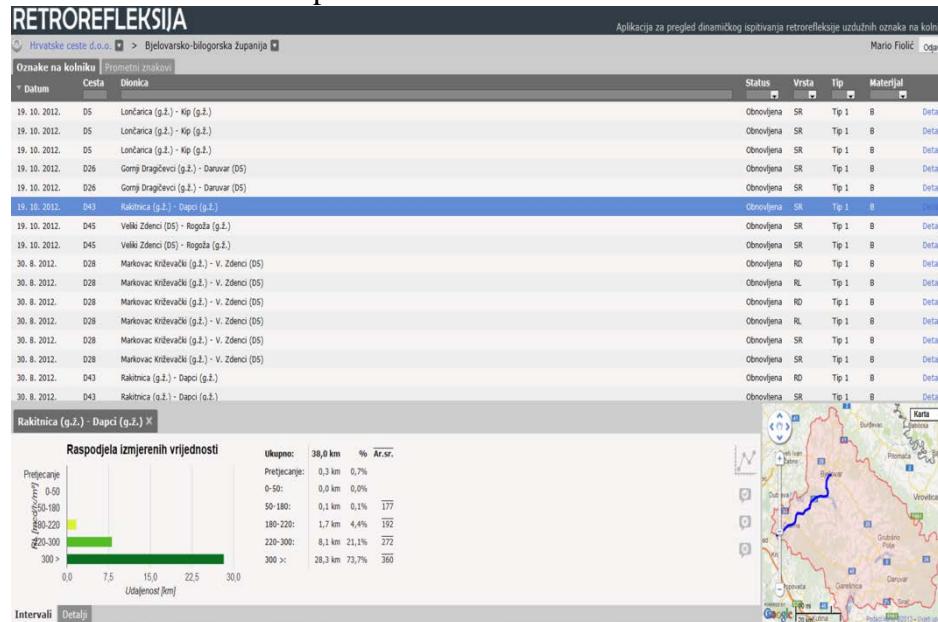
Figure 8. The appearance of the interface after the selected region
Source: Prepared by the authors

Comparison of methods for testing the quality of road markings

As already stated, the reflective properties of road markings are of crucial significance, and represent one of the main factors increasing the safety of participants in road traffic. In order to achieve a better quality of road markings, measurements should be done in compliance with internationally recognized methods (Fiolic at al., 2012). Also, methods for testing the quality of road markings must be recognized by the road authorities and in accordance with the technical requirements in each country.

Each of these methods has its advantages and disadvantages and it is on the employer to conduct the measurements by a particular method in accordance with their own needs.

However, for the detailed control of road markings quality the best method is of dynamic method. Table 6. shows the main advantages and disadvantages of each method.

Table 6. Advantages and disadvantages of each method for measuring the quality of road markings

Method	Advantages	Disadvantages
Kentucky	- measuring day and night visibility	- only the first third of length of the section is being measured which cannot represent whole section

Ztv m02	- measuring day and night visibility - gives a more realistic picture of the quality of road markings on the entire length of the section in relation to the Kentucky method	- measurement sequences are selected according to the principle of randomness
Dynamic	- measures of night visibility throughout the whole length of the section or road - provides an overview of results in computer application displaying GPS coordinates and pictures from the field - in combination with software it represents live data base of all measurements suitable for analysing and preparing maintenance plans	- does not measure day visibility - little higher level of error in measurement (but in overall doesn't influence the results)

Source: Prepared by the authors

While mobile reflectometer's typically have more error in their measurements of pavement markings, portable handheld units require maintenance of traffic and can be quite tedious for examining large segments of roadway. Mobile devices have the benefits of reduced safety risks to road workers, faster data acquisition, as well as a reduction in traffic congestion as compared with handheld devices.

In some cases, it has been determined that small changes in the positioning of a handheld unit on a marking can produce significantly different readings. This may allow operator to influence the measurement of the marking retroreflectivity if only one measurement is to be recorded. This is not the case with mobile device because it takes many more samples than typically obtained with a handheld unit, and averages the scans, which reduces operator bias, and gives a more reliable reading for a stretch of roadway. Thus mobile reflectometer's are considered a supplement to conventional handheld technology and full replacement with further study on reducing their error.

Conclusion

Testing road markings with a measurement vehicle (dynamic method) equipped with dynamic retroreflectometer offers the possibility of obtaining a continuous measurement results for the whole section intended to be measured, in a short time. At the static method

Measurement sequences are selected according to the principle of randomness. In the dynamic method selected road section is examined in its entirety while static method tested only selected sequences of selected road.

At the same time, the process of testing, measuring vehicle with dynamic retroreflectometer performs accurately, and disruption of traffic is reduced to a minimum (the operating speed of testing the quality of road markings is 60 km/h). All the above suggests the possibility of systematic testing the quality of road markings on the Croatian roads and getting quality results for individual sections which represents a solid basis for the optimal maintenance plan, and savings in the maintenance of road markings.

The results obtained in tests enable you to efficient maintenance of certain roads, review of critical places and prioritization of maintenance and optimize the order of applying the markings on the roadway. Using this measurement method it is possible to organize a system of road maintenance, which provides a constant high level of visibility markings on the roadway, which affects the safety of drivers, especially when driving in adverse weather conditions.

From the above it can be concluded that the static methods for measuring the quality of road markings are appropriate for certain quality checks, but for a systematic and detailed analysis and monitoring of the quality of road markings dynamic method should be performed.

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DEMOGRAPHY AND IT'S INFLUENCE IN THE URBAN DEVELOPMENT OF A COUNTRY

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Abstract

Urbanization brings a sustainable development as it closely relates to demography, the movement of population. After 1990, in contrast to the communist regime era a shift from the planned population movements, to congestion mainly toward Tirana and other coastal areas has been noticed. The aim of this paper is to analyze the impact that the population movement has had into our country's urban development. Urbanization is considered to be a major component for the economic growth of a country, especially in coastal areas, in which it is more incentive for sustainable development.The urbanization has passed through several stages: pre-industrial, industrial and postindustrial one. It is seen as a means to improve civilization, while bringing more progress and development.
So we may ask:
Was it worth a movement of population without a plan in Albania and should we put nowadays a planning strategy for the urbanization and demography?

Keywords: Urbanization, population, development

Introduction

Urbanization – comes from the latin word urbs-city. Urbanization is science, art and the construction technique of cities, living zones having a specific plan to allow favorable conditions to work, relax and inhabit. Urbanization is the theory and practice of city construction. Urbanization is a huge component in the economical growth of a country, especially in the coastal areas bringing stable development.

Urbanization has passed through preindustrial, industrial and postindustrial phases.
In the paraindustrial phase cities were small, rare with city population participation between 15 and 20%. The undeveloped countries and the developing ones are in the paraindustrial phase of urbanization.

Secondary activities were in the industrial phase, especially industry and the participation of city population which reached between 20 and 50%.

The postindustrial phase is reached in the highest level of urbanization with more than 2/3 of city population. Tertiary activities have a main role in this phase. Through this phase the migrations from village to city are interrupted and those from city to suburbs are shown.

Urbanization Development

The 21'st century is seen as the urbanization century. The cities will be more extended, with many centres, different, fragmented, seperated and connected to different networks, interconnected with global exchange, autonomous to state notions, in massive ecological, social and cultural intertwinement. Technology will bring a big change in people's lives helping families that live away from each other. So, the developing cities in

the 21's century will bring a radical change of civilization and the features inherited through different generations.

In the western cities, where civilization and culture have left their marks, three cities subdivision have started to take form:

a) The selected urban periphery's, with excellent infrastructure, seperated homes, gardens, space, parking, chosen neighbors, nature full of trees and guaranteed tranquility. Here lives the elitary society of nowdays civilizations.

b) City centres, full of people, with public transport frequented from middle classes where different objects are placed with care and the historical centres are the proof of cities origin.

c) The dangerous zones, ghettos, where nobody wants to live there where dominates the absence of security, dominates the moving violation law and the communities do place the everyday rules.

This is worth to be seen even as a way of development for Albania. The construction, addition and the spread of urbanization will bring many changes in the way people live.
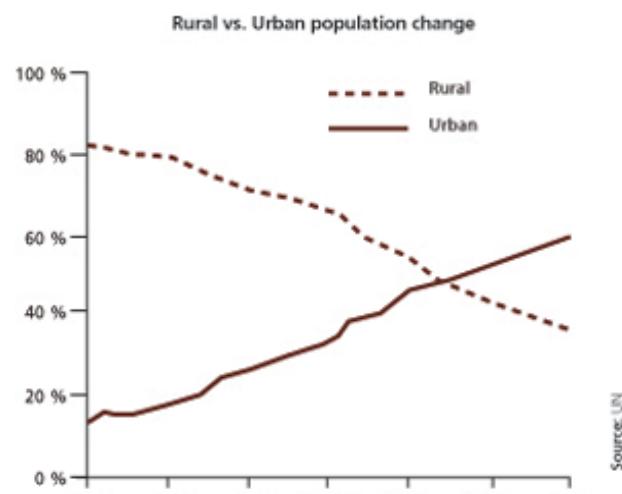
As in the whole world, even in Albania the urbanization appears in two forms;
1) Planned, that needs time, months, or years to be thrown in letter
2) Urbanization that comes naturally to respond to modernization and development of industrial life of an area (like the case of developing countries)

Urbanization is seen as a way to improve the civilization, bringing more progress and development.

Urbanization like every side of the medal has it's positive and negative side
- **The positive sides of urbanization are**
a.   the fuse of rural-traditional features in contemporary urban features
b.   the increase of cultural and educational level
c.   the reduction of populations natural raise
d.   socialization of the population
- **The negative sides of urbanization are**
a.   Huge pressure in working places,
b.   Pressure in habitation funds,
c.   Transport problems,
d.   The enviroment contamination,
e.   Nois,
f.   Changing behavio in people,
g.   Criminality etc.

b) What kind of urban development will Albania have in the future?
It's difficult to specify a prevailing line since urbniaztion is changing phenomenon, eventhough its quite sure that the future developing lines are connected with:
- Cities
- With the increase in human population

Albania is a post-communist place that has passed from a planned movement toward a massive one especially in Tirana and coastal places. Until before 15 years the world knew Albania mainly as a very isolated society, where the state had the titles of ownership and the control over properties similar to other socialist places. From that time Albania has passed through many changes with almost no similarity with other economies in transition.

Albania is trying to become a candidate state in the European Union, a speical attention is given to the regional development decreasing the levels between them.

The regional development influences not only in the population but also in the urbanization of the population and it's economical and social aspect.

In the country there is a big change between the most developed pole, Tirana and Durres, and the least developed regions which are Dibra and Kukesi. The migration is a critical problem, which brings huge infrastructure pressures even in the services for the most attractive zones, also a reduction of population and inefficiency for the least attractive ones. The least deveoped cirucits are Dibra, Kukesi and Berati with ZHR 75 index.

Tirana has the highest index (151) and it's considered as the most developed city. All the other circuits with index between 75 and 125 are classified as:

Circuits with an average level of development, which are distinguished in many characteristics.

According to INSTAT[1] they show a regional conentration increasing, where the part of population in Tirana and Durres will increase with less than ¼, in almost 1/3 of the general population, whether the population in other big regions (especialli in the north and south) will decrease. The central region, focuse on Tirana and Durres, shows the largest concentration of the registered firms (partly for administrative reasons). This is the region where the modern services and productive activities, main of the companies with other capital, main of the public sector and the construction bum, together. This region is also the centre of export and import, it dominates all the ports, the aerial transport and passenger traffic in the country.

The coastal zone (in north and south of Durres) has unexploited potentials for the toursim and has unused potentials for tourism and agriculture/ agro-buisness, which will look for structured support to develop, to raise the standards and to support the competirion of the European Union in expansion.

The inner zone does not have new incentive to disallow the fall of agricultural sector, continuing to stay behind. The cities of Berat and Korca constitutes a positive exclusion and conitnues to preserve a regional dinamic.

The main objective of goverment in the third phase would be the legalization and integration of real estate fortune. The new construction and urnbanization in the two first phases have been spontanous with no interfering from the central goverment. In reality the adaption of private sector, trhough the first decade of transition, was very apparent having present the starting point: the artificial space distribution of population (65% in the rural zones), state posessions of 70 % inventory of the accomodating homes, and a very restricted possesion for accomodation (the exploitation of construction area is only 5 m2 for each person in the urban zones, compare to 16 m2 in Bulgaria on the transition period). Having present the weak economy and administration in the beginning of 90's, the informal building were the only practical way for population accomodation of a displaced population.This phase of Albanian urbanization must non be considered negative. It contributed in the sub-division and land distribution, state property, in small parcels in a very short time. It created a huge inventory of the permanent residences so that they could be sold and bought.

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[1] Instat.al.

The trajectory of population number in Albania

At least until 2021 the trajectory of population number in Tirane and Durres will increase progressively. It's precisely the study of the Institute of Statistics that confirms a fact where all the sources and origins of displacement are detailed. This may be one of the reasons why in Tirana and Durres the prices of residences never decrease even in times of crisis. The demand and population growth in this region is progressive.

However, having present that only 22 % of non migrants live in the city, migration has intensified the urbanization of the city. Almost every prefecture with a positive migrative statisic has increased in the urban population. For more, 62 % of immigrants in Durres and 62 % of those in Elbasan are placed in urban zones. During 1989-2001 period, Dibra, Fieri, and Lezha had the highest level of immigration with rural character. Vlora, Durresi and Tirana had the lowest levels. In this prefectures, except Tirana it's noticed a reinforcment of migration urbanization.As we see from tab above nr 1 Korca's prefecure is mainly touched from inner migration, but not as a place where you can migrate. It's connected to a huge number of persons that migrate chosing to live and work in another place of destination, except that of the origin.The migration has touched mostly the population in working age, where those who are getting old have remained in the places of their origins.

Korca's prefecture has migrative esperience, connected to the inner migration especially towards Tirana or coastal places and the migration towards America, Greece or other places.

Conclusion

The inner migration, with the extension of international migration, can lead to the reduction of human resources and development in the prefectures of origins. It brings a chaotic sensation in the waiting prefecture infrastructures.

A strategy is needed. from the side of albanians to have a programmed movement of population not only in Tirana but also in other regions.

A political system is needed from the urbanistic aspect and demographic one to become the most active part of population in Albania being seperated in developing and population zones.

The urban zone and the rural one need to develop especially from the north of our country, where there are buildings and investment are higher.

Urbanization is considered to be a major component for the economic growth of a country, especially in coastal areas, in which it is more incentive for sustainable development.

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A NEED TO CONTINUE THE TRADITION IN THE REGIONAL ARCHITECTURE OF THE PODHALE REGION

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Abstract

In Podhale, at the turn of the 20th and 21st centuries, the existing historical buildings are visibly endangered due to a lack of grounds for the mass development of trade and tourism. An increasing number of characteristic buildings keep disappearing from the landscape of Zakopane. Historical objects are often subject to destruction, are knocked down or thoughtlessly re-designed losing their original character. Every year preservation of the decreasing historical substance depends on various complex circumstances, different from the ones that assisted its construction, development and 'continuation' in individual historical periods. The reason for preserving the traditional wooden architecture in the Podhale region results from a widely understood preservation of monuments nowadays, which is connected with cultural heritage and preservation of a place's identity.

Keywords: Architecture in the Podhale region, cultural heritage, preservation of monuments, place's identity

Introduction

The architecture of buildings in Zakopane and development trends of the so-called 'Zakopane style' provide extremely valuable research material for studies concerned with the development of the wooden architecture in the Podhale region, which was developed and shaped at the turn of the 19th and 20th centuries. Although the architecture of this 'sub-region' was not considered by many decision-makers as an architecture masterpiece, it still deserves our particular attention. It has become the centre of society's interest being a creativity complex of individual personalities and its greatness was highlighted by assisting emotions.

Among those interested were artists, writers, poets and scientists, i.e. people who were sensitive to social, political and artistic processes. The following individuals are worth mentioning: Maria and Bronisław Dębowski[2], collectors of souvenirs and utensils based on folk traditions; Maria Andrzejkowiczówna[3], who as one of the first made sketches and drawings of furniture in the style of highland furniture; countess Róża Raczyńska[4]; Helena Modrzejewska and Kazimierz Tetmajer, whose poetry extolled Polish mountains as well as

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[2] Maria Dembowska (1856 – 1992), Bronisław Dembowski's wife – a collector of Podhale art souvenirs. She came to Zakopane in 1882 and in 1885, together with her husband, decided to stay there permanently due to her health state. Bronisław Dembowski (1848 – 1893) – a professional lawyer, a collector and researcher of Podhale art and culture, an author of works on Podhale dialect, e.g. Słownik gwary podhalańskiej.
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Dr   Władysław Matlakowski[5], who undertook studies on regional architecture inspired by the extraordinary character of Podhale apartments.

At that time new science disciplines began developing. New aspects connected with highland people and their various problems became known.

Buildings in the so-called Witkiewicz style and their meaning for the national culture

Along the development of the Zakopane Resort there appeared a mutual relation between old regional traditions of the Tatra people and the culture of visiting patients. Those two cultures began merging and created a new trend in regional forms. The size of new buildings dominated the architecture of original highland cottages, creating a specific climate and relating to the features of the regional architecture. It was believed that pre-Polish forms were preserved in the Podhale architecture[6] and on the basis of those monuments all things endangered by foreign influences during a long-lasting subjugation should be restored.

Stanisław Witkiewicz started his activity at the beginning of a growing interest in the Podhale culture[7]. A large movement of a national character in the architecture of Zakopane emerged under his influence. Local Podhale highlanders, knowing patients' requirements, had already started to adjust the traditional form and function of highland cottages to the 'higher rank' needs.

The next step in the development was shown to them not by a highlander, but a visitor from the East, the far-away Żmudź – Stanisław Witkiewicz: "We found a highlander in a tasteful and decorative cottage, surrounded by artistry visible in every piece of furniture, each detail of ordinary use. His cottage was a treasure of former culture, preserved by this nation of culture, which was still alive but stopped developing because of the inevitability of rural life conditions. It was doomed to die, disappear and seemed to wait for saving, calling for help. We saved it, a highland cottage gave birth to a type of higher architecture; the furniture and ornaments became the source of development for a big artistic movement, whereas studies showed that the architecture and ornamentation used to be once present in the whole area of Poland'[8].

There came a moment of developing the disappearing regional values. New houses were built based on the prototype of a highland cottage. The houses that were built showed similarities but also differed from one another. As Witkiewicz wrote, the seemingly 'fossilized form' of a highland cottage could be rebuilt and at the same time adjusted to increasing requirements of guests – patients. The emerging buildings contained elements of

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[5] Władysław Matlakowski (1850 – 1895), a doctor. He visited Zakopane for the first time in 1886, because of Dr Tytus Chałubiński. He undertook studies on Podhale art. He wrote two works which constituted the basis for Stanisław Witkiewicz's works: Budownictwo ludowe na Podhalu, Wyd. Akad. Um.1892, Zdobienie i sprzęt ludu polskiego na Podhalu, Wyd. Kasy mianowskiego 1901.

[6] Pawlikowski J.G., O lice ziemi, Warsaw 1938, p. 330, quote: „(…) the style was considered to be a development of not only the Podhale model, but also the pre-Polish one or, as Witkacy says, the western-Slavonic one.
Barycz H., Na przełomie dwóch stuleci, Zakład narodowy im. Ossolińskich, Wyd. PAN 1977, p,103-104, quote.: „Potkański's historical studies on Poland's prehistory, its ancient prehistorical society deeply influenced the development of Witkiewicz's views and affected the formulation of his theory on pre-Polish origin and character of the highland art".
Estreicher Karol, Sztuka około 1900 środowisko artystyczne Zakopanego w okresie Młodej Polski (1900 – 1914), PWN Cracow 1967, p.129-140. On folk architecture Karol Estreicher writes that 'folk architecture in Podhale is, of course, not native, is not exclusively a possession of Podhale but is connected with herding architecture and customs stretched over the Carpathian ridges from Romania to Moravia'.

[7] Stanisław Witkiewicz, born in 1851 in Żmudź, died in 1915 in Lovran, buried at the 'Pęksowy Brzyzek ' cemetery in Zakopane, painter, writer, social activist, author of the 'Zakopane style'. He came to Zakopane for the first time in 1886 in order to cure tuberculosis. Between 1890 – 1908 he lived permanently in Zakopane.
See: Paryscy Z. and W., Encyklopedia Tatrzańska, Warsaw 1970, p.601.; Olszaniecka Maria, Kalendarium życia i twórczości [in:] „Stanisław Witkiewicz 1851 – 1915", Zakopane 1996, p.27-41; Moździerz Zbigniew, Stanisław Witkiewicz (1851 – 1915). Szkic biograficzny [in:] „Stanisław Witkiewicz – człowiek, artysta, myśliciel". Materials from a session organized on the artist's 80th death anniversary. Zakopane 20 – 22 October 1995. Chief editor Zbigniew Moździerz, Zakopane 1997, p.11-50.

[8] Quote.: Witkiewicz Stanisław, Na przełęczy, Volume II. Po latach, Wydanie literackie, Cracow 1978, p.37

the Podhale architecture, were an example of architecture as an inherent part of the landscape and the used building materials in the form of stone and timber had deep roots in the construction tradition of the region.

All developed elements in Witkiewicz buildings played the same role as in a highland cottage: size of rafters, inclination of roofs were proportional to the strength of foehn wind and snow load as well as the size of windows and width of flat logs were a witness to the mountainous climate[9]. The trend shown by Stanisław Witkiewicz in the Podhale architecture played an important role in shaping the sense of individual artistic value among highlanders, especially the developed art of architecture and ornamentation.

At the beginning of the 20th century the Zakopane style began to lose its popularity due to various kinds of requirements or social and economic conditions. Its development was disrupted by the 1st World War.

The inter-war period meant a time of new solutions and numerous changes in the Zakopane architecture. 'The Zakopane style' was slowly losing its popularity. However, there emerged sporadic buildings as a result of some architects' aspirations to retain the style features in connection with new architectural and construction elements, apart from new buildings not connected with traditional regional forms.

Continuation of traditional features of the regional style in the contemporary architecture of the Podhale region

Besides widely understood preservation of cultural heritage, mainly conservation care for monuments, a problem that becomes increasingly noticeable as far as preservation of cultural and traditional landscape are concerned is the question of architectural expression of the contemporary architecture existing in the Podhale region. There emerges a need to continue the regional architectural tradition in the spatial structure of an architectural form, detail or also construction elements of new buildings.

Traditional wooden architecture which continues harmoniously principles in the method of solving spatial structure of buildings (projection outlay, architectural form), construction and material issues, developed over the centuries, co-created the characteristic cultural landscape in the region, defined the cultural environment spatially, created the mood and beauty of the place's climate;

Wooden buildings (residential villas, guest houses, inns, hotels, etc.) with the surrounding elements of the 'small architecture' (gates, fences, etc.) visibly determine the cultural identity and traditions in the region connected with forms of housing, climate, natural environment – they create the cultural landscape to a considerable degree;

Regional architecture was accompanied by ornamentations and adornment with motifs and forms closely connected with the region, among others woodcarving and smithery works (richly ornamented window and door carpentry, solutions of gables with the motif of the so-called sun, balustrades, 'ceiling main beams' and so on) as well as construction solutions, e.g. beams supporting eaves, the so-called 'rysie', with a meaningful artistic expression;

Traditionally used construction materials in the form of timber (construction arrangements of log cabin with quoins so-called 'ostatki'), linings in the form of so-called boarding in horizontal and vertical arrangements, shingled roofs as well as stone (stone foundation) influence the entirety connected with reception of an architectural form and its artistic expression visible in details.

Features and elements functioning as characteristics connected with a place have important influence on defining a region's identity, they constitute more or less noticeable

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[9] Witkiewicz Stanisław, Styl zakopiański, booklet 2: Ciesielstwo, Lvov 1911, p.8.

spatial and formal characteristics. Regional features visible in architecture, construction and details, appearing in newly-designed buildings harmoniously refer to and continue traditions – they enable survival of local features shaped by generations or last but not least they visibly differentiate between villages and towns in different regions and thus effectively counteract widespread unification, which destroys valuable regional qualities.

Distinguishing regional features, their defining and especially continuation sometimes seem extremely difficult, require multi-disciplinary analyses and decisions. There are only few regions which undoubtedly and unquestionably continue regional traditions in construction and architecture. Style features disappear in individual regions of Poland – with the exception of the Podhale region.

Factors influencing disappearance of traditions continuation in regional architecture

Disappearance of continuation of characteristics connected with regional architecture is a result of numerous aspects influenced by:

– weakening or disappearance of a sense of regional ties and regional identification in society's awareness;

– chaos in aesthetical values of modern art, including architecture, negation of cultural traditions;

– frequent ineffectiveness of the National Service for Monuments Protection and reducing its activities to practically ineffective protection of the existing wooden buildings;

– a lack of catalogues with designs of buildings with traditional features connected with a given geographical, historical and cultural region;

– technical limits resulting from quite strict fire, safety, sanitary and epidemiological regulations;

– replacement of traditional building materials with new technologies and materials effectively advertised and easily accessible, not always used in accordance with guidelines referring to mountainous lands;

– disappearance and weakening of interest in continuing regional traditions in architecture on the side of architectural and construction services.

Conclusion

Need for a new strategy in protecting and increasing the region's attractiveness.

Continuing regional traditions in the contemporary Polish architecture does not exist as a rule. It has not been formulated as a recommended principle in designing. Devastation of existing objects has been allowed and foreign, useless standards have been introduced.

Tendencies to continue traditions in new architecture are rarely met. In general, attempts to regionalize contemporary architecture using traditional motifs and inspirations are only incidental in building activities.

Every year preserving the decreasing historical substance depends on various complex circumstances, different from those which were connected with its construction, development and 'continuation' in individual historical periods. The reason for 'caring' about regional wooden architecture nowadays results from the widely understood monuments preservation, which is connected with cultural heritage and preservation of regional identity influenced by:

– care for aesthetical values of buildings and cultivation of the local regional tradition,

– exposing traditional wooden architectural forms which constitute an element of individualization and identification of a place,

– renovation and modernization of buildings while preserving a unique mood and climate of the local regional architecture,

– a need to draw on the extensive achievements of the regional culture in times of globalization and unification of places.

Thus, attractiveness of a region should be based on:

− traditional sources about a place and the society's culture developed over the centuries, preserved existing historical objects and natural climate and landscape conditions.

A regional style has one specific characteristic, namely it is independent from historical styles and contrary to them it retains canonic values important for national culture.

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PRE-RESTORATION INVESTIGATIONS OF THE BASARABI CHALK MONUMENT DIAGNOSIS, TREATMENT AND IMPLICATIONS

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Abstract

This paper will sumarize several important aspects of the material research of chalk stone monument that is affected by various weathering/decay processes. Diagnosis of materials on monument should offer the necessary informations about the nature (genesis, composition) of materials and their states - intact and/or altered state. Detection of the major damage processes located on the studied monument can elucidate what are the factors contributing to the damage. Depending of the above results, will be established the managing restoration steps: selection of methodology of research, sampling strategy, analytical procedures and the time issue. Atmospheric pollution and acid deposition materials are recognized as the most important and common causes of decay the heritage monuments. Studies on chemical-mineralogical-physical changes in Basarabi chalk monument caused by weathering will also make a part of the paper. Discovered on 1957, the Basarabi – chalk church is one of the most impressive archaeological sites of Europe, consisting of churches dated from 9th - 11th century. Situated in the cliff of a chalk stone hill, this church is built from amorphous calcium carbonate and is very sensitive to humidity, frost, salts etc. The studies called 'pre-restoration material investigation' is in fact, 'in-between two interventions' – past one and future one. Only our deep understanding of these changes, together with recent material properties and their possible future development can make the material investigation of stone monuments a strong tool that improves the restoration itself.

Keywords: Basarabi Church, chalk stone, restoration, consolidation

Introduction

Building materials on the surface of architectural monuments are prone to degradation phenomena, aesthetic, and functional. Historical monuments suffer various forms of degradation, the most common being:

a) detachment of plaster or masonry substrates wall decorations. Causes detachment supported are: capillary moisture infiltration combined with migration and crystallization of salts, improper works on architecture structure, vibrations caused by blasting, traffic.

b) Cracks in the substrate, corresponding dislocations facing and contraction cracks as a fine network of cracks, due to the contraction of unsuitable materials introduced into the original substrate, technical flaws, the inadequate restoration (refurbishment) [12].

c) Migration and crystallization of salts in the plaster layer, the phenomenon of Freeze-thaw, air pollution in the presence of humidity and temperature variations, technical defects may result to a friable mortar, resulting in a powdery surface of the plaster, not resistant to mechanical action.

d)   deposits adhering impurities (dust, smoke, soot, cobwebs - and adhesion (smoke, tar, bird droppings), due to air pollution, improper maintenance of the monument.

e)   soluble efflorescence, poorly soluble or insoluble - are due salts (nitrate, sulfate, chloride, carbonate) which crystallizes in certain conditions of temperature and humidity on architectural surfaces.

f)   degradations due to the action of microorganisms that thrive in conditions of microclimate: humidity, temperature, light, air pollution.

In order to evaluate all the effects of the application of any used consolidant, changes in the chemical and physical properties (e.g. strength, porosity, liquid-water and water-vapor transport, and hygroscopicity) of the substrate must be determined. This involves the depth of penetration, material-strength profile and the concentration profile of the consolidant. Also, the changes that appear (e.g. whitening and added gloss) should also be quantified. Never the less, the historic transformation of the historical building is essential and for this is necessary the diagnostic procedures and protocols used on the investigated buildings.

In this paper, some important aspects about the diagnostics on materials involved in the architectural restoration are analyzed. The materials microstructure as: consolidating value, depth of penetration, effect on appearance, compatibility of consolidant with substrate, durability of treatment, effect on liquid water and vapor permeability, biological resistance, ease of application and health and safety issues, are discussed for Basarabi Chalk Church in particular. Causes of stone deterioration, mechanisms, characterization of building materials, in terms chemical and mineralogical composition, the physical, chemical and mechanical properties, have been studied in this paper. Also, the composition will be deceleted by petrographic analysis, and analytical techniques: X-ray diffraction (XRD), thermal analysis, scaning electron microscopy (SEM), Fourier transformed infrared spectroscopy (FTIR) and energy-dispersive X-ray fluorescence (EDXRF). The materials compatibility restoration - conservation of the monument will be made by techniques such as zoom microscopy, SEM, relative kinetic stability. Mechanical properties as compressive strength and capillary water uptake test, have been evaluated and discussed, comparing the model-smaples with chalk samples, treated as shown above.

Experimental part
Specimens samples preparation

The samples prelevated from Basarabi Church (samples collected from the exterior of the monument, without any value for this church. Samples were obtained by taking a minimum part of the archaeological object, with the aid of a scalpel with diamond tip, to minimize any damage and contamination. Being detached from the Church's wall, all the samples, have the same constitution as the wall and the same composition.

Consolidants

Nanosuspension of $Ca(OH)_2$ dispersed in ethanol, is synthesized in the lab (Ion, 2010). By comparison, has been used CaLoSiL E25 composed of lime nanoparticles suspended in alcohol [15, 16,17]. It is supplied as CaLoSiL E25 consisting of 25g particles per litre of ethanol. Each type of mortar substrates was treated by three different consolidants.

Application of consolidants

The application of all types of consolidant was carried out by immersion. After the each cycle the all samples were covered for one day by a slightly opened cover to avoid quick evaporation of solvent. Next day the cover was removed and the specimens were exposed to

laboratory conditions to get dry. The following application cycle was done when the specimens became completely dry.

Characterization techniques

The samples were analyzed by using the following techniques:

Ion Chromatography, performed on a DIONEX DX-500 Chromatograph, was used to identify the soluble salts as cations and anions present in the samples. The eluent was sodium carbonate and sodium bicarbonate with a flow rate of 2 ml/min, and a 4 mm column for the separation of anions.

The diffraction analysis has been carried out in a DRON UM1 diffractometer using an iron filter for the CoK_α radiation (1.79021Å) and also, with a XRD, Philips Diffractometer PW 1840, 40kV/20mA, Cu Kα radiation).

DSC was performed on a Metter-Toledo Instrument DSC 823^e. Samples (1-2 mg) were loaded into sealed aluminum pans with lids and heated to 600°C at a heating rate of 10°C min $^{-1}$ in oxygen flux (100 ml min $^{-1}$).

X-ray fluorescence analysis was performed with an energy dispersive instrument, EDXRF PW4025, type Minipal- Panalytical, with a Si(Li)-detector of 150 eV resolution at 5.89 keV (Mn-Ka-line). A Rh-tube with an acceleration voltage of 50 kV and a primary filter of Pd with 0.05mm thickness were used for excitation.

For evaluating the effectiveness of the consolidating treatments, the **relative kinetic stability** of the dispersion of nanomaterials, was defined as ξ, which is calculated using eq.1 [18].

The particles size and theirs size distribution have been measured by **Dynamic Light Scattering** (DLS) technique.

Scanning electron microscopy (SEM) produces high resolution images of a sample surface. The Quanta 200 Scanning Electron Microscope (SEM) was used to produce enlarged images of a variety of specimens, achieving magnifications of over 100000x providing high resolution imaging in a digital format.

Atomic force microscopy (AFM) investigations were carried out with an Agilent 5500 SPM system, described by PicoSPM controlled by a MAC Mode module and interfaced with a PicoScan controller from Agilent Technologies, Tempe, AZ, USA (formally Molecular Imaging). The original images for the samples, the 3D topographical images and section analysis over the articles were performed using the PicoView SPM Software, version 1.6.2, Molecular Imaging. Height image data obtained by the AFM is three-dimensional.

The conservation efficiency of the consolidant was estimated:
- by compressive strength, with Silver Schmidt Hammer L, with a compressive range 5-30 N/mm^2 and 0.735 Nmm impact energy (EN 12 504-2).
- by capillary water uptake tests, determined according to the method according to EN ISO 15148 .

Results and discussion
Historical aspects

The assembly is part of a career "of Roman", a cliff named Tibişir hill on the outskirts of Murfatlar (Basarabi), 20 km far from Constanta. The rock, chalk, amorphous calcium carbonate, almost pure, soft, with high porosity, very hygroscopic and capillary. During the massive extraction operation from career, were excavated several chapels (small churches), vaults, etc. branched galleries. The first chappel has been discovered, on June 11, 1957, in the works of opening a contemporary rock mining. The new operation was stopped and follow work archaeological research. Thus, a whole set of religious cave came to light, after being released by sterile deposits of chalk, various concentrations and soil accumulated over approximately in a millennium.

The main causes of degradation are :

- Water accumulation, before 1977 to 2007, due to the defects of the old temporary buildings, frequent freeze-thaw sequences lead to fragmentation (disintegration) masses of rock and degradation surfaces, the composition of the causes of pathology is essentially reduced in 2006, the rehabilitation of temporary protective structure.

- Crystallization of salts has a similar, somewhat to that of frost: crystal formation is a huge mechanical force and break porous structure of the rock when the humidity is reduced and salts are solid, moisture variation alternative sequences are basically the same harmful as variations in temperature around the freezing point.

This component causes pathology is essentially reduced in 2006, the rehabilitation of temporary protective structure, but are essentially required for degradation of existing symptomatic treatments and developing.

- Soluble salts and crystalline certainly come from the masses of concrete made the structural system in the years 1960-1977, when these phenomena incompatibility does not appear to have been known. We study methods to stop these potentially harmful chemicals, and flow control them through masses of chalk and surfaces.

- Other salts come under investigations already carried out, the waters of Lake the nearby soil, the main source being the "mountain of garbage " located in near which, stupidly, increases very day.

- Proliferation of massive biological gone, after decomposition, the accumulation of the nitrate salts which are also crystalline and are soluble and regress solid after rehabilitation (the "unhealthy" conducive to such bodies changed, and largely left alone without waiting for treatment biocides).

In conclusion, it is essential for the future of environmental control, and treatment existing damages at all stages, as in medicine: emergency treatment causally symptomatic background maintenance.

Stone characterization

Stone materials are characterized by a mineral-inorganic nature, and by hydrophilic properties, both these aspects being very important when choosing the treatments for their conservation. Two main causes for stone deterioration have to be mentioned: acid attack (caused by rains and humidity condense in polluted urban atmospheres) and soluble salts cyclic crystallization [1]. The first mechanism (acids) induces corrosion to carbonatic materials such as calcium and/or magnesium carbonates based stones while silicatic stones are only poorly affected. The second mechanism (salts) is mainly active towards porous stones, independently of their nature. Also, important is the effect on low porosity stones. This is important for the consolidation of natural stone such as limestone, marble or sandstone as well as for mortar and plaster [2].

It should take into acount that decay agents can reach the surface both from outside (acid attack and salts deposits) and inside (soluble salts), in case of porous materials [3,4].

Some studies on environmental influences on degradation stone monuments, considering the factors such as temperature (average, minimum, maximum), number of days of frost and sunny days, humidity annual average rainfall amount and chemical composition, currents air, will be evaluated, too, knowing that carbonates have been detected as the predominant in the body of the church with sulphates impurities [5].

Usually, calcium carbonate is occurring as limestone, chalk and biomaterials. It is known that some nonaqueous dispersions of calcium, barium or magnesium hydroxide nanoparticles started to be tested and used as new possible consolidants for calcareous material [19]. Gypsum is, as lime, one of the important component used as binder alone or together with lime for the production of plaster and mortars [20, 21]. In order to evaluate the

efficiency of the new treatment method, based on nanomaterials, first of all the characteristics of the substrates and chalk wall, have been evaluated.

Many literature sources rank magnesium sulfate among the most damaging salts. [4,5]

The alteration of stone is a natural and irreversible process. Crystallization of soluble salts in the construction materials, is considered today one of the most important decay process. These soluble salts induce the rock fabric, when efflorescence appear, especially, and induce crystallization within the pores causing the stone damage. All the damage processes from the stone surface is due to high level of sulphates, chlorides, nitrates, detected by ion chromatography and Ca, Na, K and Mg. Deterioration of mortar can be rarely attributed to the presence of only one salt. The most abundant salts are chlorides, sulphates or nitrates, of calcium, sodium, potassium, magnesium and sometimes also ammonium kations. Source of chlorides are usually deicing agents, nitrates are of organic origin. Sulphates are usually rising from groundwater but may be also a product of calcium carbonate corrosion reaction with sulphur oxides. Nitrates and sulphates can be also product of an action of some bacteria.

By ICP-MS all the metals constituents of the chalk sample, have been identified, Table 1.

Table 1. The metal composition of the chalk stone sample.

Metal	Concentration (ppm)	Metal	Concentration (ppm)
Ti	75.19	Cu	42.69
Sr	857.69	K	2600
Ba	136.92	Al	8100
Mn	272.115	Fe	4800
Bi	191.69	Mg	2300
Sn	152.115	Na	8600
Si	14400	Li	34.61
Ca	241200	Zr	10.77

Divalent metal ions of similar ionic radius as Ca^{2+} may be incorporated as impurities into calcite during mineral precipitation. In agreement with the literature data, these results indicate the presence of Sr, which is favouring the calcite stability by precipitation/adsorption of $SrCO_3$ and the dissolution of $CaCO_3$ is occurring at these sites [25]. On the other hand, Gutjahr and co-workers have shown that Sr^{2+} causes a significant reduction in the growth and dissolution rates of aragonite. This was attributed to reversible adsorption of Sr^{2+} ions at growth sites (kinks) [26]. Cu^{2+} and Zn^{2+} could form soluble oxides and carbonated over the calcite surface, [27].
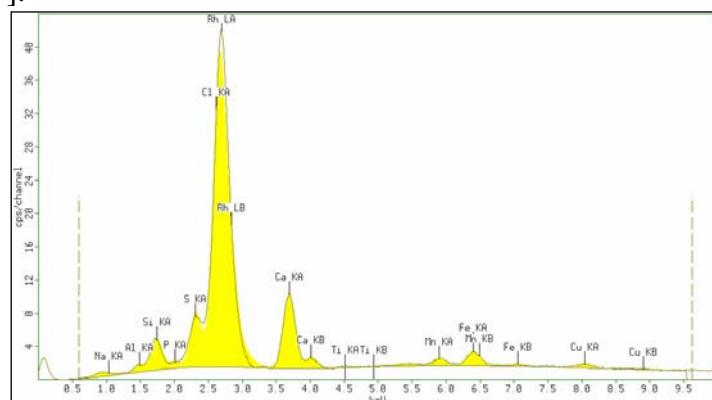
Figure 1. EDXRF spectrum of the chalk sample
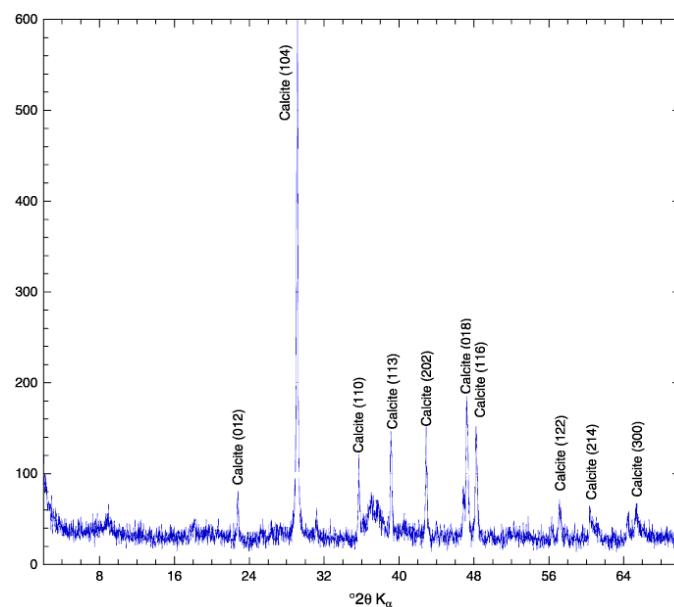
Figure 2. XRD of calcite

Magnesium sulfate tends to precipitate within a wider crystallization front and in pores of different size, while sodium sulfate is mainly concentrated close to the surface and in large pores. The goal of the DSC experiments was to determine the composition of the salt mixture that forms by drying a magnesium sulfate solution. [6-8]. By DSC techniques is important to detect the soluble salts arising from the degradation, because the soluble salts are usually hydrated, so they undergo changes at low temperatures, less than 100 ^{O}C. Is important to identify them by DSC techniques, so: $CaSO_4 \bullet 2H_2O$, KNO_3, $Mg(SO_4)_2$, $NaSO_4$. If we compare the temperatures corresponding to the minimum of the peaks in DSC curves for each sample with the data listed in Table 1, we can see that $CaSO_4 \bullet 2H_20$ is present in all type of deteriorated materials; KNO_3 is always present in salt efflorescences and scarcely in patinas and crusts. Hydrous or anhydrous Mg and Na sulphates are also frequent. Hence, the most abundant anions are nitrates and sulphates and cations are Ca, Na, K and Mg.

Table 1. Decomposition temperature of the salts which appear as products of the monumental rocks degradation

Soluble salts	Temperature (^{O}C)			
	Dehydration	Phase transition	Melting point	Decomposition point
$CaSO_4 \bullet 2H_2O$	143			
Na_2SO_4		257		
$Na_2SO_4 \bullet 10H_2O$	40	251		
K_2SO_4		583		
$MgSO_4$		352		
$MgSO_4 \bullet 7H2O$				
$MgSO_4 \bullet 6H2O$				
$MgSO_4 \bullet H2O$	76	345		
$(NH_4)_2SO_4$		355	505	
$NaNO_3$			275	308
KNO_3		133	334	
NH_4NO_3				267
$Mg(NO_3)_2 \bullet 6H_2O$	93			423
$Ca(NO_3) \bullet 4H_2O$	49			549
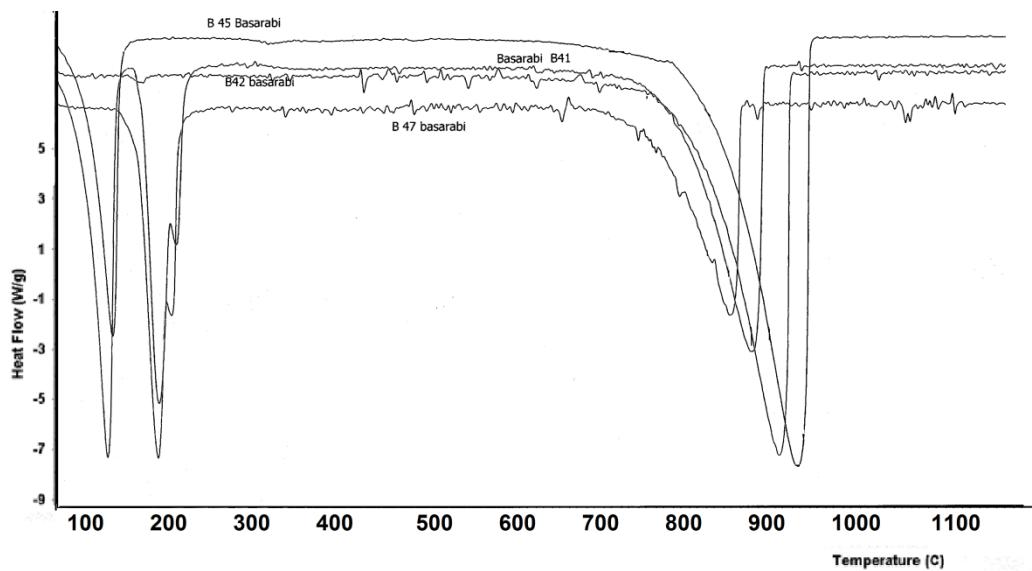
Figure 3. The DSC diagrammes for different church walls (left ordonate, mg; right ordonate, mg/Celsius degree). [B41 = stone dislocated from inside West wall; B42 = wall efflorescence dislocated from the inside wall surface; B45 = wall sample from inside East wall; B47 = dust from the dome surface]

Efflorescence is well known as the unsightly white deposits or stains that sometimes appear on the surfaces of concrete or brickwork on buildings. Three categorites of efflorescence are known: Lime bloom, Lime weeping, Crystallization of soluble salts.

Primary efflorescence observed with lime bloom and lime weeping refers to uniform calcite deposits $CaCO_3$ arising from transport of calcium hydroxide $Ca(OH)_2$ in solution through capillaries within the structure to the external surface. The solution evaporates and leaves behind deposits of solid white calcium hydroxide. These in turn react with atmospheric carbon dioxide CO_2 to form white deposits of calcite, the normal end product. Secondary efflorescence arises where water penetrates the surfaces and dissolves soluble calcium salts in a basically patchy way. The main chemical reaction is the same as that in primary efflorescence, namely conversion of calcium hydroxide to calcite. Secondary efflorescence originates from reaction in solution, usually caused by rain or condensation, whereas primary efflorescence is caused by evaporation leaving behind the deposited salts.

Consolidation options

Nanotechnology applied to building materials represents an example of how innovation increasingly combines dematerialization, eco- efficiency and knowledge-based approach to develop new classes of products – often substitute of conventional technologies – with the aim of opening new market sectors based on the paradigm of the green high-tech.

Recent innovations in construction materials driven by nanotechnologies application are based on the design of material properties in order to obtain the required performances, developing sophisticated transformation processes that allow to realize custom-fit products for specific architectural applications. The development of "designable" materials and components marked the evolution of architectural languages, evolving from a "muscular" exhibition of technology (typical of the "high-tech" architecture of the past decades) to a widespread microinnovation not always visible to the naked eye. Historically, limestone objects, lime-based renders and wall paintings have been treated with solutions that resulted ultimately in the deposition of calcium carbonate. A saturated solution of calcium hydroxide in water (often referred to as 'limewater') was one of the earliest treatments for building

materials and was well documented in the classical literature by authors such as Vitruvius (c. 70-25 BC) [Vitruvius, 1970].

Calcium hydroxide readily reacts to form calcium carbonate when exposed to atmospheric carbon dioxide under moist conditions. The rate and extent of carbonation may vary, prompting attempts to hasten or supplement the transformation of the calcium hydroxide. For chalk consolidation, calcium hydroxide has been used, due to theie similarities of the lattice parameters, Table 2.

Table 2: Lattice parameters of calcite and calcium hydroxide [42, 14]

Mineral	a (Å)	b (Å)	c (Å)
Calcite	9.98	9.98	33.82
Calcium hydroxide	12.59	29.27	20.34

However, a humid environment and a higher and larger porosity of the stone favour the consolidation with time, being these conditions necessary to take into account when $Ca(OH)_2$ nanoparticles are used to consolidate carbonate stones [46].

First of all, we determined the relative kinetic stability for every type of nanomaterial. Despite the fact that calcium hydroxide has a bigger size (408.9 nm, determined by DLS), it has a good kinetic stability followed by hydroxyapatite with a very small size (30 nm) and its mixture with calcium hydroxide, Figures 8-10.
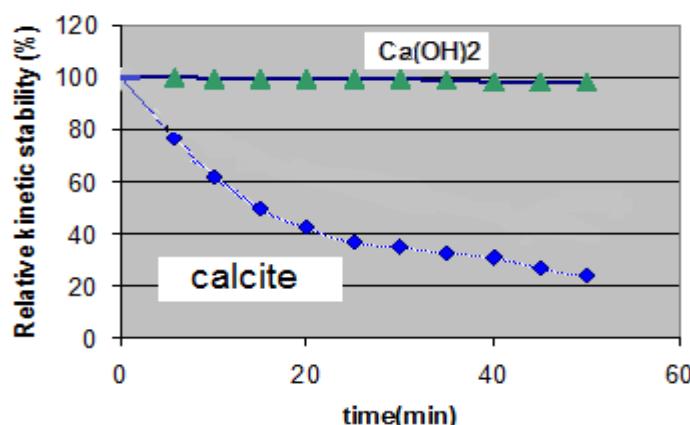
Figure 8. The relative kinetic stability of nanomaterials

Optical and Scanning electron microscopy research was performed to investigate microstructure characteristic of the specimens. Special attention was paid to the effectiveness of consolidation treatment observable namely in the pores and cracks. It is mostly the size of pore openings and the chemical/ mineralogical nature of the pore walls which are of relevance to the treatment by consolidant.

The nanoparticles of $Ca(OH)_2$ have been synthesized as previously reported [47, 48].
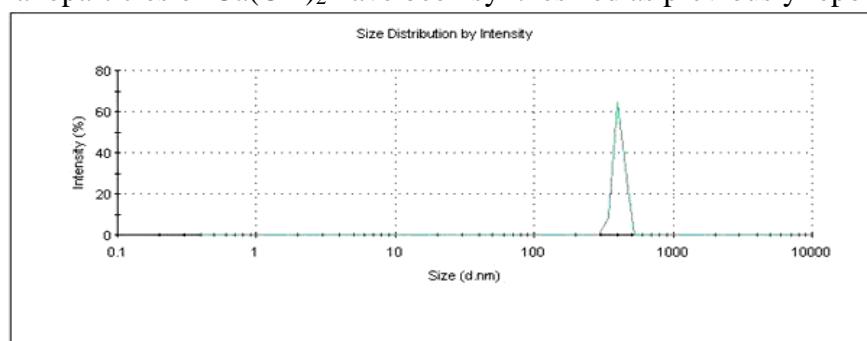
Figure 9. Size distribution for $Ca(OH)_2$ nanoparticles dispersed in 2-propanol

Besides detail structural features AFM can provide important information on surface forces (adhesion, friction, electrostatic, van der Waals, etc). By spraying on a cubic piece, less white deposits of $Ca(OH)_2$, although the same concentration and the same volume of suspension has been applied on the same type of stone. AFM revealed a rough surface architecture for HAp, the predominant size of grains being in the range of 90-100nm. The light part of the image can be the consequence of the presence of a thick part of sizing material, possibly to an aggregate form [49, 50]. For $Ca(OH)_2$ a higher magnified of 5000x has been used to provide a great depth field and to aid to morphological and topographical analysis of the sample, as in Figures 11.
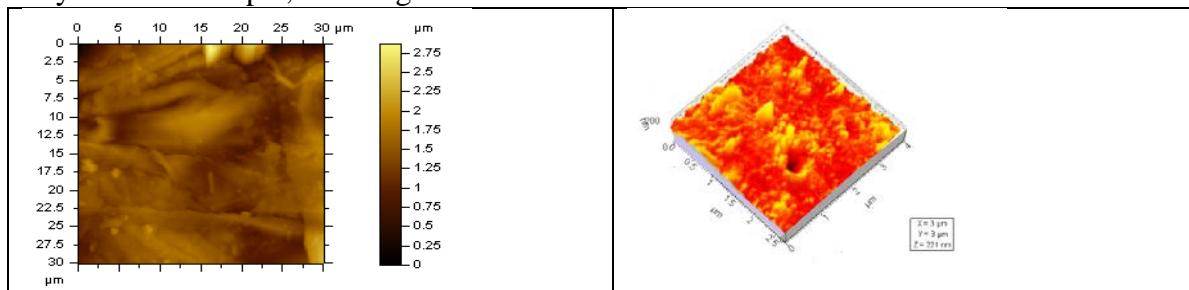
Figure 11. AFM image of Ca(OH)2 on surface obtained in contact mode (a), 3D AFM image of Ca(OH)2 on surface (b)

Three specimens of cube shape (4x4x4 cm3) of each type of substrate were used for measurement. Before testing, all samples were dried up to constant weight at 80 °C in a drying chamber for 24 hours. After the drying process the substrates were left to get cold for two hours in a dessicator and their aspect was measured, Figure   . Despite of its relatively low stability, $Ca(OH)_2$ is uniform layer, and induce a high white colour of the treated surface.
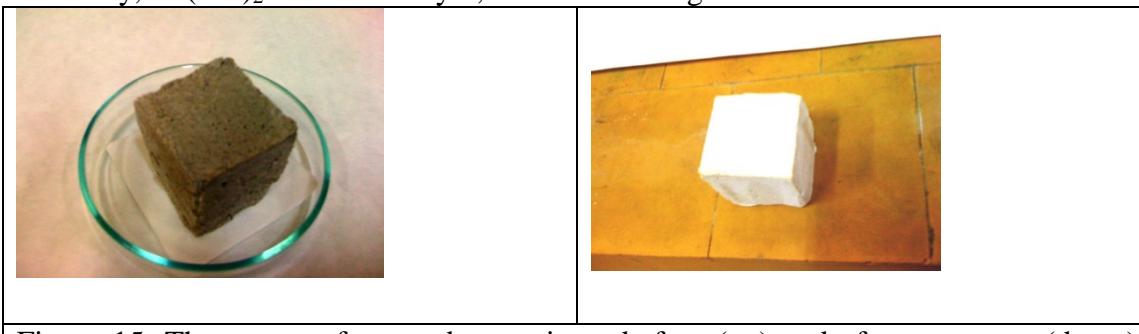
Figure 15. The aspect of one cube specimen before (up) and after treatment (down) with nanomaterial $Ca(OH)_2$

For the model-samples, the compressive strength determined with Silver-Schmidt Hammer, indicated that the most effective treated sample has a compressive strength of 40 MPa and is that treated with $Ca(OH)_2$. In the case of $Ca(OH)_2$, we have to take into acount the non-uniform thickness of the consolidant, due to the aggregation tendency of $Ca(OH)_2$. For chalk samples, the values are bigger, but the order is the same, most probably due to the inhomogeneity of the chalk strone. The drilling resistance measurement system is measuring the penetration force versus depth and can detect fluctuations in the drilling resistance with depth, attributed to non-homogeneities in the material (sedimentation layers, different grain size and resistance, micro and macro cracks). The results are shown in Table 3.

Table 3. Drilling resistance tests for the studied samples

Sample	Treatment	Drilling resistance Mean (N) (10 mm)	Compressive strength (Silver Schmidt) (MPa) (5 mm)
Model-sample	Not treated	6.2±1.73	11±4.0
	$Ca(OH)_2$	9.63±2.31	13.33±3
Chalk sample	Not treated	13.19±1.83	20±3.2
	$Ca(OH)_2$	6.18±2.52	40±2.3

For chalk samples, the treatment with $Ca(OH)_2$ do not cause any increase in cohesion, rather a decrease. In this case we should take into account the considerable moisture that characterizes the area, which lowered the average value of drilling resistance of this area. The capillary water uptake of the test blocks is decreased after the treatment with consolidants, concluding that the treatment makes the stone samples more compact and less permeable to water, Table 4. Low capillary action can protect the stone against erosion by water and soluble salts or bases [53]. The area treated with $Ca(OH)_2$ shows an absorption capacity similar to the untreated zone. A possible explanation of this behaviour is the inhomogeneity of the chalk.

Table 4. Water absorption tests for samples

Sample	Treatment	Water absorbed ($cc/cm^2 s$)
Sample model	Not treated	2.87±0.09
	$Ca(OH)_2$	2.53±0.08
Chalk sample	Not treated	2.22±0.10
	$Ca(OH)_2$	2.25±0.22

Conclusion

In this paper has been treated the structural, morphological and compositional aspects of chalk stone sample prelevated from Basarabi Chalk Church (Romania), for which a new method based on nanoparticles $Ca(OH)_2$:HAp has been tested.

A complex collection of petrographic (stereozoom microscopy) and analytical techniques ((Dynamic Light Scattering (DLS), Scanning electron microscopy (SEM), Atomic force microscopy (AFM), Energy-dispersed X-ray fluorescence (EDXRF), ion chromatography, thermal analysis, X-ray diffraction (XRD), relative kinetic stability parameter (ξ), have been used in order to identify the major constituents of chalk stone (metals, anions, type of calcium carbonate), the influence of environmental salts ($MgSO_4 \bullet 7H_2O$ and $MgSO_4 \bullet 6H_2O$, $Na_2SO_4 \bullet 10H_2O$ and Na_2SO_4) on this monuments, all these being useful for subsequently method of restoration. The mechanical parameter compressive strength either determined by DRMS, or by Silver Schmidt hammer, indicated us a resonable value for Ca(OH)2, most probably due to the aggregation tendency of $Ca(OH)_{2.,}$ the inhomogeneity of the chalk strone, and the humidity, determined here by cappilarity water uptake.

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METHODOLOGY FOR MEASURING TRAFFIC SIGNS RETROREFLECTION

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Abstract

Increase of traffic congestion and speed, as a result of the development of modern society require high-quality solutions in the field of traffic signalization. Modern traffic signalization needs to enable right decision making in order to secure a safe and optimal traffic flow. One of the key elements of traffic signalization is timely detection which, followed by reading and understanding its meaning, allows drivers to make proper response in accordance with the requirements of the situation. Quality solutions in the field of traffic signalization, especially traffic sings, can be achieved with relatively small investments through application of modern technologies and continuous inspection and maintenance. Important element of traffic signs maintenance is their retroreflectivity measurement. In order to ensure a satisfying level of retroreflection, continuous measurements in accordance with prescribed standards and technical requirements, should be carried out. The aim of this paper is to analyze the importance of traffic sings retroreflection measurement as a part of standard maintenance program in order to increase road safety.

Keywords: Traffic sings, retroreflection, traffic safety

Introduction

Roads must be equipped with adequate traffic signs that warn road users about potential danger and threats that are in users near distance, providing them with clear information's about limitations, prohibitions and obligations which must be respected. Sign information can be conveyed through the legend, which can be compromised of words, symbols, and arrows. Roadway users can also extract information from a sign's unique appearance as size, color, and shape are critical components.

In road traffic, the impact of direct information is of the greater importance than in other traffic modes due to the large number of participants, the intensity of traffic flows and participant's individual decision making in different situations, either as a driver of the vehicle or pedestrian.

It has been scientifically proven that with a use of modern technologies and proper implementation of traffic signs, a significant impact on the traffic flow of the entire network, enhancement of traffic safety and motivation of road users to cooperate can be achieved.

Quality of traffic signs is especially important in night and in conditions of difficult or poor visibility. In these conditions there is very little light available and overall visibility is decreased which directly impacts traffic safety and traffic flow.

In order to perform its task properly, traffic signs retroreflection and visual inspection should be performed at least once a year. For the measurement of retroreflection portable or mobile retroreflectometers are used. Portable retroreflectometers contains an internal light source and photoreceptors and relies on the method of substitution calibration.

This paper will analyze the importance of traffic sings retroreflection measurements and give guidelines for this type of measurements with the examples of measurements conducted in Croatia.

Definition and basics of traffic sings retroreflection

The only way an object on the road is visible at night is if it is artificially illuminated or if part of light that falls on the object is reflected back to the driver's eyes. The amount of light entering driver's eyes from a certain object will have a great impact on how bright that object appears to the driver. At night, light comes from sources such as streetlights or vehicle headlights. In areas without streetlights, the vehicle is the only possible light source. Because the light from a vehicle is generally aimed in a downward direction, little light is directed upward towards traffic signs. With so little light directed at them, traffic signs must be very efficient at returning light back to the vehicle and driver so they can be visible. This property of returning light back to the source is called retroreflectivity.

From all of the above, retroreflection can be defined as a phenomenon of light rays striking a surface and being redirected back to the source of light[10]. Principle of retroreflection in shown in Figure 1.
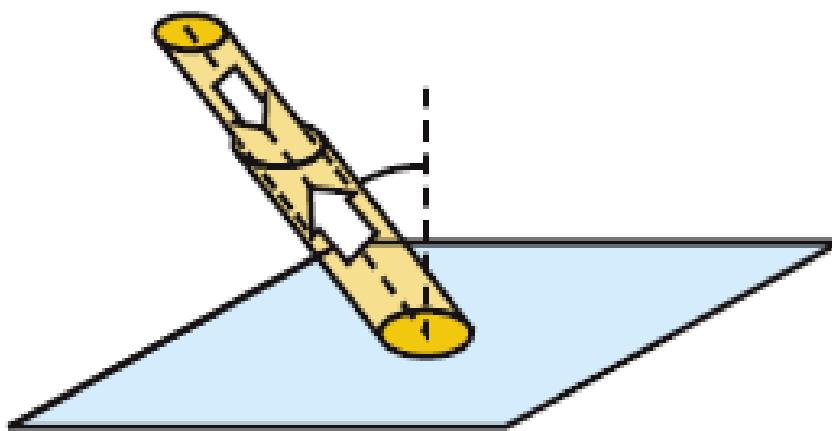
Figure 1. Principle of retroreflection
Source: http://www.roadvista.com/retroreflection/ (19.11.2013.)

Retroreflectivity of traffic signs is achieved by specially manufactured materials or sheeting's that are applied on the traffic signs face. Today, three types of retroreflective materials for traffic signs are used:

a)   Materials class I

Materials class I are retroreflective sheeting's made of a durable material with the bounded glass micro beads or prisms. Retroreflection of materials class I with glass micro beads is about 70 $cd \cdot lx^{-1} \cdot m^{-2}$ and because of its low retroreflection it is in most cases used in areas with low-speed and calmer traffic flow. Materials class I that have bounded micro prims have significantly higher retroreflection (around 200 $cd \cdot lx^{-1} \cdot m^{-2}$) than materials with glass micro beads.

b)   Materials class II

Materials class II are retroreflective sheeting's that contains encapsulated glass micro beads or prims that are three times brighter than materials class I. The signs made from materials class II are clearly visible, even from a wide viewing angle, and the lighted environment, effectively warning drivers of approaching danger on the roads. Retroreflection

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[10] http://www.roadvista.com/retroreflection/ (19.11.2013.)

of materials class II with glass micro beads is around 250 cd•lx^{-1}•m^{-2} and 500 cd•lx^{-1}•m^{-2} for materials with micro prisms.

c)   Materials class III

Materials class III are retroreflective sheeting's that are made of highly effective micro prisms that enables retroreflection around 700 cd•lx^{-1}•m^{-2}. Therefore, they provide the drivers with adequate visibility in all day and night and adverse weather conditions.

There are several types of reflective materials class III:

-      V.I.P. (Visual Impact Performance) - enables maximum efficiency over short distances and is ideal for signs in city traffic.

-      L.D.P. (Long Distance Performance) - developed specifically for the use on motorways and main roads and, therefore, the signs made from these materials are visible from greater distances.

-      Fluorescent - provides increased visibility during the day, not just at night, with a usage of fluorescent dye.

-      Diamond Grade Cubed - combines the best features of VIP and LDP so it can be used either in the city or on the highways.

Methodology of traffic signs retroreflection measurement

As mentioned before, traffic signs should be inspected at least once a year to verify their retroreflection properties and quality. For the measurement of retroreflection handheld or mobile (dynamic) retroreflectometers are used.

Mobile retroreflectometers for measuring traffic sign retroreflectivity is highly advanced and automated system which represents a new technology which is still in the testing phase. System is equipped with high sensitivity cameras installed onboard which measures the luminance[11]. The response curve of the cameras is equivalent to the human eye and allows luminance measurement consistency. Also, cameras are geometrically calibrated to measure distances and dimensions together with the multiple sensors onboard[12].

With a further development of mobile retroreflectometers could provide the following advantages[13]:

-      measurements could be made while driving down the highway and therefore no equipment would have to be in contact with the sign

-      measurements would be made at real roadway geometries rather than prescribed geometries that do not always represent the real world

-      twisted and leaning signs would be measured as seen from the roadway perspective and can be easily identified as needing routine maintenance

-      images of signs could be recorded at highways speeds, although post-processing the images would be needed, this would minimize the exposure and risk of the technicians

-      all signs can be measured, including overhead and difficult-to-reach shoulder mounted signs

-      using image analysis, the entire retroreflective area of the sign can be measured rather than a few 1-inch diameter areas.

Because the mobile system is still in the testing phase, for the measurements of traffic signs retroreflectivity, handheld retroreflectometers are used. There are several types of these instruments depending on manufacturer: Zehntner ZRS 6060, Delta RetroSign, Road Vista 922 etc.. These instruments, in the measuring process, are placed on the surface of the sign in

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[11] Luminance - the quantitative measure of brightness of a light source or an illuminated surface, equal to luminous flux per unit solid angle emitted per unit projected area of the source or surface

[12] Carlson, P.: Evaluation of sign retroreflectivity measurements from the advanced mobile asset collection (AMAC) system, Texas Transportation Institute, Texas 2011.

[13] Ibidem

order to exclude the impact of daylight and the measuring method is based on substitution calibration because of which they need to be regularly calibrated.

Instruments have a internal light source that corresponds to the standard source A according to CIE-in, and photoreceptor that have a spectral sensitivity that fits standard photo-optical observer according to CIE[14]. Geometry should be selected so that it corresponds to the values that are listed in national specifications which in the European specifications means observation angle of 0.33° and the entrance angle of 5° (Figure 2.).

Entrance angle is primarily determined by the position of the sign in the edge of the road and geometry of an oncoming vehicle and it is formed between a light beam that falling on the surface of the sign and the line that comes out vertically from the surface. Observation angle is the angle between the incoming light beam and reflected light beam and it is a function of the height of driver eye compared to the vehicle headlights. As it is assumed that most of the retroreflection materials reflects light directly back to the source, the optimal observation angle is zero. However, in reality it is not so considering that the driver's eye is higher than the vehicle headlights[15].
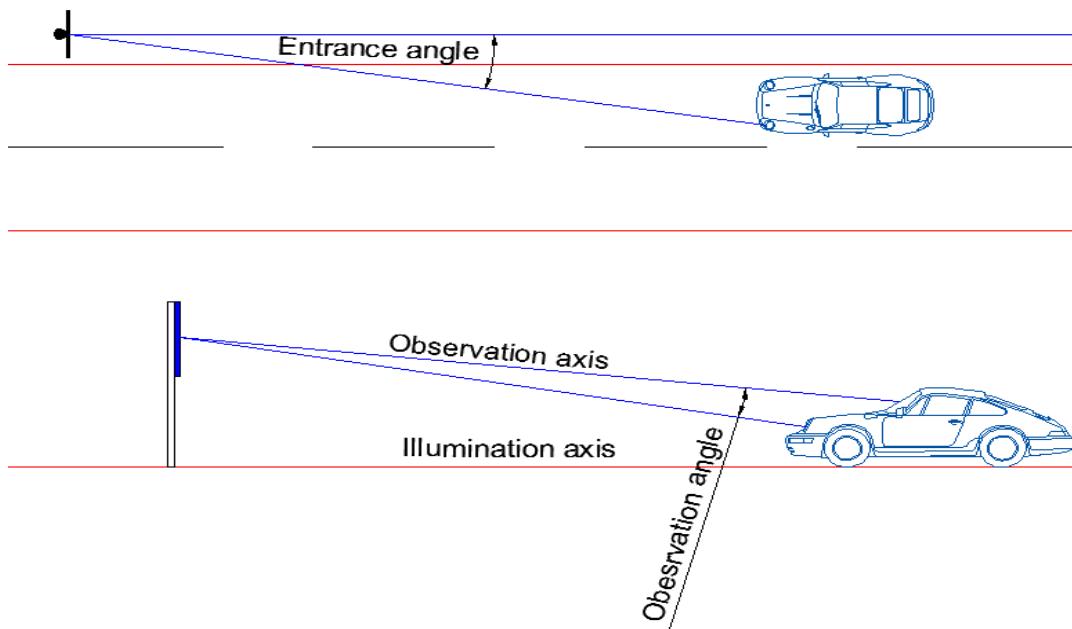
Figure 2. Entrance and observation angle for a traffic sign

Source: Ščukanec, A., Krleža, J., Vidović, T.: New software for testing the quality of road signs, Planning and development of sustainable transport system, Zagreb 2013., ISBN 978-953-243-064-6

Minimum initial coefficient of retroreflection R_A (cd•lx^{-1}•m^{-2}) of traffic signs measured in accordance with the procedure using CIE standard light source A, must match the values in Table 1., 2. and 3.

Table 1. The coefficient of retroreflection R_A: Class I units cd•lx^{-1}•m^{-2}

Geometry of measurement		Color							
α	$\beta 1$ (β_2=0)	white	yellow	red	green	blue	brown	orange	gray

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[14] CIE, Meintained Night-time Visibility of Retroreflectivity Road Signs, Brussel, 1995

[15] Ščukanec, A., Krleža, J., Vidović, T.: New software for testing the quality of road signs, Planning and development of sustainable transport system, Zagreb 2013., ISBN 978-953-243-064-6

α	β								
12′	+5°	70	50	14.5	9	4	1	25	42
	+30°	30	22	6	3.5	1.7	0.3	10	18
	+40°	10	7	2	1.5	0.5	#	2.2	6
20′	+5°	50	35	10	7	2	0.6	20	30
	+30°	24	16	4	3	1	0.2	8	14.4
	+40°	9	6	1.8	1.2	#	#	2.2	5.4
2′	+5°	5	3	1	0.5	#	#	1.2	3
	+30°	2.5	1.5	0.5	0.3	#	#	0.5	1.5
	+40°	1.5	1.0	0.5	0.2	#	#	#	0.9

\# Signifies "Value greater than zero but not meaningful or not applicable "
α = observation angle ; β = entrance angle

Source: EN 12899-1: Fixed, vertical road traffic signs - Part 1: Fixed signs, 2008.

Table 2. The coefficient of retroreflection R_A: Class II units cd•lx^{-1}•m^{-2}

Geometry of measurement		Color								
α	β1 (β$_2$=0)	white	yellow	red	green	dark green	blue	brown	orange	gray
12′	+5°	250	170	45	45	20	20	12	100	125
	+30°	150	100	25	25	15	11	8,5	60	75
	+40°	110	70	15	12	6	8	5,0	29	55
20′	+5°	180	120	25	21	14	14	8	65	90
	+30°	100	70	14	12	11	8	5	40	50
	+40°	95	60	13	11	5	7	3	20	47
2′	+5°	5	3	1	0,5	0,5	0,2	0,2	1,5	2,5
	+30°	2,5	1,5	0,4	0,3	0,3	#	#	1	1,2
	+40°	1,5	1,0	0,3	0,2	0,2	#	#	#	0,7

\# Signifies "Value greater than zero but not meaningful or not applicable "
α = observation angle ; β = entrance angle

Source: EN 12899-1: Fixed, vertical road traffic signs - Part 1: Fixed signs, 2008.

Table 3. The coefficient of retroreflection R_A: Class III units cd•lx^{-1}•m^{-2}

Geometry of measurement		Color					
α	β1 (β$_2$=0)	white	yellow	red	green	blue	orange
10′	+5°	850	550	170	85	55	260
	+20°	600	390	120	60	40	130
	+30°	425	275	85	40	28	95
20′	+5°	625	400	125	60	40	140
	+20°	450	290	90	45	30	100
	+30°	325	210	65	30	20	70

33´	+5°	425	275	85	40	28	95
	+20°	300	195	60	30	20	65
	+30°	225	145	45	20	15	49

Signifies "Value greater than zero but not meaningful or not applicable "
α = observation angle ; β = entrance angle

Source: EN 12899-1: Fixed, vertical road traffic signs - Part 1: Fixed signs, 2008.

Current practices of traffic signs retroreflection measurement and maintanance in Croatia

In the Croatia, traffic signs retroreflection measurements are conducted by the Department for Traffic Signalization at the Faculty of Transport and Traffic Sciences for more than ten years. In the capital city of Croatia, Zagreb, traffic signs were measured on all newly constructed roads in the least ten years for clients like Zagreb Roads d.o.o., Viadukt d.d., Hidroelektra d.o.o., etc. Measuring retroreflection of road signs have been carried out also on state roads for Croatian Roads d.o.o. and on some county roads for County Roads Administration[16].

Measurements are conducted using handheld retroreflectometer Zehntner ZRS 6060 in accordance with the European and National standards and specifications. When measuring retroreflection each sign is measured four times: up, down, left and right. The relevant value of retroreflection represents the average values of all four measurements. Except the retroreflection value, several other elements are analysed:
- sign name and code
- graphic display (sign picture)
- dimension and height and distance from the edge of sign
- colours of surface, edge and symbols
- way the sign is implemented and fixed
- information about the producer of sign
- retroreflective material etc.

For the maintenance purposes, Department for Traffic Signalization, have developed online based software "Retrorefleksija" which consists of two fields: road markings and traffic signs.

Field traffic signs allows clients easy and quick overview of retroreflection measurements conducted by the Department. Data access is possible with the user name and password that is assigned to the authorized personnel involved in the process of traffic sign maintenance. The aim of the software is to provide a data base of traffic signs on particular road and clearer overview of measured values.

Data base provides personnel's involved in the sings maintenance with the inside view into the state of traffic signs on specific road enabling them to optimize whole maintenance process which as a result should have increase of road safety and decrease of maintenance costs. Optimization is achieved by prioritization of maintenance, optimization of replacement of existing sings, reviewing "black spots" or critical places on the road and by enabling the authorities to create a long and short term maintenance plan.

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[16] Shcukanec, A., Krleza, J., Vidovic, T.: New software for testing the quality of road signs, Planning and development of sustainable transport system, Zagreb 2013., ISBN 978-953-243-064-6

Figure 3. Data base of traffic signs in software ''Retrorefleksija''
Source: http://ispitivanja.fpz.hr/#!sign-measurement:526f7786e4b0371ab15a7352
(26.11.2013.)
Figure 3. shows a date base of traffic signs on one road in software ''Retrorefleksija''.

Data base includes all sings on road, their retroreflection and technical characteristics, time of the measurement, temperature and humidity, digital map with correct location of the signs etc.. Also, data base provides a picture of the sign when particular sign is chosen for a detailed view as shown on figure 4.

Figure 4. Detailed view of chosen traffic sign
Source: http://ispitivanja.fpz.hr/#!sign-measurement:526f7786e4b0371ab15a7352
(26.11.2013.)

Conclusion

Traffic experts interpreted road accidents as a result of the constant increase in the number of vehicles, a high percentage of defective vehicles in traffic, insufficient traffic culture of road users, lack of road adaptability to the requirements of the modern traffic, inadequate traffic signs and signalization, etc.. Modern road traffic demands safe movement of users under normal circumstances and especially at night and/or in circumstances of reduced visibility. One way to ensure safer road traffic is with implementation of modern and innovative technologies for traffic signalization. Quality solutions in the field of traffic signalization, especially traffic sings, can be achieved with relatively small investments and continuous maintenance.

Traffic signs should be inspected at least once a year to verify their retroreflection properties and quality. For the measurement of retroreflection handheld or mobile (dynamic) retroreflectometers are used. Although mobile retroreflectometers, in theory, have several advantages over handheld due to the lack of practical use and tests handheld retroreflectometers are commonly used in traffic sings retroreflection measurements.

In the Croatia, traffic signs retroreflection measurements are conducted by the Department for Traffic Signalization at the Faculty of Transport and Traffic Sciences for more than ten years. Methodology of measurement is based on the European and National standards and specifications. When measuring retroreflection, each sign is measured four times (up, down, left and right) and the relevant value represents the average values of all four measurements.

To achieve quality level of maintenance, except the retroreflection value, several other elements must be analysed so the data base of traffic signs on a specific road can be created.   Data base provides personnel's involved in the sings maintenance with the inside view into the state of traffic signs on specific road enabling them to optimize whole maintenance process which as a result should have increase of road safety and decrease of maintenance costs.

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THE P-Δ-DUCTILITY EFFECT : OVERVIEW THE EFFECT OF THE SECOND ORDER IN THE DUCTIL STRUCTURES

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Abstract

Building behavior is a function of a number of factors and their interactions versus external action chosen by us. This discussion rises above the geometry of the structure, its hardness and their connections functions. The main parameters of the connections functions are loads and the calculation stage. With loads we mean static and dynamic ones, while the calculation stage I refer to the phase behavior of the material and structure, the elastic stage or post elastic stage , without deformed or deformed elements. Each stage is realized or lets say , approximate in calculations methods and modifying some standard procedures. In this discussion we will address in a concise way , two key factors in the design of structures, which are second order effects (P-Δ) and the ductility of structures. Both factors have emerged as a necessity of approximating real complex behavior in a calculation methodology. Will hope to better understand the interaction of these two design factors, studying different methodology and approach to the problem by comparing the design requirements. What we stand for discussions , is to increase the accuracy of structural analysis for structures at the design stage of internal forces. It is known that a nonlinear analysis is more accurate than a linear analysis, but on the other hand is an inefficient analysis in terms of time consuming with calculations and computer memory. The solution in our case would require a small memory and fast time.

Keywords : p-δelta , ductility , linearity , nonlinearity , geometric stiffnes

Introduction

In short, we give the two concepts mentioned above, on which the following material will be discussed. Because of their complexity and treatments in different fields, as we can mention: the Stability of structures, Building constructions, Dynamics of structures, Building materials etc. We do not undertake, within this material that could provide treatment to solving every problem, but will concentrate on the design aspect of structures.

P-δ effect

P-Δ effect in structure mainly arises from the direct action of lateral forces and expiry the structure in a state of equilibrium where the deformed structure shape is a more determining factor. This kind of effect is made in the analysis of second order, where the geometry of the elements is come from their warped condition. Gravitational loads (especially in high buildings, they reach a very high order of their values) on their way through the construction elements, where this one are deformed they produce additional forces, which are not taken into account during calculations of structures in undeformed shape. The given gravitational loads are the loads , more precisely defined, in the group of action forces in a structure, we can not say that their change from project values ,will be the determining factor in the effect of P-Δ, but in defining order remains the geometry of the

structure. More precise the geometry is defined as the correct second order effects could be considered in structures.

Ductility

Ductility is one of the excellent properties of composite materials reinforced concrete (but not only) and is one of the properties which is paid more attention during design . In short , ductility will be defined as the ability of concrete and steel material (after a correct design) to give an element with excellent featured in post- elastic performance , becoming a better energy absorer . Ductil design refer mainly seismic loads as cyclic loads . The realization of an element managing ductility would bring , by the use of plastic properties of iron materials , mainly to achieve the same element performace . This also applies to a complex structure. When we manage to realize a shape with ductil elements and hierarchy formation of plastic hinges , the same performance of the structure will be realized as a non ductil design. The whole essence of the design is the replacement of elastic forces with elasto - plastic forces to get the same performance , simply by exploiting structure elasto - plastic properties of the elements .

Conclusion

"A structure included in linear elastic stage would have the same performance with a structure included in inelasto-plastic bilinear stage , reducing the force acting but at the same time we consider plastic deformation.

In practical design ductility is estimated by the coefficients of ductility , determined by the specifications of different codes. This topic is not part of this discussion. Despite different methods and empirical formulas, ductility values will be used to reduce the elastic spectra into the elasto-plastic spectra (with other words reducing the value of the aplaied forces). For programs SAP2000, ETABS etc. ductility have been incorporated in the analysis by the response spectra 'RESPONSE SPECTRUM', or static analysis of seismic loading cases 'CASE QUAKE'. Implementing automatically the reduced spectrum.

Deformed geometry of the structure, which is calculated from these programs must be modified to the value of the structure ductility. In order to simplify we say that if we have the reduced spectrum with value q (indirectly have reduced operating forces), deformation from linear analysis , should multiply the q value. Naturally, the above conclusion is valid for systems with one degree of freedom, but for systems with multi degree of freedom, deformations are product of a number of factors and the distribution of the ductility throught the height of structure , so that deformation it would not be a real product of elastic deformation with a single factor ductility. In the elastic phase deformations are proportional to the force, which means that if we reduce deformation forces will be reduced to the same extent and vice versa, but in elasto-plastic phase , it does not apply , even you can not apply the principle of superposition .

To realize a non-linear analysis in elastik phase taking into account the P-Δ effect and the lateral loads, a far more efficient way to reduce computer memory , is a combination of a linear elastic analysis of lateral forces with the rigidity matrix of a nonlinear elastic analysis with P-Δ effect of gravitational forces. Thereby we reduce the use of computer time and taking the same result, also nonlinear analysis P-Δ of gravitational forces can also be used in combination with other analysis. Completion of the above derived by the principle of superposition and independence of action forces. This principle is not valid for the plastic phase because is not maintained the proportion of force-deformation and also can not be determined accurately the impact of various factors action for accepted deformations.

Discussion

"in designing structures of every significance or every type, engineering and science of engineering intends to use more accurate calculations methods with maximum efficiency in time and material. Everything in function of better recognition of real structure deformation and the inner actions. Linear static and dynamic linear analysis offer efficiency in time but no efficiency in precision. Therefore any usage of nonlinear analysis increases accuracy. We ask : how to increase the accuracy by acting with to paralel analysis, one linear and another nonlinear. Specificially how to correct the actions in function of ductility.

Elastic systems.basics principles of mechanics
The principle of superposition

According to the principles of mechanics of deformable bodies in their elastic phase, can apply the principle of superpositing the different actions. Basically, about our task we can say that a structure under the action of lateral and vertical forces, has the same behavior with a structure in which initially applied horizontal forces 'H' and in the deformed shape of this structure we apply the vertical forces 'P'. The figure below presents the deformation shape to the different calculation phases.
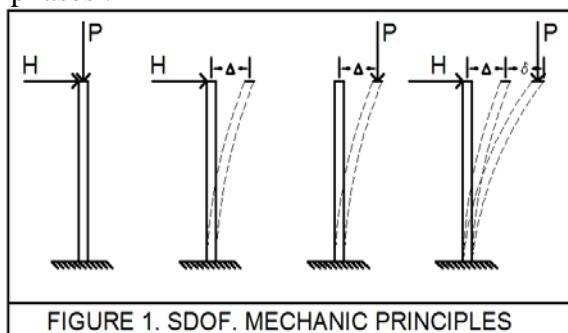
FIGURE 1. SDOF. MECHANIC PRINCIPLES

By applying the finite elements method, this structure can also be addressed vice versa. Engineering programs offers in their application, different accounting options, which of them is P-Δ effect. Referring SAP2000, P-Δ nonlinear analysis of the above shape is equivalent to a linear analysis of lateral forces 'H' structure applied in the above figure, which would have a stiffness equal to the stiffness of the structure that is result from the application of P-Δ effect in nonlinear analysis with vertical loads 'P'. By that, what we take advantage of this procedure is the use of the rigidity of the structure taking into account the effect of the second order, the geometric nonlinearity of the structure, in every analysis that we want, any kind of force which would cause us to lateral displacements of structures.
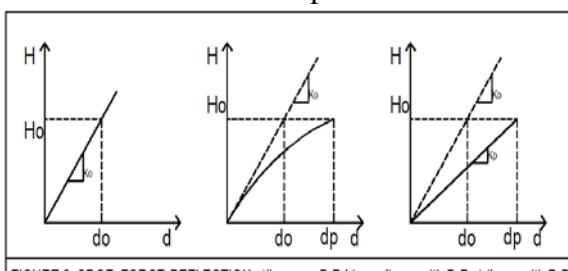
FIGURE 2. SDOF. FORCE-DEFLECTION a)linear no P-D b) non linear with P-D c) linear with P-D

Based on the Finite Element Method for the three cases above, we would have:

a) $\quad \{F\} = [K_0]\{U\}$

b) $\quad \{F\} = \{[K_0] + [K_P]\}\{U\}$

c) $\quad \{F\} = [K_{\text{P}-\Delta}]\{U\}$

With the index 'o' we have symbolized, in which case the influence of axial loads on the hardness of the element is zero. With the index 'p' elements have marked rigidity under the influence of axial force. With the index 'P-Δ' the total rigidity of the structure taking into

account as lateral loads and normal loads, the axial one. By applying the principle of superpozimit easily get that:

$$[K_0] + [K_P] = [K_{\text{P}-\Delta}]$$

Phase of elastic behavior of the element, and the material does not have any doubt at this point, but the problem that exists is the fact that: Superposition principle is not valid in the plastic phase behavior of the structure or material; most important lateral forces are directly linked to the rigidity of the structure obtained by the analysis. In both design trend above , factors must not be neglected.

Linearization of the problem

Effects of the second orders have always been under study construction shapes, for all kinds of analysis of any structural system type. Analyzes of buildings (mainly buildings and flexible structures against lateral loads) lateral displacement of a mass in a deformed position generates an supplementary moment. Since this additional momentum in the building is equal to the weight of the floor 'P' multiplied by the displacement of the floor 'Δ', this second order behavior (which calculates the balance of deformed shape) was baptized as *'P-Δ ' effect*. Many techniques have been proposed for assessing the behavior of secondary effects. Rutenberg proposes a simple way to include this effect in calculations. Almost most methods consider the problem as a geometric non linearity and propose techniques for solving the successive approximations (iterative method), which essentially remain inefficient in time. Also, these analysis are not suitable for dynamic analysis where we consider axial forces in lateral rigidity of the structure , it increases the natural period of free vibrations. With Rutenbergut proposal, the problem could be linearized and the results can be obtained directly and accurately without the need of successive iterations. This method is based on two assumptions.

- The weight of the structure remains constant during the deformation process due to lateral forces.
- The total displacement of the structure is received in a smaller amount compared with the structural dimensions.

This method does not require repetition of actions (successive approximation technique) while the total axial force at a floor level is equal to the weight of the building above the level of the floor and that does not change through the action of lateral force. Therefore all terms associated with geometric rigidity against lateral forces are not taken into account but only those axial forces under the action of the weight of the structure involved in the drafting of the rigidity of the building. With this method effect 'P-Δ' implemented basic analytical formulation, and is therefore included in both tests, static and dynamic.

$$[K]\{U\} = [F] + [L]\{U\}$$
$$[K]\{U\} - [L]\{U\} = [F]$$
$$([K] - [L])\{U\} = [K]^*\{U\} = [F]$$
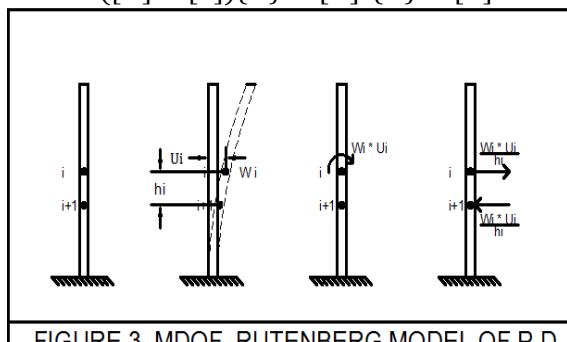
FIGURE 3. MDOF. RUTENBERG MODEL OF P-D

$$\begin{Bmatrix} f_i \\ f_{i+1} \end{Bmatrix} = \frac{w_i}{h_i} \begin{bmatrix} 1 & -1 \\ -1 & 1 \end{bmatrix} \begin{Bmatrix} u_i \\ u_{i+1} \end{Bmatrix}$$

{F}- lateral forces ; [L]- factor matrixes 'Wi/hi' of th P-Δ momentums ; [K]* - linear matrix of the system including P-Δ. [K]- linear matrix of the system excluding P-Δ ; {U}-lateral displacements.

The above method of linearization of the problem is in its essence exactly the method we mentioned to entry, for implementation in the application of SAP2000. Nonlinear analysis of the second order effect for temporary usage loads and permanent ones, in buildings takes a constant value, and does not take into account the effect of lateral forces changing the vertical forces (axial forces) in the elements of the structure. While linear analysis of lateral loads with the stiffness matrix, the matrix obtained from nonlinear analysis above, principally linearize the problem of second-order effect.

What mentioned above regarding the effect of axial forces of columns can be illustrated with a very simple example of a portal frame. By portal frame analysis described above assumed as a system with a single degree of freedom , which happens to overthrowing the moment balanced by lateral forces ' H ' , will produce a pair of forces in structure side columns. In one of the columns is a pulling force and as a result the column will be less loaded , while the right column arises wherein compresive forces , the element will be overloaded. The rigel of the frame is taken absolutely rigid only reason to study the case with a single degree of freedom (rotation is not taken into account for its small values of displacement compared with translative) while we do not influence at all in the concept of the problem , because an elastic Rigel will only cause the redistribution of the moments in other elements of the structure.
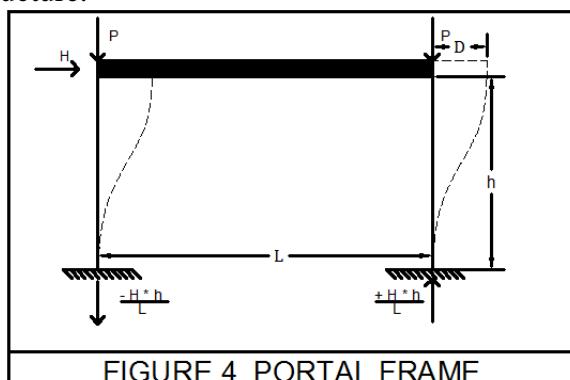
FIGURE 4. PORTAL FRAME

This distribution of the moment to the beam and vice versa will retain the same proportion , whether this moment will arise from the lateral loads or it comes from the P - Δ effect. Any internal force that arises in the structure arises as a backlash of external action, with the same size regardless of what would be the nature of this action.

If at first sight this shape will not boost interest to an engineer to study the effect of the second order, then I'm reminisce previously, that this portal frame is a small element of a multi-floor structure which under the action of earthquake or other lateral actions, would really be under adverse conditions of these effects, both as an localized element or the entire structure. Following expressions enhance us this idea:

$$H_i = k * m * S_a$$

$$V_i = \sum_{top\ story}^{level\ index\ story} H_i$$

For earthquake lateral forces above formulas are valid, and for vertical forces, the own weight of the structure will be able to write:

$$P = \sum_{top\ story}^{level\ index\ story} P_i$$

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Given that the law of progression of axial forces (from own and temporary weight of usage) is almost linear, while for lateral forces (seismic action calculated with simple methods) is roughly triangular, so the ratio Vi / Pi will come increasing for the lower floors, favoring severe second effects due to increased progressive lateral displacement.

Bilinearization of the problem

Ongoing treatment of the system with a single degree of freedom and the concept of the formulas given above on the impact of the P-Δ effect in a given structure, the following are some basic concepts on the treatment of the second order effects of which will require us in following discusions. With the concept of bilinearization , we just do enter the first step of non linearization the problem.

Some of the basic mechanical parameters associated with P-Δ effects are illustrated in the figure below for a structure with a single degree of freedom. This consists of a mass, m, with a weight P, associated with a rigid column with a flexible connection to the base. To include viscous dumping we have connected a dumper. Rigidity associated with lateral displacement of the mass, under the action of lateral forces V, is Ko and it does not take into account P-Δ effect. With this model, the overturnig moment M, which act in the elastic connection , is given with the following expression:

$$M = Vh + P\delta$$
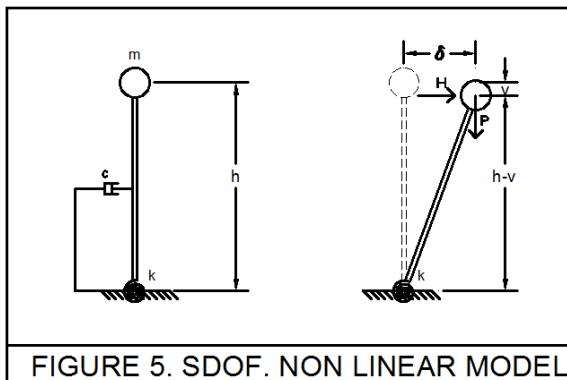
FIGURE 5. SDOF. NON LINEAR MODEL

With h is marked the height of the column, and with δ is marked the horizontal displacement of the mass. The second term of the formula expresses , additional moment induced by the P-Δelta effect. A parameter that is used more to evaluate the sensitivity of the structure of P-Δelta effect, is the stability factor, θ. The numerical value of which is defined as the ratio of the induced current overturning moment from the effect of axial load P, with the value corresponding to the moment of the lateral seismic loads. The coefficient is a result of receiving linear elastic behavior of the structure. For a model with a single degree of freedom, the stability factor is calculated :

$$\theta = \frac{P\delta}{Vh} = \frac{P}{K_o h}$$

The influence of P-Δ effect, in a system with a single degree of freedom, with a bilinear histeretic behavior is illustrated in Figure 6, for the case of a monotonous increase of displacement. Omitting P-Δ effect, a horizontal force Vy limit is reached for the yielding , and yielding plastic phase have a small increase of resistance with the rigidity of the structure , αsr Ko. Considering the effect of axial load P, effective rigidity against lateral forces is Ko (1-θ) for elastic deformation stage, and Ko (α-θ) for post-elastic deformation stage. The lined area between the force-displacement graph without P-Δ effect, and the P-Δ effect gives the work done by the axial force for reduction in height.

A consequence of reducing the rigidity effected from the inclusive of P-Δ effect in an analysis, is that the normal period of free oscillation increases from T to T` by the following expression:

$$T' = T \frac{1}{\sqrt{1 - \theta}}$$
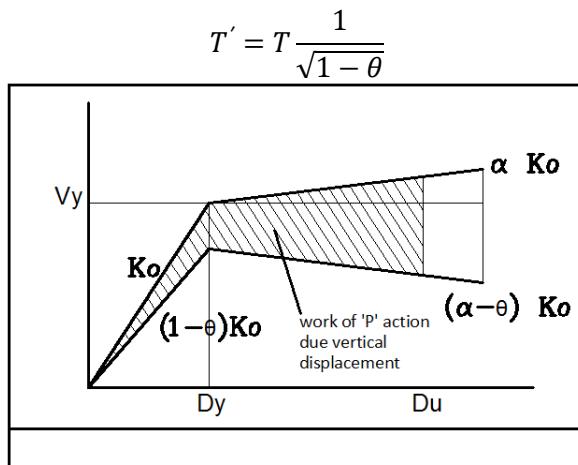
For the possible values of the coefficient of stability that extends from 0 to 0.2 increase in the period of free vibrations is not very significant in terms of design. However, in view of the study of P-Δ effect has a significant impact. Comparisons are made between the behavior of response spectrum, and as well as land tremblings are invariabel in nature , a small change in period, brings itself to be a difference between the two analysis evaluated.

Reducing rigidity of a structure in inelastic phase, during inclusion of P-Δelta effect means that for every structure in the inelastic behavior will have a tendency to increase the deformation. To offset the effect of P-Δ can be used two estimates:

❖   Increasing the rigidity of the structure. In this way, we manage to reduce the deformation and at the same time the impact of P-Δelta effect. However, it is generally not practical and economical to increase the rigidity of the structure in an amount necessary to eliminate , as taking into account the second order effects. Also the increase of rigidity associated with increased seismic actions, since it would be reduced self period of the structure.

❖   Increasing resistance of the structure. The effect of increasing the resistance brings reducing the 'P-Δ' effect, as a result of the reduction of deformations by reducing plastic deformation. The downside of such a solution reduces plastic deformation in the structure.

The result of P-Δ effect, in a bilinear system can be estimated by the following two factors:

1.   The first factor is known as the amplification factor α, which is the ratio of the yielding resistance of the structure including P-Δelta effect with the yielding resistance without P-Δelta effect for the same level of ductility. M' is required yielding resistance for given ductility, taking into account the effect of the second order, while M is yielding resistance for the same ductility without the effect of the second order.

$$M' = \alpha\, M$$

2.   The second factor is the amplification factor of P-Δ, β, which takes into account plastic deformation from the ductil behaviour and P-Δ. δ_{max} are the maximum displacements calculated for a given ductility without considering P-Δ action.

$$M' = M + \beta(P\, \delta_{max})$$

Multi story buildings

A number of questions can be raised about the application of the above method for pervious systems with a single degree of freedom, in multistory structures. One of them is : which of the deformed shapes should be used to calculate the P-Δelta effect. In systems with a single degree of freedom , the model was built for a bilinear behavior had to do with a deformed form, where all elastic deformation occurred at the base.

However, as long as there will be multi degree of freedom systems, consequently will have some shapes of deformations, and consequently that the deformed structure

behavior will be a function of the warped shape itself. A number of analysis have shown that the deformed shape according to the response spectrum analysis provides a reasonable basis for calculations of P-Δ effect. This envelope with a small deviation to the first mode of the structure. Multiplying the top of the structure deformation of the response spectrum analysis with the ductility factor of the structure, is proven to provide a reasonable estimate of the deformation of this point. But the use of the same scale ductility to the lower levels could lead to huge underestimation of the deformations, compared with a nonlinear dynamic analysis 'Time-History'. Discrepancy increases with ductility factor and basic period of structure.

From the results of the seismic analysis performed by the response spectrum , for determining the displacement of the structure, drifts between floors and demanded ductility , the conclusion drawn exactly what noted above. Let us take an example from the book of A. Chopra, Dynamic of Structures, Theory and Aplications to Earthquake Engineering. If we had:

$$\Delta_{im} = u_i$$
$$\Delta_{iy} = \frac{V_{iy}}{k_i} = y_i$$
$$\mu_i = \frac{u_i}{y_i}$$

Δ_{im} – magnitude of the drifts to the structure , Δ_{iy} – corresponding drift in the early yielding phase , V_{iy} – shear forces corresponding with the early yielding of the elements , k_i strength of i-th floor , μ_i – demanded ductility in i-th floor. By applying the above formulas in a specific example will receive the following graphs.
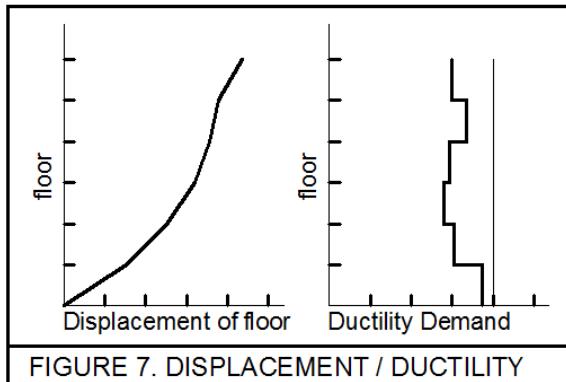
FIGURE 7. DISPLACEMENT / DUCTILITY

The demanded ductility in a floor varies in its height of the structure and the demanded ductility differs from the definition used in the design of spectrum and its calculation from the yielding resistance phase of the structure. The above shape in which the demanded ductility do not exceed the allowed ductility not always happen. The demanded ductility , in most cases depends on the relative stiffness of different floors. To demonstrate this concept, let refer to structures with "soft story", which can be floors with smaller stiffness compared to the upper floors, or floor with yielding to less than the floors above.

FIGURE 8. "SOFT STORY" BEHAVIOUR
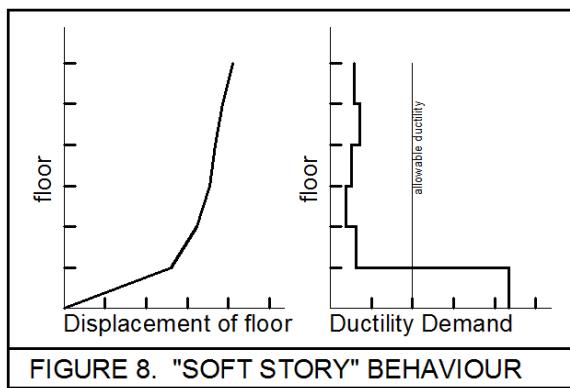
What is important to note from these results is the fact that the structural deformations computed as the product of the displacement obtained by the response spectrum analysis (with the designed spectrum corrected with the allowed ductility) multiplied by allowed ductility does not give us the correct results, for the reason that each floor featuring a certain ductility, and in many cases it's demanded ductility passes the allowed ductility (which means that the structure will colapse because the internal forces do not correspond with the designed forces and exceeds the required performance). Deformation of such involved shape would not be available for further calculations of the second order effect.

Another fact that matters mentioning at this point is the concept of "soft story". As mentioned there are two cases: 1 - floor stiffness lower than the other floors above, 2 – the resistance is lower than the other floors above. Only referring figure 6. we reach the conclusion that axial forces simultaneously reduce stiffness and the yielding resistance of the element and consequently the total floor. Respectively values: $K_{(P)} = K_o(1-\theta)$; $V_{y(P)} = V_y (\Delta_y \theta)$. It seems that the presence of normal force, if there is considerable value then we would have a substantial effect, that a floor of a building is called a "soft story". According bilinear model, evaluation factor, is the coefficient of stability θ, which depends directly on the size of the vertical force and lateral displacement, both these two in a symbiotic relationship with seismic analysis

Modeling
Application sap2000. P-δ effect in different multi story structures. P-δelta nonlinear analysis. "quake" linear analysis.

Below we give the geometric rigidity matrix element which takes into account the influence of axial forces in one element.

$$K_{P-D} = K_0 + K_\sigma$$

$$K_0 = \begin{bmatrix} \frac{EA}{L} & 0 & 0 & -\frac{EA}{L} & 0 & 0 \\ 0 & \frac{12EI}{L^3} & \frac{6EI}{L^2} & 0 & -\frac{12EI}{L^3} & \frac{6EI}{L^2} \\ 0 & \frac{6EI}{L^2} & \frac{4EI}{L} & 0 & -\frac{6EI}{L^2} & \frac{2EI}{L} \\ -\frac{EA}{L} & 0 & 0 & \frac{EA}{L} & 0 & 0 \\ 0 & -\frac{12EI}{L^3} & -\frac{6EI}{L^2} & 0 & \frac{12EI}{L^3} & -\frac{6EI}{L^2} \\ 0 & \frac{6EI}{L^2} & \frac{2EI}{L} & 0 & -\frac{6EI}{L^2} & \frac{4EI}{L} \end{bmatrix}$$

$$K_\sigma = -\frac{P}{L}\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{5}{6} & -\frac{L}{10} & 0 & -\frac{5}{6} & -\frac{L}{10} \\ 0 & -\frac{L}{10} & \frac{2L^2}{15} & 0 & \frac{L}{10} & \frac{L^2}{30} \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{5}{6} & \frac{L}{10} & 0 & \frac{5}{6} & \frac{L}{10} \\ 0 & -\frac{L}{10} & \frac{L^2}{30} & 0 & \frac{L}{10} & \frac{2L^2}{15} \end{bmatrix}$$

Rigidity matrices presented above can be applied in FEM (finite element method). Below we give an application in SAP2000 for comparing methods outlined above for seismic calculations considering the effect of the second order.

Geometric property

The model is a ten story planar frame with three spaces. The floor height is 3 m while spaces are 6 m. It is assumed that the same space includes other direction (for the distribution

of load in the beam). Beams are accepted size 40x50 cm and are not updated in different variants. The columns vary for each variant of experiment in a close diapozon of their rigidity characteristic , however, differences in behavior are evident.
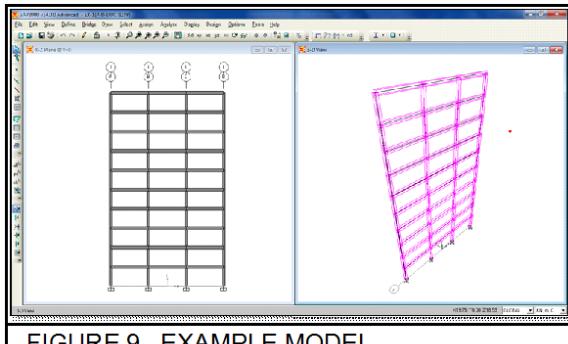
FIGURE 9. EXAMPLE MODEL

Loads
i.   Permanent loads and temporary loads, included in the first group of building load from which we take the vertical loads and the mass of the structure, which will serve in seismic calculation.
ii.   Earthquake load type 'quake' will serve as a generator of earthquake lateral forces which will used in the analysis. These values are accepted :

$g^n = 7$ kN/m^2 ; $p^n = 7$ kN/ m^2

The conversion factor of vertical load to mass is , 1 for dead loads and for live loads 0.8. The earthquake loads is received from design spectra according to EC-8 2004 with peak ground acceleration equal to ag = 0.22 and ductility factors q = 1 and q = 4. P-Δ effect can be taken with a direct nonlinear analysis taking into account P-Δ effect from vertical load , and the use of the stiffness in the earthquake analysis. Results from eartquake loadings , type "quake" will be obtained from two vertical load combinations with the horizontal , in two cases. Case A with a ductility factor q = 1 (we supose to take real deformation of the structure) and Case B coresponding ductility factor, q = 4 (we supose to take real internal forces in elements).

columns	50X50	55X55	60X60	40x70	65X65	40X70	40X80	70X70
M'	197.21	224.07	255.13	259.39	289.78	259.39	305.22	328.90
M''	186.72	216.25	249.28	254.22	286.18	254.22	302.71	327.13
ΔM %	5.32	3.49	2.29	1.99	1.24	1.99	0.82	0.53

The example above shows a comparison of internal forces arising in structure between the results obtained from the calculation of P-Δ effect, as production of axial force in the column with the displacement obtained by linear static seismic analysis "Quake" without changing the rigidity M'=M + P * $\Delta_{q=1}$, and linear static seismic analysis "Quake" with reduced stiffness structure for P-Δ effect, M". For hand calculations the P-Δ effect (M '), deformations are not accepted as deformations of the structure multiplied by ductility of the structure, since the paragraph just above it this acceptance was not correctly accurate, but we get it by linear analysis without reducing the design spectrum. The principle used is the principle of equalization of spectral displacements , where spectral displacements in elasto-plastic phase are equal to the elastic phase shifts spektarle.

Application sap2000. Nonlinear analysis type quake. Linear analysis type quake

From the results of the above example we take as substantiated: - for more accurate estimates need that column stiffness must be greater than the stiffness of the beams, thereby redistributing the second order moment M = PxΔ, within beam will be smaller, while within columns will be grater.

The second example application will be based on the example above with some minor modifications:

- Geometric properties have been saved , beam 40x50 cm , column 70x70 cm.
- Structural loads are increased, to increase vertical forces and their effect on structure.
- Applied analysis :

a. PDELTA K=1 (scale factor = 1) type Nonlinear Static

b. PDELTA K=4 (scale factor = 4)
type Nonlinear Static

c. QUAKE
type Linear Static

d. QUAKE PD
type Nonlinear Static

e. QUAKE K-PD1
type Linear Static
start from PDELTA K=1

f. QUAKE K-PD4
type Linear Static
start from PDELTA K=4

The purpose of this analysis is to compare between their results and derive conclusions on the analysis which would have more value for design engineering.
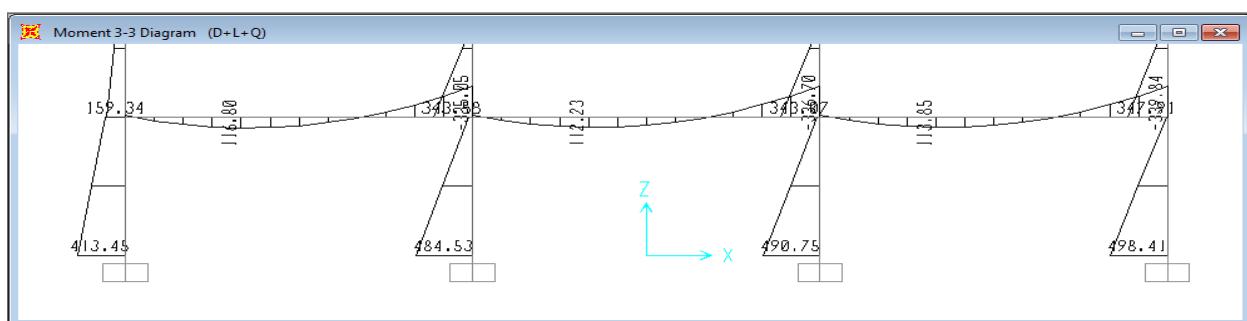
FIGURE 10. DIAGRAM OF MOMENTS FROM QUAKE ANALYSIS : 413.45 ; 484.53 ; 490.75 ; 498.41
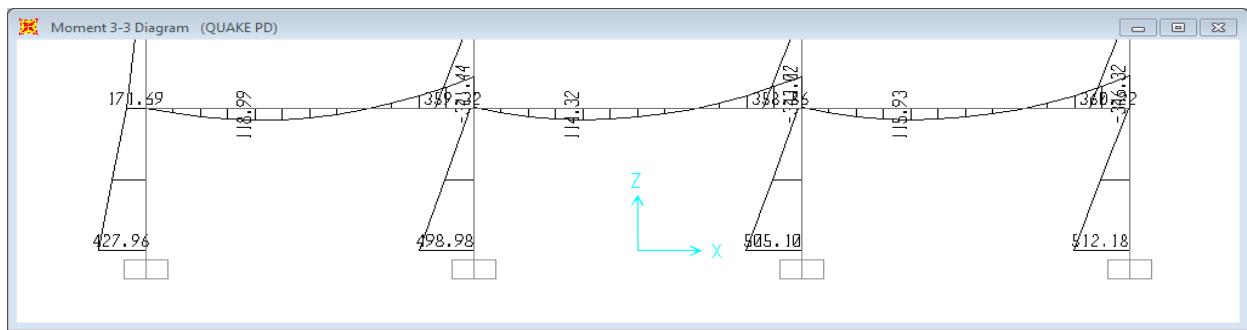
FIGURE 11. DIAGRAM OF MOMENTS FROM QUAKE NONLINEAR PD ANALYSIS : 427.96 ; 498.98 ; 505.10 ; 512.18
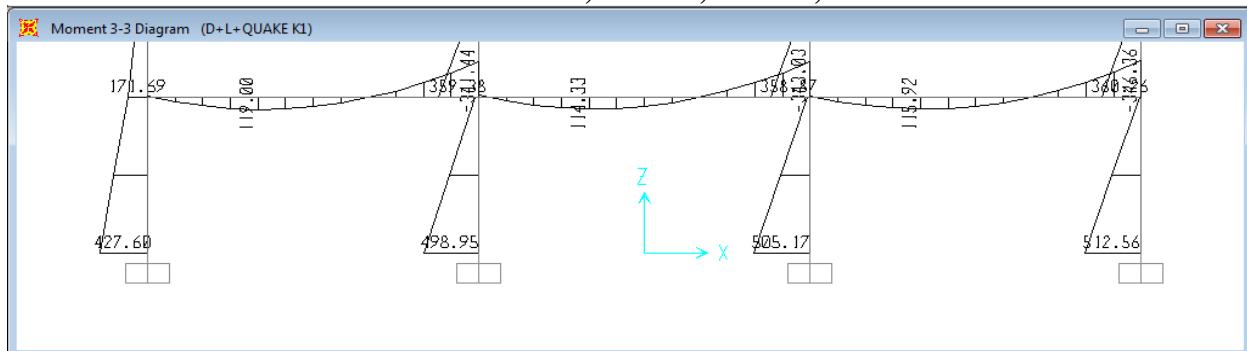
FIGURE 12. DIAGRAM OF MOMENTS FROM QUAKE LINEAR WITH REDUCED STIFFNESS ANALYSIS : 427.60 ; 498.95 ; 505.17 ; 512.56
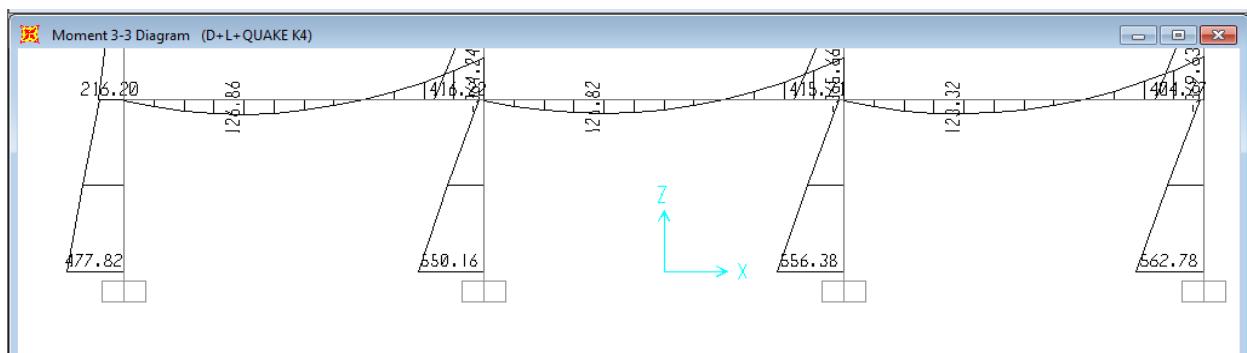
FIGURE 13. DIAGRAM OF MOMENTS FROM QUAKE LINEAR WITH REDUCED STIFFNESS (WITH A DUCTILITY FACTOR) ANALYSIS: 477.82 ; 550.16 ; 556.38 ; 562.78

First, we add that because the analysis type 'QUAKE PD', takes into account the values of internal forces and vertical forces, to compare the same conditions of the same structure , we have combined analysis described above with vertical loads 'Dead' and 'LIVE'. By the above application it is clear that for engineering design aspects , the design of a structure is very convenient to develop an analysis of linear lateral forces, in a structure with reduced stiffness. Although the recent trend is to design according to the design displacement control , and such analyzes use nonlinear methods, we must admit that such analysis require previously a preliminary modeling. If in the theoretical part we sought to avoid interative method and voluminous analysis , what we would think to make an designe by repeating the nonlinear analysis in different proposed structures.

Results of the analysis above are also valid for application analysis, 'RESPONSE SPECTRUM', which are more accurate for seismic calculations.

Conclusion

Sections of this paper, in which we modestly tried to make a submission to the P-Δ problem, but not only. The essence of this study is the relationship P-Δ-DCTILITY. Ductility is the most important parameter on seismic design, but without wanting to get out of topics we do not want to treat the dynamical problems, we are conscious that Seismicity remains fundamental premise of sustainable and safe design. The scope of an engineer remains, analyzing a framework for recognition of its real behavior and controling destruction mechanism of the structure.

The question that arises is: how can design the reality, without knowing the behavior of the structure itself ?

In analyzing the effect of the second order , the design is based on the recognition of the structure deformation shape, which shape is complicated by post-elastic phase of the structure. After determining the deformation shape and application of external forces , we take internal forces, which we use to design stiffness, resistance and factic ductility of the structure.

In trying to increase the accuracy of the analysis of application of the above examples, we can apply the following methodology:

- Apply vertical forces in the building by construction loads and of utilization.
- Apply further a nonlinear analysis of vertical forces , by amplifying their action with the ductility we want to accomplish structure accuracy.
- Apply lateral loads, by using nonlinear analysis stiffness.
- With internal forces obtained from the analysis, we design each elements.

With non-linear analysis of vertical forces achieve these benefits:

- Save time in analyzing the structures, by using linear analysis .
- Realize a more accurate estimate of the structural rigidity.
- Internal forces respond to a reality, and create more safety for elements.
- Consideration of P-Δ effect reduces the possibility of creating soft storys in buildings from non estimated actions and stiffness.

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SAP2000 Manual

THE FORMS OF PRODUCTION OF ALTERNATIVE ENERGY IN ALBANIA

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Abstract
In this article are given on alternative energy considerations, including these forms of production:
• Solar Energy (Photovoltaic)
• Wind Energy
• Biomass Energy
• Biogas
• Biodiesel
Where are given technological considerations for the application of each case in the Albanian territory.

Keywords: Renewable energy, environmental, benefits, solar energy, biomass, climate

Introduction

This study focuses on the main aspects of energy problems like industrial production, energy systems environmental character and the impact on human health and ecosystems.

Today, energy is indispensable to our daily lives.
With Energy we heat and refrigerate our homes, we use it for many transportation systems, and other things.

Energy is used in all human activities.

In the environment in which we live, we consider energy and its uninterrupted use, endless but in fact it is not.

The demand for energy is constantly growing and fossil resources are being exhausted. Their use significantly affects the system "LAND"

Fossil fuels, from which derive 90% of energy that we use, emit carbon dioxide (CO_2) during the process of burning. This gas causes warming through the greenhouse effect.

The combustion processes produces also carbon oxide (CO), nitrogen (NO), sulfur (SO_2), hydrocarbons (HC) that are the main causes of environmental pollution and acid rain.

Other advantages of renewable resources is that they are local resources, guarantee a small source for transportation, obvious economic benefits, and increase local employment.

The most common renewable energy sources are:
✓   Wind Energy for electricity production.
✓   The energy of the Sun, solar radiation is used to produce electricity or heat
✓   Hydraulic energy, kinetic energy and potential uses of water to produce electricity
✓   Biomass energy uses organic origin combustor to produce (boilers, chimneys, etc.) electricity by large plants.
✓   Geothermal energy uses the underground heat that produces electricity (large plants)
✓   The energy of the waves, the Sea waves energy is used to produce electricity.

Alternative energies are nowadays the main problem in finding and implementing these forms.For this problem, there are discussed and designed projects for locating these energy sources in the future.

Renewable energy sources have double advantages:
- Respect ecology and environmentand
- Efficient in costs

Source: National Agency of Natural Resources & Google

Solar Energy in Albania:
The sun is the most important source for energy production.
All sources of renewable energy, from the geometric type derive directly or indirectly from the sun, and is defined as a great source of clean renewable energy and zero cost as raw material.
The advantages of solar energy:
- There is no cost natural materials
- There is no cost of transportation from the source
- There is no environmental pollution

The main types of solar collectors are:
- Flattened collectors
- Parabolic collectors
- Tube collectors

Thanks to the favorable geographical position, Albania has very good climatic conditions for the use of renewable energies.
The high intensity of solar radiation, has found a wider use for hot water production.
The territory of our country has an accumulated exposure to solar radiation ranging from 1200 kWh/m2 mainly in the north-east, to 1.600 kwh/m2 in the western area.
Much of the territory of Albania receives a solar radiation of 2200-2400 hours / year.
The number of sunny days ranges from 280 to 300 sunny days.
According to solar radiation measurements carried by the Hydro Meteorological Institute and the geographical latitude, where these measurements were made, results the solar energy potential of Albania.

Total annual solar radiation varies from a minimum of 1.185 kWh/m2 in northeastern Albania (Kukes) up to a maximum of 1.690 kWh/m2 southwest (Fier). Albania has a daily average solar radiation of 4.1 kWh/m2.

Source: Young Germany

Radiation of daily average solar in Albania (kWh/m2 / day):

MONTH	Shkodra	Peshkopia	Tirana	Fier	Erseka	Saranda
January	1.7	1.55	1.8	2.15	1.00	1.9
February	2.3	2.3	2.5	2.85	2.7	2.4
March	3.35	3.25	3.4	3.9	3.4	3.6
April	4.5	4.15	4.2	5.00	4.4	4.8
May	5.45	5.25	5.55	6.05	5.6	5.8
June	6.1	5.85	6.4	6.8	6.4	6.8
July	6.5	6.25	6.7	7.2	6.8	6.1
August	5.55	5.45	6.05	6.4	5.9	4.8
September	4.45	4.35	4.7	5.15	4.7	3.6
October	2.9	2.9	3.2	3.5	3.1	3.2
November	2.1	1.85	2.15	2.4	2.1	2.1
December	1.7	1.5	1.75	1.85	1.8	1.8
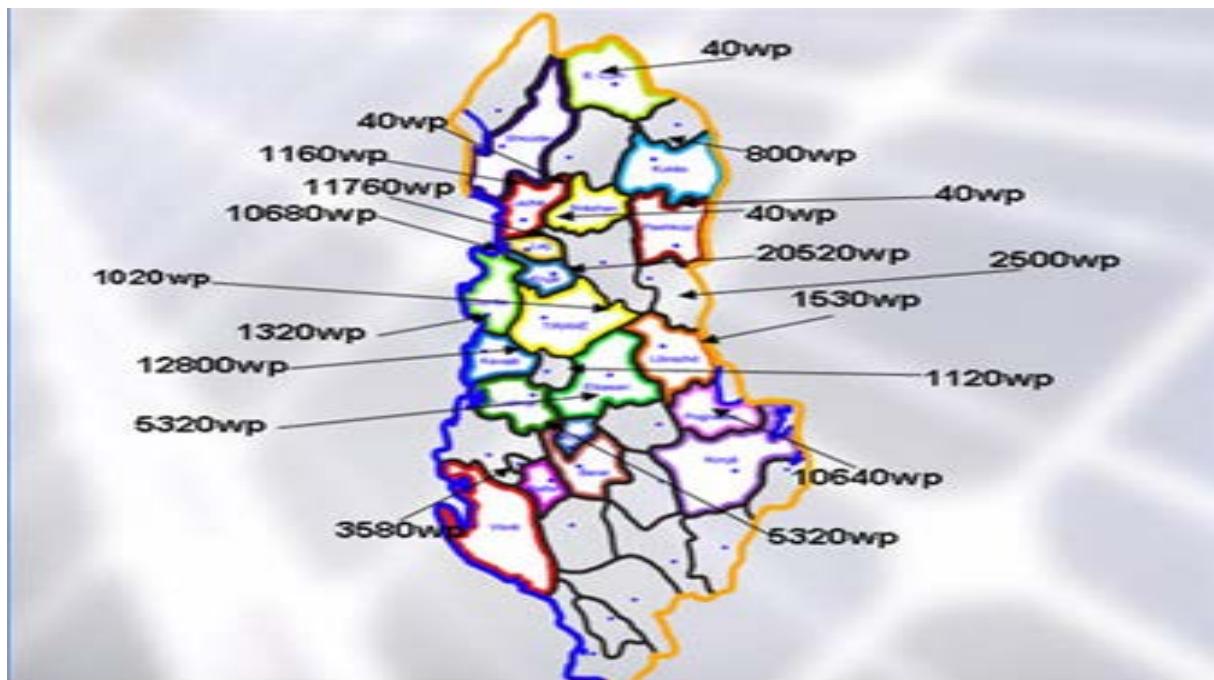
If we compare the daily average solar radiations (annual average) with the daily average solar radiation (annual average) of some other European countries will have these values:

- Netherlands: about 2.5 kWh/m2 / day
- Denmark: about 3 kWh/m2 / day
- Germany: between 3.0 - 3.8 kWh/m2 / day
- France: between 3.8 - 4.6 kWh/m2 / day
- South Albania: about 4.5 kWh/m2 / day
- Spain and southern Italy: less than 4.6 kWh/m2 / day
- Greece: more than 4.8 kWh/m2 / day.
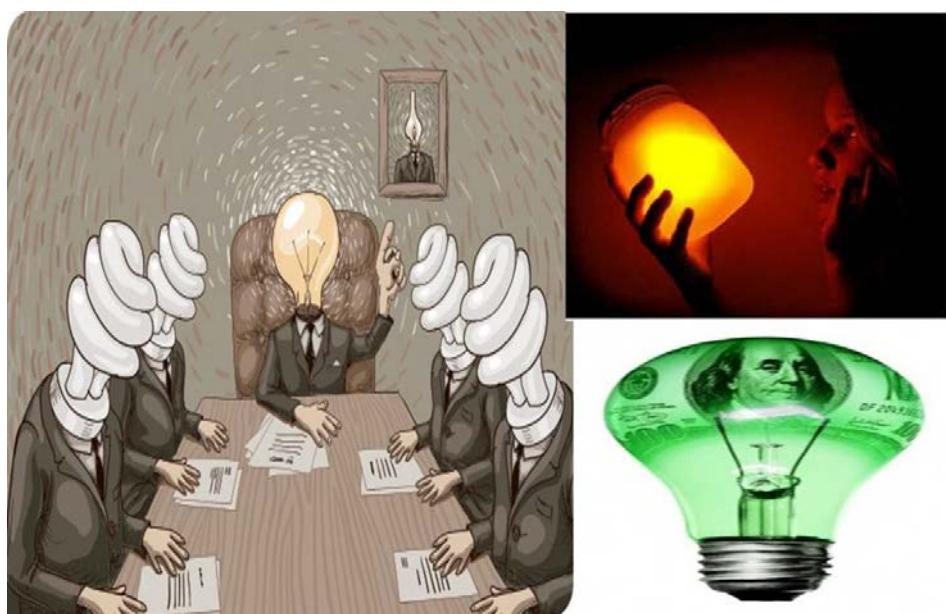
As can be seen from these comparative values, Albania should be considered as one of the countries with high potential solar radiation, thus relying on the experience of these countries, emphasize that it is necessary that even in Albania to promote the use of solar energy.

Kyoto, Be and Albania

In long terms, the use of solar radiation for water heating will significantly reduce the emission of greenhouse gases, CO_2 in the atmosphere, as one of the main causes of global warming and will contribute for her mitigation. Is there any obligation for Albania? "Albania has ratified the Kyoto Protocol, but has not reduced the emission of greenhouse gases.

Albania and other developed countries, that have historical responsibility for global warming and climate change, should be active and take voluntary commitments. Albania aspires to join the EU and, once it is part of the EU, will have to voluntarily change the status and behave like all other countries by incuring obligations to reduce emissions of greenhouse gases. Albania is also part of the UN Convention on Climate Change, UNDP project. It is important to create a renewable energy market.

The foreigners appeal to Albania "Use Solar Energy"

Albania, according to experts, is a special case because about 10-13% of total primary energy sources (TPEs), including imports, are obtained from biomass, especially firewood.

The fact that the country relies on hydropower makes it vulnerable to climate change, as observed during the recent drought. This has significantly reduced electricity supplies.

Renewable energy could be the solution to reduce this dependence, but also for macroeconomic and political security of the country, reducing the deficit of state budget.

Analysis performed by Albania and reflected in the National Plan for Renewable

Energy shows that the ultimate goal is to occupy about 38% of final consumption by 12% for heating and cooling systems, 23% from renewable sources for electricity and 3% will be spent on transportation.

Wind energy in Albania

The aim of the present study is to assess the potential of wind power as an alternative source of energy, for Albanian conditions, through the data receiption in some of the main areas of this source.

Identification of the potentials for these conditions of our country is seen as one of the ways of solving the problem of energy and environmental conservation.

Some statistical data records by the Hydro Meteorological Institute of Tirana, for a multiyear period, give opportunities to use wind energy in the future.

Measurements taken in Albania identify some areas of high wind speed.

Below, there is a comparative table showing the map of wind resources in Albania and locations with wind speed greater than 5 m / s also, the annual number of hours.

It is known that to produce energy in sufficient quantities, it is necessary to place Aero-generator installed to be more wind.

With an average generator, 50 m high, 600 kW potency in the presence of wind, the daily electricity can meet the need of 500 families.

Referring to our neighboring country, Greece, particularly in its south, the islands of the Ionian Sea has substantial winds for energy use, and Greece has installed wind turbines in these islands.

Greece's northern coast has broken ground, wind speed v = 5 m / s, at the height of 50 m, where these values match the values of wind speed on the southern coast of Albania.

The same situation is also in the regions of Italy near Albania.

By the final analysis, for different height of turbines, their different types, different surfaces Drum, performance and power, coefficient of wind speed distribution conclude that: Valley of Skavica, Plain Kukes, The area Gllavas, The coastal area of Durres, Mamurras, Fier, Lushnje, Vlora have a considerable potential of wind energy.

According to Hydrometerological Institute Tirana we have these data:

Classification according to potential that becomes to wind energy		
Possible sources	Energy densities at 50 m height [W/m^2]	Wind speed at 50 m height [m/s]
Lower limit	200 – 300	5.6 – 6.4
Fair	300 – 400	6.4 – 7.0
Nice	400 – 500	7.0 – 7.5
Gorgeous	500 – 600	7.5 – 8.0
Famous	600 – 800	8.0 – 8.8
Magnificent	800 - 1600	8.8 – 12.0

The table shows that there are data for 50 m height where the speed of the wind reaches 6-8 m/s. In these conditions our country is one of the best possible sources with an average energy density of about 400 W/m2.

Biomass energy in Albania

Biomass used to produce energy (bio-energy) directly from burners or converted into other types of combustion, electricity or heat due to thermo-chemical and bio-chemical process.

Biomasses are:

- All agricultural products cultivation of forests.
- Waste of agricultural and food industry wastes.
- Algae

  All organic products derived from animal biological activity.

Among the main sources of renewable energies, biomass has an important role because it is a form of solar energy-collecting can be used, directly or indirectly through certain processes of transformation, such as bio-energy incinerator to produce thermal or electrical energy.

Biomass as energy source present a set of priorities based on their availability in the area:

-Biomass is more abundant, found in every part of the surface of the planet, from algae, trees, or waste.

-It is renewable.

-Can easily be replaced, for example, by planting trees.
-It is easily convertible in acrid with high energy, like alcohol or gas.
-It is economic.
-Production of biomass often involves regeneration of deforested lands.
        Useless-utilized areas in agricultural space and create busyness of rural communities.
        The energy sector in Albania is one of the most important, occupying about 10% of the GDP of the country.
        In the framework of the promotion of renewable energy, has become possible to study the potential of biomass in Albania for producing electric power.
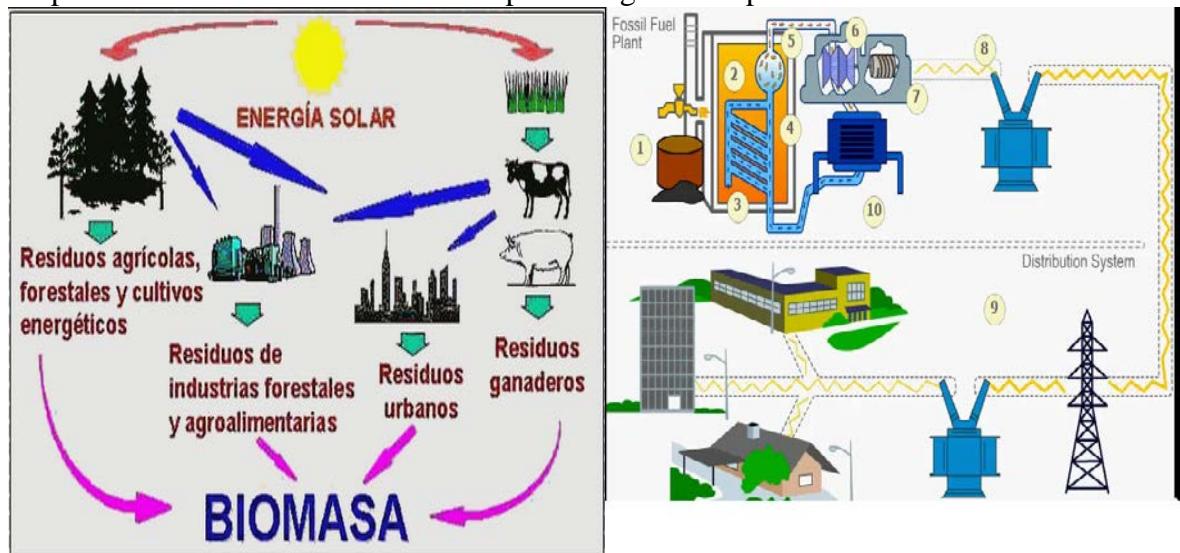
        In many countries of the world already is seen biomass as an alternative source of energy that does not contribute to the increase of CO2 in the atmosphere. Forests waste is the main source of energy for heating in our country and for cooking in many households.
        According to ANFI, it appears that the capacity utilization of forests is about 2.2 million m3 of forest waste with a calorific power of 15-18 MJ / kg. In this study, the use of the forest is considered in a sustainable manner and the use of 919,000 tons per year, or 1.3 million m3, which can be produced by about 1,271 GWh per year. Urban waste in our country are one of the main problems, as their quantity increases with the increase of welfare and their processing is still in the primitive stages, thereby posing a major environmental hazard. In our country it is one of the main problems, as their amount is added to the Welfare.
        Our country, produces about 0,219 to 0,307 tons / resident / year urban waste with a calorific power of 10 to 17 MJ / kg. If these wastes would be used for electricity production, they will produce about 236 GWh per year. According to statistics issued by INSTAT, Albania in 2006, has consumed 6,793,523 MWh, is approximately 1.88 MWh per resident.
        From these data, we can say that 44% of the total energy consumed can be replaced by renewable biomass, contributing significantly to reducing or increasing atmospheric carbon electricity consumption per resident, from a 1.88 MWh, which consumption is low compared with other countries in the region or in the world.
        The impact of systems that process renewable biomass will bring a range of positive impacts: supply of electricity, economic growth, employment growth in rural areas, reduction of import fuels, reducing of gas emissions greenhouse gases in the atmosphere, The Albanian government have an important role to play through promotional policies in the field of renewable energy, making pilot projects for construction of power generating plants from biomass.

Biogas energy in Albania

The term Biogas means a mixture of different types of gases (with most 50-80% methane) produced by bacterial fermentation, in the absence of oxygen, organic waste originating from:

- solid waste
- plants in decomposition
- residues zoo
- agro-industry waste

Biogas can be used:

- For burn in boilers
- For heaters
- For Cooking
- In Petrol engines

Through conversion of these substances in Biogas we obtain energy production which can be sold in the national market.

Albania is known as a country of livestock and agriculture, but also as a place with very poor rural areas. Biogas benefits contribute in economic incomes but also becoming energy self-sufficient but also for other needs such as heaters, cooking, etc..
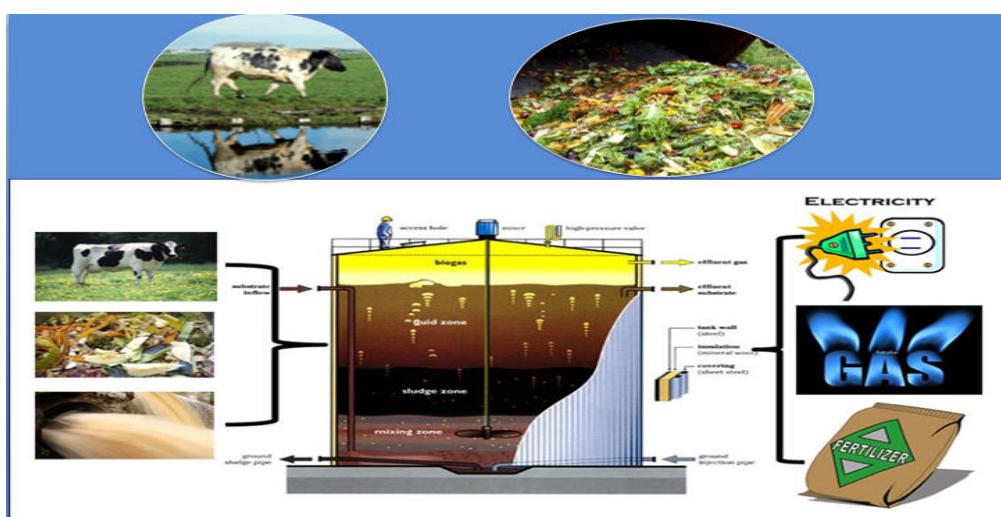
Source: American Biogas Council

Another factor beside the many positive benefits of biogas production is that residues that remain after extraction of biogas are very good materials for enrichment of agricultural, eliminating the purchase of chemical fertilizer use to enrich the soil, but also saving money.

Comparing with the other forms of energy production like wind and solar implants, is lower, but has the advantage as agricultural farms are not conditioned by atmospheric conditions.

There are two main types of implants that are widely used nowadays:
- ✓ room implants with plastic,
- ✓ rubber or gas storage biogas implants vaulted brick.
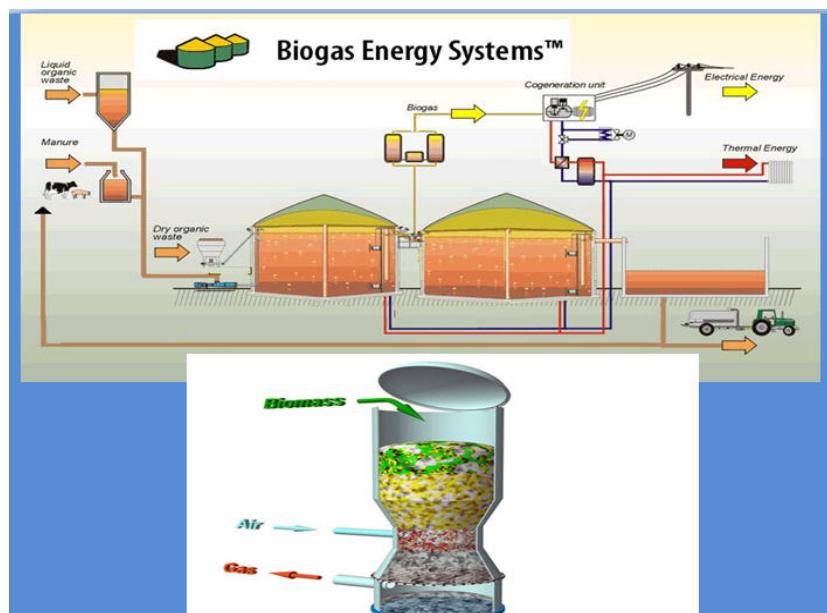
Source: American Biogas Council

Geothermal energy in Albania

Albania has thermal water sources, these sources are known since antiquity.

In Bënjë of Permet has thermal springs in the riverbed of Langarica, known at the time of the Roman Empire. Thermal sources of Elbasan are known since 1932.

In Postenan Mount, North of the Leskovik, appear steam sources, also the well-known thermal sources "Vormoner" on the river bank "Sarantaporos"

Geothermal energy is a renewable energy:
• Soil heat flux
• Hot water emanating from underground

Balance geothermal conditional distribution:
• Fields of temperatures at different depths
• Geothermal gradient
• Heat flux density
• Tectonics and hydrodynamics of underground waters

In the first half of the twentieth century, it was observed climate warming by about 1 ° C, then with a cooling of 0.6 ° C , and is present in our day to 1.2 ° C warming , this heat is part of the global warming that is currently observe in the circle of the Earth .

A period of heat in Albania is associated with changes:
- ✓ Atmospheric precipitation regime
- ✓ Moisture
- ✓ Wind speed

Nowadays the thermal waters are used only for curative purposes of various diseases.

By some measurements data, many areas of interest represents temperature in Lake Ohrit, where the temperature measured on 4 September 1994 at 10 m depth was 23.8 ° C.
In the center of the near-Adriatic Lowland, the heat flux density is up to 41.3 mW/m2.
Isotherm 30 mW/m2. Where the heat flux density of up to 35.7 gold and 38.2mW/m2, 50 km distance from Durres, and 35 km distance from Vlora.
In the area of Xara and Dumre of Saranda heat flux density reaches 37mW/m2.
Groundwater Potential constitutes 31% of the total water potential of Albania.

Sources and geothermal water wells in Albania are located in three geothermal areas:
a) Kruja Geothermal Area
b) Peshkopi Geothermal Area
c) Ardenica Geothermal Area

Besides these, there are other sources in areas which are given in the table below:

Nr	Name of source according to the zones	Temp. °C	Geographic coordinates		The debit l/sec
			Width V	Length L	
1	Mamurras 1 and 2	21-22	41°35'24''	19°42'48''	11.7
2	Shupal	29.5	41°26'9''	19°55'24''	<10
3	Llixha Elbasan	60	41°02'	20°04'20''	15
4	Hydrat Elbasan	55	41°1'20''	20°05'15''	18
5	Peshkopi	43.5	41°42'10''	20°27'15''	14
6	Ura Katiut Langaricë,Përmet	30	41°14'36''	20°26'	>160
7	Vromoneri,Sarandoporo,Leskovik	26.7	40°5'54''	20°40'18''	>10
8	Finiq,Sarandë	34	39°52'54''	20°03'	<10
9	Përroi i Holtës, Gramsh	24	40°55'30''	20°09'24''	>10
10	Postenan, Leskovik	Steam of source	40°10'24''	20°33'36''	
11	Kapaj, Mallakastër	16.9-17.9	40°32'30''	19°48'42''	12
12	Selenice, Vlorë	35.3	41°32'18''	19°39'30''	<10

In the area of renewable energy utilization, geothermal implants are those that allow higher power installed.

The principle of operation of a geothermal plant is:

Steam flows coming from underground, sent to turbine that produces mechanical energy, which is transformed into electricity energy through a generator or alternator connected to the turbine.

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DEVELOPMENT OF THE DATA TRANSFERING SYSTEM USING SOC

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Abstract

In this article the systems on a chip is analyzed. Advantages of implementation of such systems on FPGA are described. Design of data transfering system is considered. Results of HDL simulation of developed system are shown.

Keywords: System on a Chip, reciever, transmitter, FPGA, HDL - model

Introduction

One of principal directions of systems on a chip (SoC) applications is developing of special purpose monitoring devices. Depending on assignment the SoC can operate with digital, analog, analog-to-digital signals, and also radio frequencies band. As a rule, similar devices are applied in portable and embeddable systems. The market of similar systems permanently grows. It means relevance of their development, and also research of methods design and interaction. SoC can be implemented on FPGA. This approach has the following advantages: smaller costs of development and prototype creation; multiple adjustment of the project; use of well checked serial chips; possibility for debugging and testing "in parts"; possibility to extension of the device function; support the principle of reconfiguration [1].

The aim of work was analyzes of SoC and design of the wireless data transfer system.

Thereby assigned and solved the following tasks:
- the analysis of the modern industrial control systems and technologies connected to design of data transfering systems;
- the analysis of algorithms of reconfigurable systems creation, including standard SoC;
- development of the data transfering system using SoC;
- simulation of the developed system on VHDL.

Main Text

As an example of modern industrial control systems the Dispatching automation system "KARJER" [2] is analyzed (fig.1).

Fig.1. Structure of Dispatching automation system "KARJER"

It solves different tasks in the fields of control and management of mining transportation complex as well as optimizes quarrying process. System updates dispatchers and management staff with information on current condition of vehicles, number of trips completed, amount of cargo transported and fuel consumed, and other parameters that characterize freight flow activities. System controls navigational parameters (coordinates, speed) of vehicles as well as condition of onboard equipment like truck body load and amount of fuel left in its fuel tank. Information gets collected using GPS technologies (Global

Positioning System). Data gets transferred in the dispatching center automatically in digital format over VHF radio channel. System ensures operative graphical representation of collected information on remote user terminals in corporate dispatching center and stores it for further recording and analysis.

The main of onboard controller is data transmission systems. To improve the parameters of Dispatching system for determination of objects positions it was proposed to receive data from several sources and send them to the user by means of GSM modules and short messages of the SMS. Formats of messages are shown on fig.2.

Fig.2. Formats of messages

To do this it is necessary to perform sending through port in the GSM module specially created line; receive acknowledgment reception (symbol «>»); then perform the sending of text messages (up to 140 symbols in the Latin alphabet); and, in case of successful receiving, accept from GSM answer «OK».

To implement of these functions the data transfering system (fig.3) constructs of two serial input-output ports to exchange data with GPS and GSM modules and processor. For programming and simulation of the main blocks of the transfering system the following software are used: Xilinx ISE Design Suite; Aldec Active HDL; Quartus II Web Edition. The project contains nine files with the description of devices and one library for used data types and constants.

Fig.3. Structure of data transfering system

For the project, based on chip of XC3S500E, it is enough to use 8 bit ALU, 256 bytes of data memory, 256 words of commands memory and 16 bit data buffer for ports of input-output FIFO. To develop and test the board Spartan-3E Starter Kit (Xilinx. [3]) and software Xilinx ISE Design suite are used (fig.4).

Fig.4. Demonstration of Xilinx ISE Design suite using

Figure 5 shows the time diagram of the output port, test frequency is accepted 50 MHz. The next lines are shown: CLK - input clock signal (50 MHz); RST - reset signal; w_data - output byte; tick - resample the signal from the baud rate generator; tx - output port line; array_reg - an array of data FIFO buffer. Thus on the first clock period with the high front of a signal (from 20 ns to 40 ns) performed reset for resetting to zero all registers and establishment of the initial values. Then (in an interval of 40 – 60 ns) in the output register are written 0A value (in binary - 00001010).

Fig.4. Time diagram for data transmission port

It is necessary to note, that transmission of binary data performed sequentially, therefore reading output byte is performed in the opposite direction. To receive data on input line **rx** a periodic signal with a frequency of 9600 Hz is generated. The simulation result is shown on Fig. 5 (rx- input data line; r_data-byte received; array_reg - buffer FIFO).

Fig.5. The time diagram of the data receiving port

Also the special processor is developed. It performs the basic arithmetic operations (addition, subtraction, increment), as well as the bit-wise logical operations to verify the data correctness. Processor uses two types of memory: code memory to store instructions and data memory. Fig.6. demonstrates a program fragment.

```
0  0000
1  40AA      --movC r0,AA
2  41BB      --movC r1,BB
4  42CC      --movC r2,CC
5  0000
6  0000
7  71BB      --CMP r1,BB
8  910F      --CALL 1,0F jump to 0F if r1==BB, stack
9  0000
10 0000
11 0000
12 0000
13 0000
14 0000
15 0000
16 0000
17 C102      --XOR r1 xor r2 -> r3
18 F000      --RET  stack
```

Fig.6. Demonstration of a program fragment.

Simulation using Xilinx ISE Design suite allows to develop effective data transfering system.

Conclusion

This paper demonstrates the results of designing and simulation of the data transfering system. The developed controller can be used as basic for development of industrial devices of specialized assignment; the received results also can be used as a bright example for the students training.

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THE IMPACT OF GODEL ON AI

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Abstract

In this paper we have discussed some of the main contributions of Kurt Godel on artificial intelligence(AI).We give a simple description of Godel's Incompleteness Theorem which was,certainly,the major theorem he proved during his bright career.He is considered as one of the inventers of the theory of recursive functions which formed part of the foundations of computers,too. Godel was,of course,one of the greatest logicians ever.

Keywords: impact, mind,logic,artificial intelligence,incompleteness theorem.

Introduction

The ideas of many people for building a machine that will be capable to think and to perform all the works made by them and in a very similar manner with them,have been very attractive for many and many times ago.So,in 1842 in a memoir Lady Ada Lovelace wrote:"The Analytical Engine has no pretentions whatever to originate anything.It can do whatever we know how to order it to perform…".The ideas,according to which the machines cannot "think" by themselves, were widespread till the 20th century and the more convincing argument against the artificial intelligence for many times was based on Kurt Gödel's Incompleteness Theorem.This theorem states that a "sufficiently powerful" formal system cannot consistently produce certain theorems which are isomorphic to true statements of number theory.

Main Text

It was in 1931,when the Austrian mathematician Kurt Godel(April 28,1906-January 14,1978) did one of the gratest invention of the 20th century.With his "Incompleteness Theorem" he,in other words,showed that it is impossible to define a complete system of axioms,which is also consistent,that is,has no contradictions.As a result,any formal system that can generate meaningful statements is powerful enough to generate true statements that cannot be proved within the system.Consequently,mathematics cannot be placed on an entirely rigorous basis.Gödel original proof of the completeness theorem is based on the paradox of the liar.Suppose that in a community we have two kinds of people:liars and people who tell the truth.Liars always tell lies and people who tell the truth tell always the truth.Let's take a person who always tells the truth.This person will say :"I am telling the truth".This part is easy.Now,the other part :a liar should say "I am a liar",but since that person is a liar he will have to lie,and will therefore say "I am telling the truth".Hence,we cannot tell,only by asking him,if that person is a liar or not.But,remember that our aim in creating perfect axiomatic systems was that for any given correct sentence,we can demonstrate based on the axioms that it is either true or false.Let's take ,for example,the sentence:"I am a liar" based on the things a person telling the truth and a liar says,no one can actually pronounce that sentence!…"And here is the problem announced by Gödel:we have a sentence about which we cannot say anything,so we cannot prove that it is true,but we cannot prove that it is false either,even though the sentence is valid".As it is pointed out "…Godel's theorem is not an obstacle to a practical AI(artificial intelligence) system based on formal logic.Such an AI would take the

form of an intelligent proof checker.Gottfried Wilhelm Liebnitz and David Hilbert's dream that disputes could be settled with the words "Gentlemen,let us compute!" and that mathematics could be formalized,should still be a topic for active research.Even though mathematicians and logicians have erroneously dropped this train of thought dissuaded by Gödel's theorem,great advances have in fact been made "covertly",under the banner of computer science,LISP and AI…"(Cole et al.,1981;Dewar et al.,1981; Levin,1974; Wilf,1982). And next,as F.Gelgi states: "The theorem published in 1931 by the 25 years old Austrian Scientist, Kurt Godel made a great impact on the scientific circles.Not only did it destroy the hopes of many scientists,but it also initiated a new point of view concerning AI and the mind.This theorem is one of the most important ones to be proven this century,ranking alongside Einstein's Theory of relativity and the Heisenberg'Uncertainty Principle…". For many and many decades it has been accepted that the Gödel's two incompleteness theorems exclude the possibility for developing a true artificial intelligence which can rival the human mind.Comparing the mind and the machines (or the natural intelligence with the artificial one) Gödel has shown that "there exist some tasks the mind can solve but machines cannot".Gregory J.Chaitin wrote: "At the time of its discovery,Kurt Gödel's incompleteness theorem was a great shock and caused much uncertainty and depression among mathematicians sensitive to foundational issues,since it seemed to pull the rug out from under the mathematical certainty,objectivity and rigor. Also, its proof was considered to be extremely difficult and recondite. With the passage of time the situation has been reversed.A great many different proofs of Godel's theorem are now known,and the result is now considered easy to prove and almost obvious:It is equivalent to the unsolvability of the halting problem,or alternatively to the assertion that there is an recursively enumerable set that is not recursive…".   In 1963, John von Neumann will write:"…there have been within the experience of people now living at least three crisis…There have been two such crisis in physics,namely, the conceptual soul-searching connected with the discovery of relativity and the conceptual difficulties connected with the discoveries in quantum theory...The third crisis was in mathematics.It was a very serious conceptual crisis, dealing with rigor and the proper way to carry out a correct mathematical proof.In view of the earlier notions of the absolute rigor of mathematics, it is surprising that it could have happened,and even more surprising that it could have happened in the latter days when miracles are not supposed to take place.Yet it did happen…".

The mechanization of the mind has been a centennial dream and has a rich tradition.It begins with the axiomatization of Geometry from Euclid and the efforts of Aristotle to axiomatize the logic,continues with the Leibniz's Calculus Ratiocinator and next with the program of David Hilbert to encode all the mathematical proofs. We note here that the Gödel's original proof applies to a particular formalization of number theory and was followed by a paper showing that the same methods applied to a much broader class of formal axiomatic systems. The modern approach applies to all formal axiomatic systems,a concept which could not even be defined when Godel wrote his original paper because of the absence of a mathematical definition of an effective procedure or computer algorithm at that time. After Alan Turing succeeded in defining an effective procedure by inventing a simple idealized computer,now called the Turing machine,it became possible to proceed in a more general fashion. Alan Turing wanted,first,to give an answer to the question:which is the set of tasks that a machine can solve in general? And,as F.Gelgi pointed out again:"…By examining Gödel's Theorem one can determine very important consequences for artificial intelligence. An English mathematician, Turing, described an abstract machine called the "Turing machine".This is an abstract machine which has an unlimited amount of storage space and which can go on forever without making any mistakes. This machine can compute any type of algorithmic problem. According to the Turing Theorem all computers are Turing

equivalents. After proposing this,Turing went on to observe that some type of problems have no algorithmic solutions.In the meantime,"the Halting Problem" emerged-the problem of deciding those situations in which a Turing Machine action fails never come to a halt because of the consequences of the Godel's Incompleteness Theorem.It has been proven that a halting problem is computationally unsolvable. This leads us to an important conclusion:a computer cannot be the same as the human mind because the non-computational physics of the mind is not available for Turing equivalent machines and the nature of algorithms is not compatible with the thinking process due to the halting problem". One interesting question is what did Godel think his first incompleteness theorem implied about the mechanism and the mind in general?In 1951,in his famous "Gibbs lecture" stated:"…So the following disjunctive conclusion is inevitable.Either mathematics is incompletable in this sense,that its evident axioms can never be comprised in a finite rule,that is to say the human mind(even with the realm of pure mathematics) infinitely surpasses the power of every finite machine,or else there exist absolutely unsolvable diophantine problems of the types specified".That is,his result shows that either the human mind is not a Turing machine or there are certain unsolvable mathematical problems.But his impact on AI does not finish with these results. Godel formal explication of the Recursion Functions is a great achievement which yielded the basis for the recursive programming. As W.Schimanovich stated: "Together with the Lambda-Calculus of Alonzo Church they give use to the development of LISP by McCarthy and other AI gurus". Several of his students worked out his ideas and they continue the research on recursive functions as a new trend in mathematics and this before the time when computers would be strong tools in the scientists's work.Since the young computer scientists mainly came from mathematics,they were influenced by the general treatment of recursive functions.And again we cite W. Schimanovich who states: "Recursive programming did not fall from heaven(as some AI people believe today); its development is embedded in a cultural situation produced by a long period of research in mathematics and logic which had been motivated by Godel's work". In private conversations Godel argued the need for using the predicate logic as a programming language and the application of logic methods in computer science. The people who were engaged with the computer science at that time could not even imagine that the logic may consist a strong mean for the programming languages. But, as it was proved later,only the computer scientists with good knowledge in logic,could realize this. As a result of their work came into the sight the PROLOG language and the logic programming. The contribution of Gödel in logic attracted many new scientists to deep their knowledge in this field. But,because the results achieved in the field of logic were not those wanted,some of these scholars interrupted the studies in pure logic and continued their career in computer science…And they tried to use their knowledge in logic there.W.Schimanovich writes next:"… Therefore, sometimes publications on AI (as computer science together with some parts of logic and other fields like linguistics or psychology) forces the researchers to develop their own "logic" which seems to be more practical and promising than the traditional logic developed by pure logicians.This is also an influence of Godel-in spite of the fact that it probably was not originally intended by him…He influenced two generations of logicians and through them the development of computer science and especially that of AI ".

Conclusion

     We conclude,saying that Godel's incompleteness theorem had a big impact on the construction of modern mathematics and currently have a big impact on the way we see programming and artificial intelligence projects. In this simple paper we tried to pay homage to the genius of Godel,who "…is not father of AI, but he can be considered as a grandfather (together with Alan Turing and possibly John Von Neumann)" as W.Schimanovich has

written. And we finish here again with Godel's bright words: "Either mathematics is too big for the human mind or the human is more than a machine…".

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USING MOBILE PHONE TO DETECT THE USER'S INDIVIDUAL RESPONSE TO SPACE WEATHER VARIATIONS

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Abstract

It is shown that there are apparent correlation between cellular networks users' communication activity and the geomagnetic field variations. It is shown that the determination of the appropriate correlation coefficients allows one to define the individual characteristics of users' reactions to space weather variations. This reaction is characterized by a wide dispersion (as there are meteo-dependent people, there are also people keenly reacting to geomagnetic field variations). It is shown that the identification of individual reactions of the specified type can make the content of the new SMS-services.

Keywords: Correlation coefficients, geomagnetic field variations, network users' activity, SMS-services

Introduction

At the present time the range of services accessible through mobile phones and other modern means of communication are significantly expanding. The examples are the advertisements carried out by means of SMS-mailing, SMS-games, distant medical consultations etc.

At the moment it is also firmly established that the space weather variations, in particular, geomagnetic field variations, have a significant impact on the psycho-physiological condition of the individual [1-3]. The information presented in the cited monographs, clearly show that the fluctuations of geo - and heliophysical parameters really affect the behavior of people, up to the existence of the expressed correlations between statistics of suicides and parameters characterizing the state of the space weather.

However, it should be emphasized that the correlation dependences obtained in the field of heliobiology, as a rule, are of a statistical nature, and are often obtained on the basis of experiments relating to limited groups of examinees. The possibility to identify the individual features of a particular person's reaction to space weather variations are still limited and often require independent surveys.

This work shows that, there are at least two ways to ensure the definition of individual dependence on space weather on the basis of the parameters characterizing the interaction of a specific user with the communication space in automatic mode.
It is also shown that the service can be provided for users by CMC-delivery, which meets the modern trends, reflected in the expansion of the range of these kinds of services.

Data and Results

Curve 1, Figure 1 shows an example of the dependence of «2GETHER» dating site attendance on time. Calculation of the coefficient of correlation between the presented data and K-index of disturbances of the geomagnetic field gave a value of r = 0, 72 for the period from September 1 to October 1, 2013. The dependence of K-index on time for correspondent period is also shown at the figure (curve 2). K-index data was obtained from the site the N.V.

Pushkov Institute of terrestrial magnetism, ionosphere and radio wave propagation of the Russian Academy of Science (IZMIRAN). The obtained value of the coefficient of correlation in heliobiology is considered fairly high and indicating the existence of the response of the considered event to space weather variations.

The obtained result is settled well within the overall number of information presented, for example, in the works [4-6]. Namely, on the basis of the data of the cited works it is reasonable to assume that once the geomagnetic field variations influence on psychophysiological state of a person, then they are statistically reflected on the network users' activity.
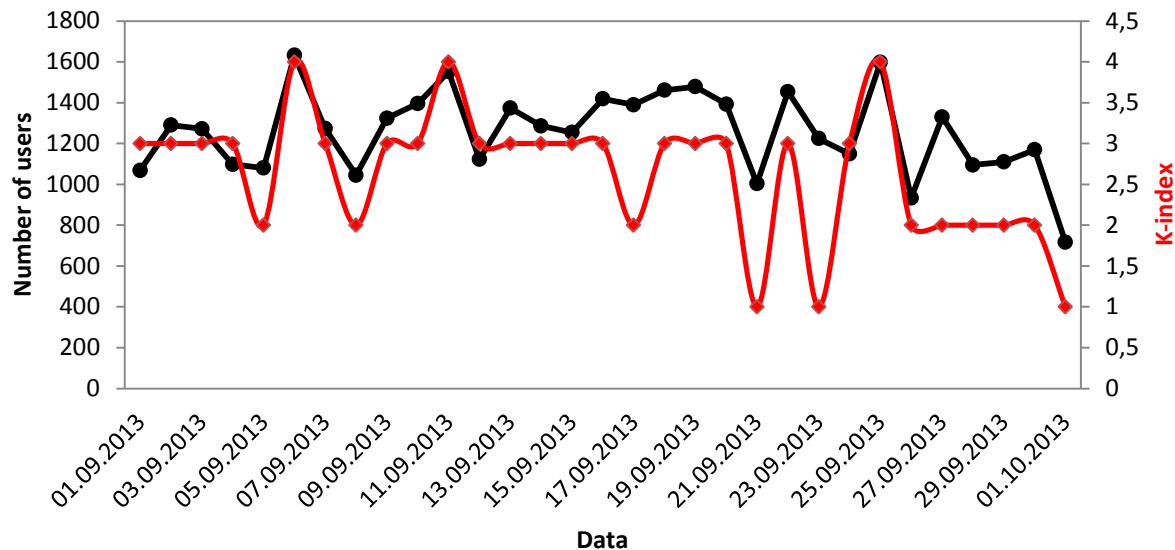
Figure 1. The dependence of «2GETHER» site attendance and K-index on time

This conclusion is also supported by results obtained from the data presented in figure 2 (The dependence of the load of Beeline mobile network operator on time). Calculation of the coefficient of correlation between the function and K-index of magnetic field gives a value of r= 0.82 for the period from August 19 to November 14, 2013.
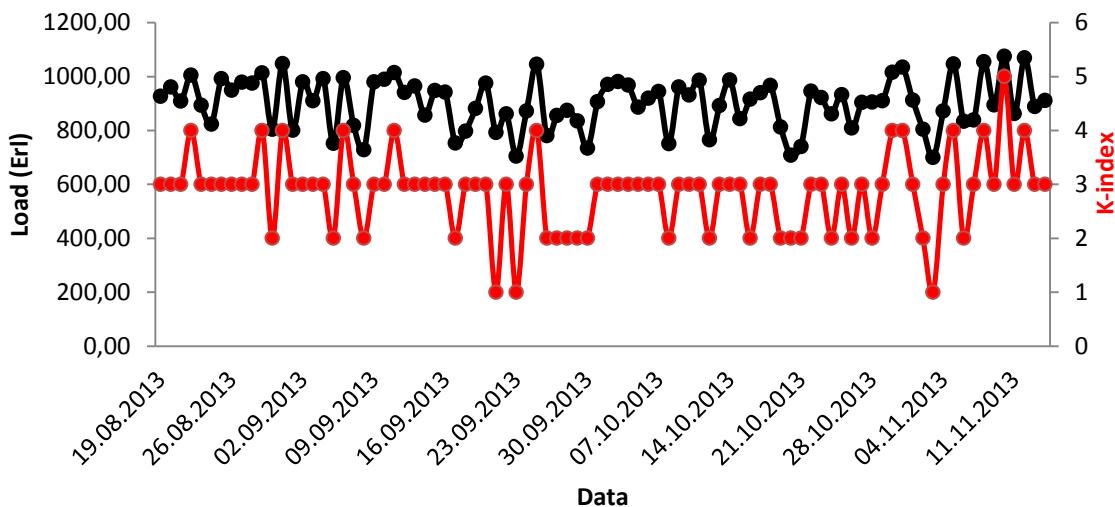
Figure 2. The dependence of the load of Beeline mobile network operator and K-index on time (data on Almaty city)

On the basis of this and a number of other similar examples we can conclude that the reaction of the user, expressed through the communication activities in the telephone

network, is much more pronounced than through site attendance. This result is quite logical, as currently the user has a twenty-four-hour access to the phone in contrast to the Internet.

On the basis of these data it can be assumed that the individual peculiarities of the individual's reaction to variations of the parameters, characterizing the state of the space weather can be determined on the basis of the analysis of correlations between, for example, the frequency of telephone conversations of a specific subscriber and such parameters as K-index.

Figure 3 presents the dependence, reflecting the communication activity of a certain testee person «A». In this graph, the horizontal axis is divided into 6-hour intervals. The ordinates axis shows the number of outgoing calls of that particular subscriber, falling to the specified time interval. (Incoming calls were not counted, since they reflect mainly communication activities of other subscribers.)
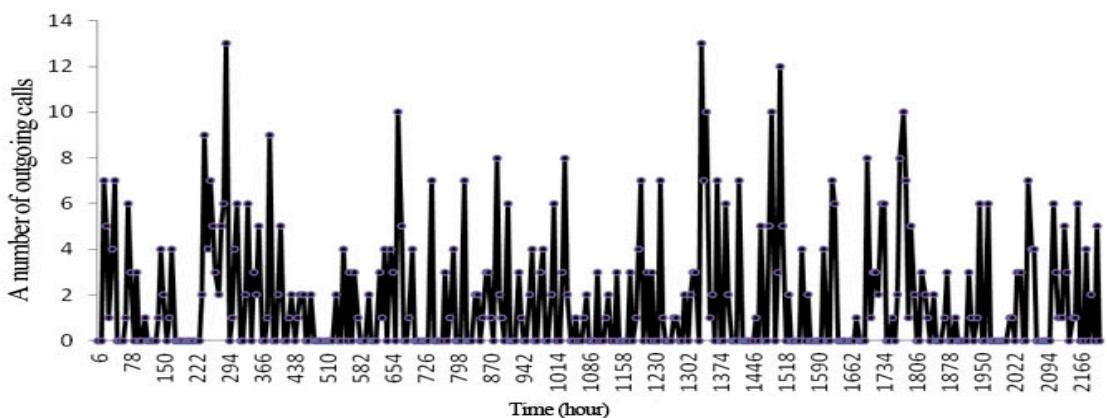
Figure 3. The dependence of a certain subscriber's communicative activity on time

The coefficient of correlation between K-index and the communication activity of «A» subscriber amounted to 0,59 when calculating the correlations using per-second precision of the time of the incoming call. The value of this indicator for the case when the time of the call was rounded to minute, also reached 0,59 within the accuracy of rounding. When using the data format when the time of outgoing calls have been rounded to 0.1 hours, the index value was 0,58. Looking ahead, it should be noted that, the economy of information volume, specified by the accuracy of rounding is essential.

Similar figures were obtained on the basis of a survey of 8 other subscribers. These data are presented in Table 1 for different nature of time rounding.

Table 1. The distribution of the correlation coefficient between the communication activity of a certain subscriber and K-index of geomagnetic field (certain testees are marked with separate letters of the Latin alphabet).

Testee	A	B	C	D	E	F	G	H
Correlation coefficient (precision in second)	0,59	0,87	0,91	0,74	0,81	0,57	0,90	0,71
Correlation coefficient (precision in minute)	0,59	0,88	0,91	0,73	0,82	0,57	0,90	0,71
Correlation coefficient (precision in 0,1 hour)	0,58	0,88	0,92	0,73	0,83	0,57	0,92	0,70

Apparently, the values obtained are characterized, as expected on the basis of literature data [1-6], by a significant dispersion. It can be argued that, just as there are meteo-

dependent people, so there are people with pronounced reaction to variations in the geomagnetic situation.

The detection of these reactions is the content of services, which, as noted above, is able to expand the range of services provided by means of modern means of mobile communication. The purpose of such services is informing the subscribers on the existence or absence of reaction on space weather variations (obviously, on the basis of information about the nature of communication activity and data received by the monitoring centres for space weather a more comprehensive survey can be conducted, involving other values characterizing the state of the space weather). In addition, the service can be included the announcement of subscribers on the periods of their heightened physiological reaction to external stimuli, in accordance with [1].

It must be emphasized that the provision of these services to subscribers is effectively implemented using the resources, already available to mobile operators. However, this approach faces a number of difficulties of legal and organizational nature.

Therefore in the frame of this work an alternative option was developed, that is based on the use of new keyboards designed for complementing **mobile phones**. Keyboard with optical encoding is being actively developed in Kazakhstan at the present time [7], however, the principle of their action doesn't play an important role for the purposes of this work.
It is important to emphasize that the use of this keyboard has a number of consumer benefits (in particular, such keyboard can be made folding, with the folded keyboard having a size smaller than the size of the cell phone). In addition, the work of this keyboard is supported by its own software installed on the cell phone.

Accordingly, there is a possibility to combine the software with additional functions. One of them is the implementation of the diagnosis of psycho-physiological reactions of the individual to space weather variations. This approach lets provide cell phone users with a considered service in manner independent from mobile operators.

Implementation of an approach resolves itself into ensuring the following additional functions with the software specified above:
- collecting information on time and duration of outgoing telephone calls;
- transferring information collected into the data center on condition that the subscriber processes a subscription to the corresponding service.

It is essential that these additional functions slightly complicate the software.

Moreover, this work offers the original expansion of the diagnostic capabilities of the system. Namely, according to the preliminary data the psycho-emotional and psychophysiological state of a person is also reflected in the nature of typing and the messaging pace, etc. All these parameters can be used directly for medical diagnostic purpose, that justifies the use of the extended platform, which collects information about cooperation between «user - mobile communicator». It is also significant that for the promotion of the proposed approach it is sufficient to initially confine oneself with one service. The introduction of other services of this kind can be made on a subscription by an updating method.

Organizationally, the operation of cosmic- weather diagnostic center is based on the exchange of SMS-messages between the centre and the users. It is therefore quite important to reduce the number of characters that are sent from a mobile phone of the user to data center. With the standard length of an SMS message comprising 160 Latin or 70 Cyrillic symbols and the usage of rugged format with the precision in 0,1 hour, not containing floating comma (for example, passing a set of characters 134 instead of 13.4) this message comprises an information on approximatelly150 telephone calls (more precisely, about the time when 150 telephone calls were made).

Thus, supporting costs on system maintenance are relatively small even in a fully independent mode (1-3 outgoing calls from the subscriber SMS messages + 1 message from the centre). Under the existing cost of services in Almaty it amounts to 15 tenge ($ 0,1).

Accordingly, the cost of services is low either, on average, 75 tenge ($0,5) per day and affordable for the majority of users of mobile communication networks, at least in Almaty.

Further reduction of the cost of the service requires either the organization of interaction with cellular communication operators or connection of the service data transmission via personal computers. The latter requires only some modifications of the software, but will not affect the quality of service provided, as the collection of diagnostic information can be delayed to 1-3 days.

Conclusion

The work shows that the diagnosis of psycho-emotional and psychophysiological condition of an individual reacting to space weather variation can be traced on the basis of a monitoring of the communication activity of subscribers of mobile communication networks.

Conduct of such diagnosis composes the content of new SMS-services that can be provided to the users both in an interaction mode with mobile network operators, and in operation mode of independent diagnostic centers.

The estimation of the service value indicators shows that it is available for the vast majority of mobile phone users, and there are considerable reserves for further cost reduction. Besides, such a system gives possibility for development of new methods of diagnostics of noosphere as whole, which will be able to give experimental basis for such conceptions as [8-10].

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OBSERVATION AND MITIGATION OF POWER TRANSIENTS IN 160GBPS OPTICAL BACKHAUL NETWORKS

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Abstract

Erbium doped fiber amplifiers (EDFA) are most commonly used in optical networks for the most assorted applications. In this paper we have investigated the power transient effect of the cascaded erbium-doped fiber amplifiers (EDFA) in dense wavelength optical ring networks. The result shows, the power transient effect of EDFAs when channels are changed due to failure or channel reconfiguration. And also ring laser configuration technique has been reported to mitigate the effect of power transients.

Keywords: DWDM, EDFA, OADM, OXC, power transients

Introduction

Wavelength routed optical networking can achieve transmissions, routing, switching, and protections of high-speed information streams in the optical domain by the optical add/drop multiplexers (OADM) and the optical cross-connects (OXC). Optical networking is ideally positioned to meet the demand for explosive communication capacity. Nowadays, the erbium-doped fiber amplifiers (EDFA) are widely used in such networks for the purpose of transparent loss compensation without O/E conversion. These EDFAs are typically operated in the gain-saturation regime to guarantee maximum channel signal-to-noise ratio. However, the number of the wavelength-multiplexed channels traversing a single EDFA may vary as a result of the network reconfiguration, the network protection, and the network growth. In these reconfiguration and protection applications, the optical network switching time is required in the order of millisecond, which is around to the spontaneous lifetime of the Er upper level. Consequently, the power variation of EDFA input will lead to undesirable fast power transients in the surviving channels by dynamic cross-gain saturation effect. [3]In an optical implementation with ring laser configuration, the lasing power plays the reservoir of excited erbium-ions and swings in opposite direction to input signal variations. If sufficient lasing power is provided, optical power at the output of the EDFA is constant in time and lasing power can be propagated through the remaining amplifiers of the cascaded as compensating signal. All optical gain clamping ring laser method has been suggested in DWDM OADM ring network.

System design and simulation set-up

The designed DWDM backhaul ring network architecture is based on a single unidirectional fiber ring topology having data rates of 10 Gbps. It consists of six OADM nodes as shown in fig. 1 connected by non linear single mode fiber. Each node is converting the electrical data into the optical signal and transmitting the optical link of DWDM ring.

Each node is also equipped with tunable transmitter operating in multiband environment and compound receiver with multiple filters; each receiver takes care of a particular data channel which owns a unique wavelength.
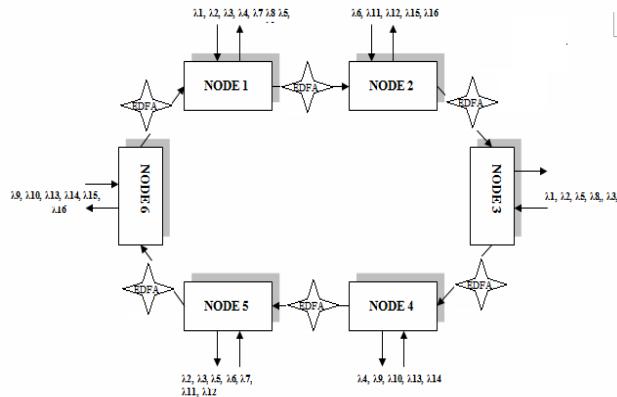
Fig. 1 six nodes, 16 channel DWDM OADM ring

Each node has the ability to add/drop any wavelength of each data channel. EDFA (erbium doped fiber amplifier) after each fiber span is inserted to compensate the fiber attenuation. LEAF fiber i.e. large effective area is used to compensate the nonlinearities of multichannel system. The power per channel of -9 dBm was used at transmitters. We used 16 wavelengths at 50 GHz (0.4nm) spacing ranging from 1550 to 1556 nm wavelength i.e. total bandwidth of 6 nm. Time delay block is used to connect signal form last node back to first node for performing ring simulation with multiple iterations.

The simulation setup for observing transients in optical ring network has been shown in fig. 2.For simplicity, only two wavelengths i.e.1550 and 1556 nm is used for the observation of power transients.1550nm wavelength is used as switching wavelength and 1556nm wavelength is used as surviving wavelength .Surviving wavelength is the wavelength, which excursion power transients when 1550nm wavelength is added or dropped. Rest other 14 wavelengths should be applied with null signal to make it inactive.
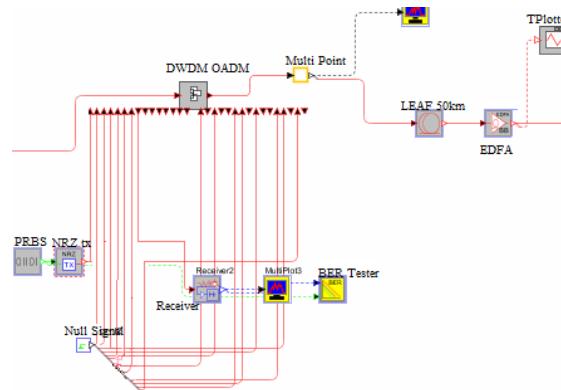
Fig. 2 Block diagram of simulation setup

The system is co-pumped at 980 nm with 55 mw of pump power and the Tx1 signal is at 1556 nm and TX2 is at 1550nm. After first EDFA transient plotter is attached to plot the transient effect. It must be noted that lambda 16 is the surviving channel and lambda 1 can be switched on and off with the help of switch. 1550nm channel is connected through switch so that it can be on off or add drop and 1556nm channel is directly attached and the third input is 980nm pump laser.Fig.3 shows practical simulation set up for observing transient .Figure

shows OADM first input is at 1550nm, which is to be added or dropped. Signals at 1556nm and 980nm are connected internally to OADM block

Results and discussions

It is observed from in Fig.4 the plot obtained at Tplotter in the schematic, the surviving signal power levels experience power excursions when some channels are dropped or added. This is due to the fact that when channels are added or dropped by network's reconfiguration or failure, the power of the surviving channels decreases or increases due to cross saturation in the amplifiers. Power excursion of surviving channels can cause signal distortion by nonlinear effects or degradation of optical signal to noise ratio (OSNR).Two signals are plotted in the figure; one is 1550 nm and another is 1556 nm, It clear from the figure that when 1550nm signal is dropped at node 1, 1556nm signal produce transient and there is shoot in power level.
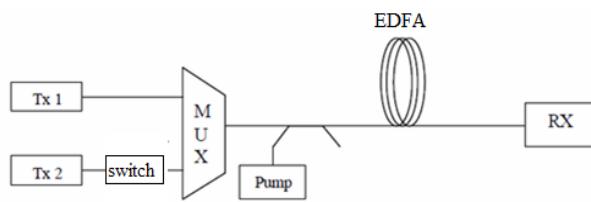
Fig. 3 Practical Simulation set up for transient observation
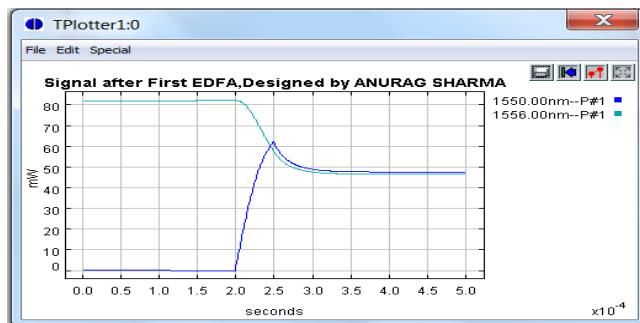
Fig. 4 Signal after first EDFA

Fig.5 shows the simulation setup for two node configuration i.e. after taking results from first EDFA at second node again 1550 nm channel is dropped and again we can see the effect on surviving channel. In this figure output from EDFA1 is connected to next OADM.
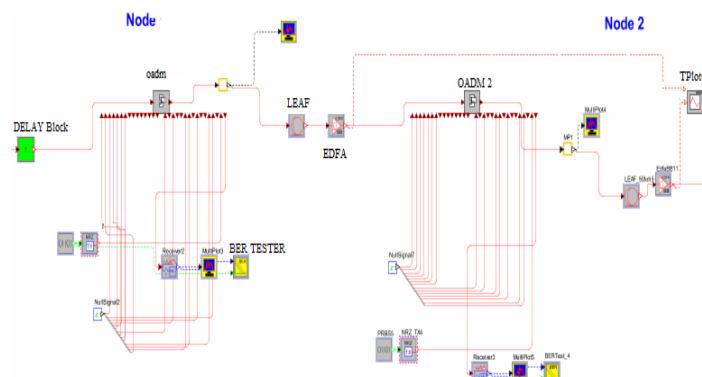
Fig.5 Simulation set up for 2 node configuration

Fig.6 shows the effect of transients after two EDFAs. It is observed that when at second OADM 1550nm signal is again dropped surviving channel i.e.1556nm signal again shoots up .The figure also shows that the power excursions experience faster rise times as the number of EDFAs in the chain increases.
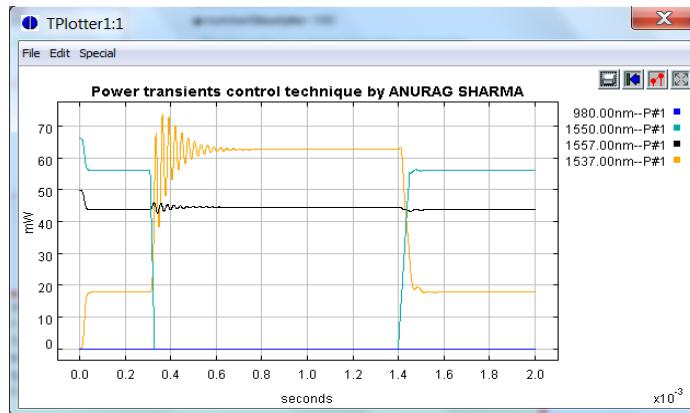
Fig. 6 Signals after second EDFA
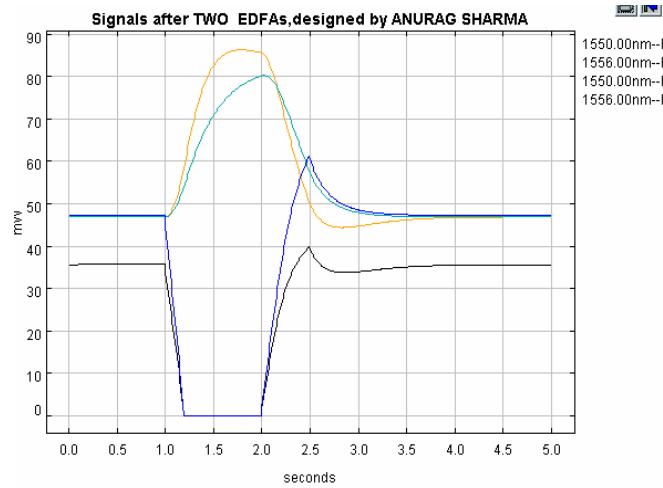
Fig.7 Ring laser configuration

Power excursions can be suppressed by using ring laser configuration. The schematic shown in Fig.7 uses a feedback loop to create a ring laser configuration. The EDFA provides the necessary gain. The signal at wavelength 1550 nm is turned on and off by the switch model shown in the schematic. The signal at wavelength 1556 nm is the surviving signal. The lasing signal at 1537 nm clamps the gain of the surviving channel when the signal at 1550 is dropped. The relaxation oscillations of the lasing signal at 1537 nm causes some relatively minor oscillations to be transformed to the surviving channel. However, these small power excursions are much smaller than those that would be realized without the gain control mechanism. The lasing signal evolves from the ASE noise of the EDFA. The lasing wavelength is selected by the filter in the feedback path. By controlling the amount of loss in the feedback path, we can trade gain stability for EDFA gain.
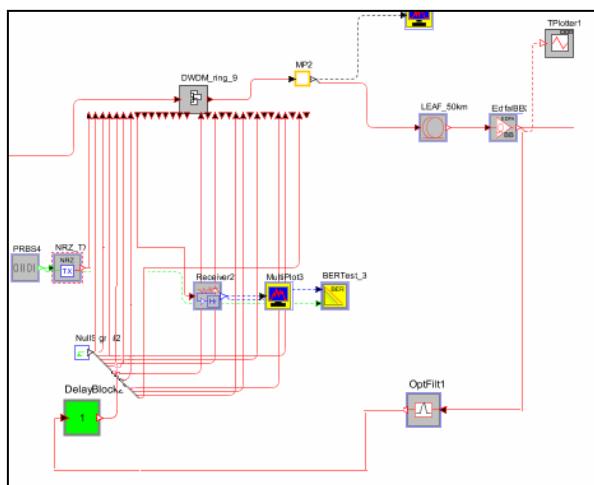
Fig 8: Power transient control technique

Fig. 8 shows power transient's mitigation graph, It is clear from graph the transients are suppressed when ring laser technique is implemented.

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AN ACCELERATION OF FPGA-BASED RAY TRACER

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Abstract

The Hardware implementations of the Ray Tracing algorithm are analyzed. A possibility of not all pixels tracing is discussed. The structure of Modified FPGA-based system is proposed. A productivity of Modified Ray Tracing algorithm is researched.

Keywords: Ray Tracing, FPGA, pixel, interpolation, productivity

Introduction

Ray tracing is one of the numerous techniques that exist to render images with computers. Ray tracing has been used in production environment for off-line rendering for a few decades now. That is rendering that doesn't need to have finished the whole scene in less than a few milliseconds. Real-time ray tracing is a very active field right now, as it's been seen as the next big thing that 3D accelerators need to be accelerating. Ray Tracer is really liked in areas where the quality of reflections is important. A lot of effects that seem hard to achieve with other techniques are very natural using a Ray Tracer. Reflection, refraction, depth of field, high quality shadows. Of course that doesn't necessarily mean they are fast.

Graphics card on the other hand they generate the majority of images these days but are very limited at ray tracing. The main specialty of ray tracing algorithm - an action is done for every pixel on the screen, so this could take a long time for complex scenes. Increasing features of ray tracing can be done by a dramatic increase in time spent with calculations. Not only must the program find all the intersections with the primary rays (as in ray casting), but it must also find all the intersections for each secondary and shadow ray.

Actually from 75 percent to over 95 percent of a ray tracer's time is spent with such calculations [1]. That is decreasing of number of the tracing pixels without the changing of the final image is an actual research task.

Main Text

Analyzes of ray tracing algorithm shows that an increasing features of ray tracing can be done by a dramatic increase in time spent with calculations. Not only must the program find all the intersections with the primary rays, but it must also find all the intersections for each secondary and shadow. Quality, in this case, is not cheap, and it only gets more expensive, as you will see in the following section. In nowadays the new technology from CUDA NVIDIA and FPGA acceleration engines can be applied for ray tracing algorithm implementation.

NVIDIA acceleration engines

NVIDIA, the leader in GPU computing, today introduced the NVIDIA® OptiX™ ray tracing engine, part of a suite of application acceleration engines for software developers. NVIDIA acceleration engines make it easy to incorporate valuable, high-performance capabilities into applications, while simultaneously reducing development time.

NVIDIA application acceleration engines [2] include:

- NVIDIA® OptiX™ engine for real-time ray tracing;
- NVIDIA® SceniX™ engine for managing 3D data and scenes;
- NVIDIA® CompleX™ engine for scaling performance across multiple GPUs;
- NVIDIA® PhysX® 64-bit engine for real-time, hyper-realistic physical and environmental effects.

As the world's first interactive ray tracing engine to leverage the GPU, the NVIDIA OptiX engine is a programmable ray tracing pipeline enabling software developers to easily bring new levels of realism to their applications using traditional C programming. By tapping into the massively parallel computing power of NVIDIA® Quadro® Processors, the OptiX engine greatly accelerates the ray tracing used across a spectrum of disciplines, including: photorealistic rendering, automotive styling, acoustical design, optics simulation, volume calculations and radiation research. Application developers are utilizing the OptiX engine to redefine what's possible for designers, engineers and researchers.

FPGA acceleration engines

Performance of existing software implementations is still severely limited by modern processors that require many processors to achieve real-time performance. Therefore, in Saarland University (Germany) a structure of ray tracing hardware implementation on FPGA is developed [3]. Operating at a frequency of 90 MHz, the hardware implementation of ray tracing algorithm achieves real-time rate of 20 to 60 frames per second at a wide range of 3D scenes to support texturing, multiple light sources and multiple levels of reflection or transparency. A feature of this system is reuse of a transformation unit for tasks decision that include effective search of an intersection of rays with triangles. Despite the additional support for dynamic scenes this approach reduces the overall cost of the hardware part at 68%. Also to accelerate ray tracing algorithm the mathematical core on FPGA can be used. It shows more speed operations, the operands are represented by 64-bit numbers. These cores include Xilinx Floating-Point Operator Core. This core provides developers with tools to perform hardware for data processing in floating point format on FPGAs. This kernel supports multiplication, addition, subtraction, division, square root, comparison operations. Performance kernel provided by the fact that transactions are conducted on FPGA DSP cores, whose frequency is 300 MHz. This system allows to generate imagers with 320×240 and 512×480 resolutions.

Interpixel interpolation

To increase the size of images a modified algorithm with an interpixel interpolation ia proposed. It based on the assumption that adjacent pixels of traced images have roughly the same (or very similar) color options. The main idea of algorithm is to trace pixels in any steps (horizontal and vertical) and than to apply an interpolation to determine the color components for untraced pixels. To realize this actions the Interpixel interpolation block is aded to the FPGA-based system (fig.1).
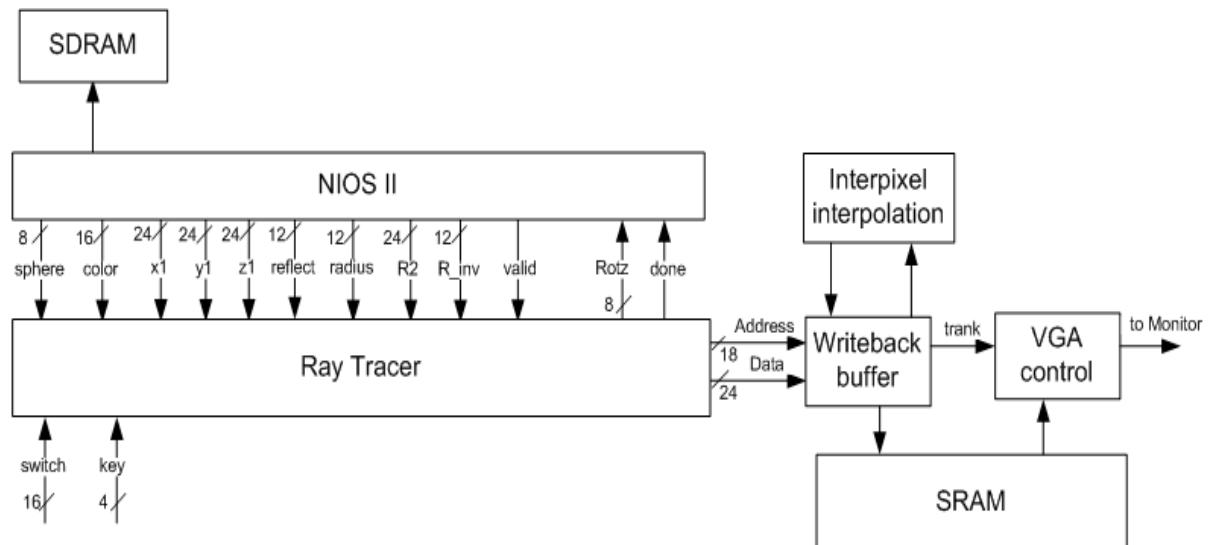
Fig.1. Structure of the modified FPGA-based system.

The ray tracing algorithm with interpixel interpolation is developed and simulated using Message Passing Interface for .NET. technology (cluster NeClus, DonNTU, fig.2).
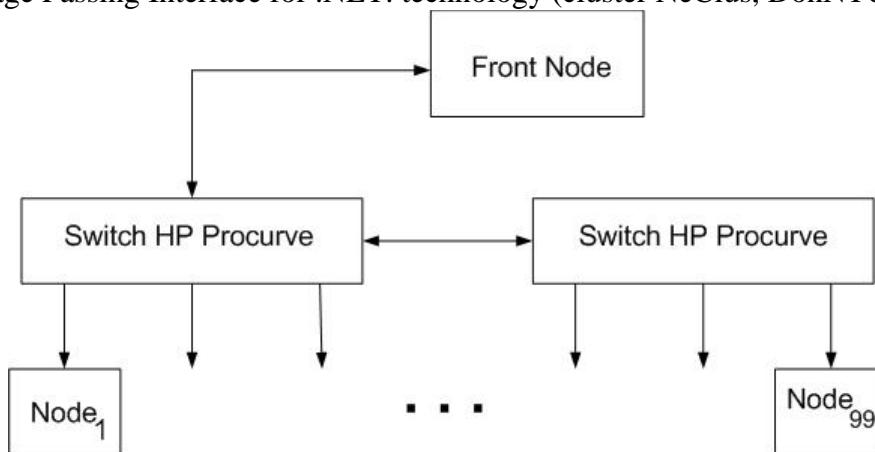
Fig.2. Configuration of NeClus.

NeClus uses an operative system ScientificLinux 5.4; packets Torque PBS and Maui to control the resources and tools for parallel programming MPI: openmpi-1.2.4, mpich-ch_p4-gcc-1.2.7, lam-7.1.4. A scene for the algorithm testing and reseaching is shown on fig.3. A coefficient of color differences is used to estimate an image and to perform adjustment of an interpolation step [4]. Results of researches are shown on fig.4.
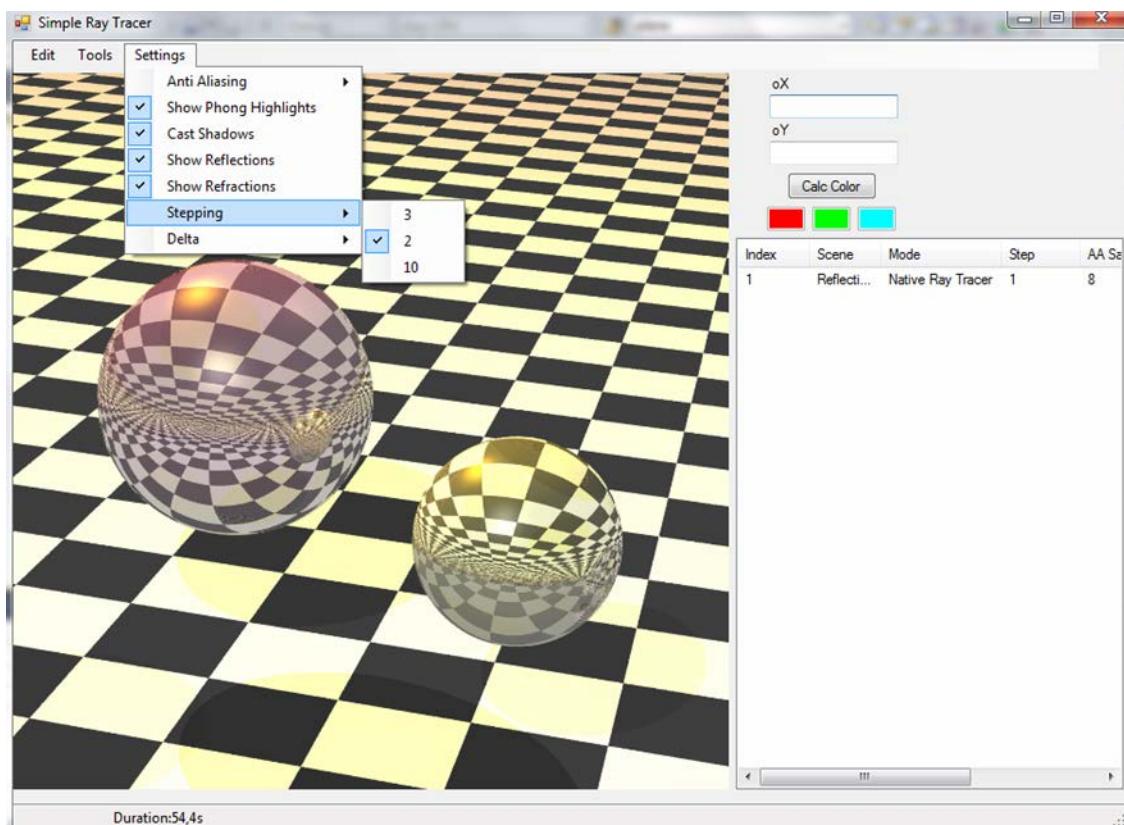
Fig.3. Scene for the algorithms testing.
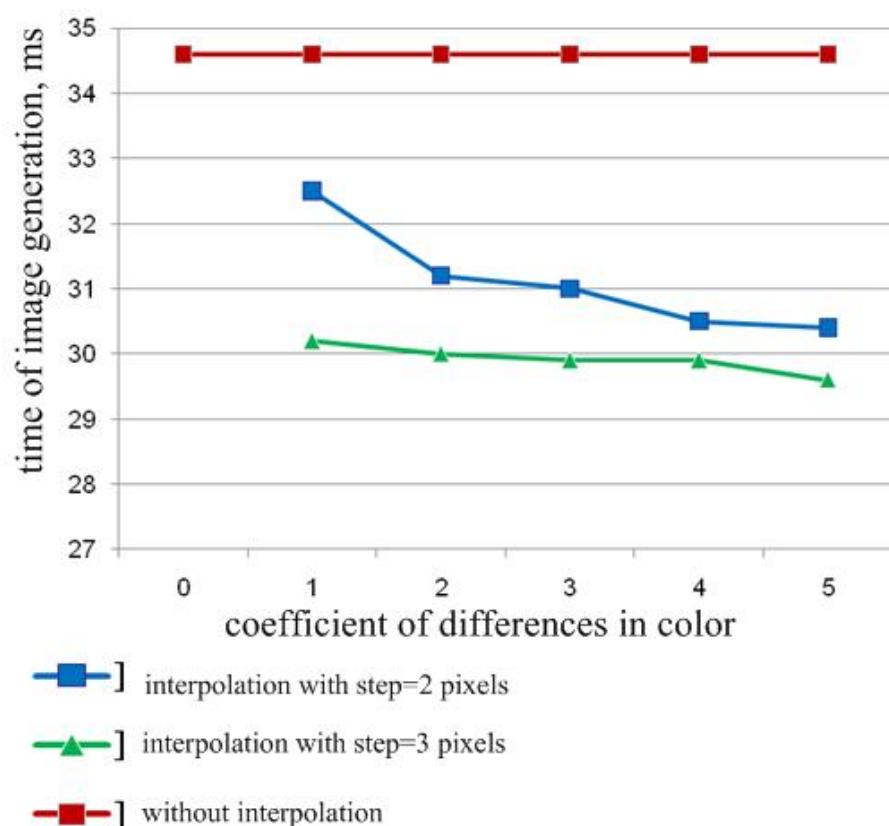
Fig.4. Results of researches.

Conclusion

       Analysis of results shows that the modifided ray tracing algorithms with the interpixel interpolation reduces the time of an image generation on 12,5 - 15%. To selected a step of tracing and interpolation a coefficient of differences in color is used. Future directions are to check a block interpolation and to extend the number of processor units.

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DEVELOPMENT OF THE DATA TRANSFERING SYSTEM USING SOC

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Abstract

The aim of work was analyzes of SoC and design of the wireless data transfer system. The modern industrial control systems and technologies connected to design of data transfering systems are analyzed. Advantages of implementation of such systems on FPGA are described. The Dispatching automation system "KARJER" is described. System controls navigational parameters (coordinates, speed) of vehicles as well as condition of onboard equipment like truck body load and amount of fuel left in its fuel tank. Information gets collected using GPS technologies.To improve the parameters of this system for determination of objects positions it was proposed to receive data from several sources and send them to the user by means of GSM modules and short messages of the SMS. Design of data transfering system is considered. It constructs of two serial input-output ports to exchange data with GPS and GSM modules and processor. For programming and simulation of the main blocks of the transfering system the following software are used: Xilinx ISE Design Suite; Aldec Active HDL; Quartus II Web Edition. To develop and test the board Xilinx Spartan-3E Starter Kit and software Xilinx ISE Design suite are used. Results of HDL simulation of developed system are shown. The developed controller can be used as basic for development of industrial devices of specialized assignment; the received results also can be used as a bright example for the students training.

Keywords: System on a chip, reciever, transmitter, FPGA, HDL - model

Introduction

One of principal directions of systems on a chip (SoC) applications is developing of special purpose monitoring devices. Depending on assignment the SoC can operate with digital, analog, analog-to-digital signals, and also radio frequencies band. As a rule, similar devices are applied in portable and embeddable systems. The market of similar systems permanently grows. It means relevance of their development, and also research of methods design and interaction. SoC can be implemented on FPGA. This approach has the following advantages: smaller costs of development and prototype creation; multiple adjustment of the project; use of well checked serial chips; possibility for debugging and testing "in parts"; possibility to extension of the device function; support the principle of reconfiguration [1].

The aim of work was analyzes of SoC and design of the wireless data transfer system.

Thereby assigned and solved the following tasks:

- the analysis of the modern industrial control systems and technologies connected to design of data transfering systems;

- the analysis of algorithms of reconfigurable systems creation, including standard SoC;

- development of the data transfering system using SoC;

- simulation of the developed system on VHDL.

Main Text

As an example of modern industrial control systems the Dispatching automation system "KARJER" [2] is analyzed (fig.1).

Fig.1. Structure of Dispatching automation system "KARJER"

It solves different tasks in the fields of control and management of mining transportation complex as well as optimizes quarrying process. System updates dispatchers and management staff with information on current condition of vehicles, number of trips completed, amount of cargo transported and fuel consumed, and other parameters that characterize freight flow activities. System controls navigational parameters (coordinates, speed) of vehicles as well as condition of onboard equipment like truck body load and amount of fuel left in its fuel tank. Information gets collected using GPS technologies (Global Positioning System). Data gets transferred in the dispatching center automatically in digital format over VHF radio channel. System ensures operative graphical representation of collected information on remote user terminals in corporate dispatching center and stores it for further recording and analysis.

The main of onboard controller is data transmission systems. To improve the parameters of Dispatching system for determination of objects positions it was proposed to receive data from several sources and send them to the user by means of GSM modules and short messages of the SMS. Formats of messages are shown on fig.2.

Fig.2. Formats of messages

To do this it is necessary to perform sending through port in the GSM module specially created line; receive acknowledgment reception (symbol «>»); then perform the sending of text messages (up to 140 symbols in the Latin alphabet); and, in case of successful receiving, accept from GSM answer «OK».

To implement of these functions the data transfering system (fig.3) constructs of two serial input-output ports to exchange data with GPS and GSM modules and processor. For programming and simulation of the main blocks of the transfering system the following software are used: Xilinx ISE Design Suite; Aldec Active HDL; Quartus II Web Edition. The project contains nine files with the description of devices and one library for used data types and constants.

Fig.3. Structure of data transfering system

For the project, based on chip of XC3S500E, it is enough to use 8 bit ALU, 256 bytes of data memory, 256 words of commands memory and 16 bit data buffer for ports of input-output FIFO. To develop and test the board Spartan-3E Starter Kit (Xilinx. [3]) and software Xilinx ISE Design suite are used (fig.4).

Fig.4. Demonstration of Xilinx ISE Design suite using

Figure 5 shows the time diagram of the output port, test frequency is accepted 50 MHz. The next lines are shown: CLK - input clock signal (50 MHz); RST - reset signal; w_data - output byte; tick - resample the signal from the baud rate generator; tx - output port line; array_reg - an array of data FIFO buffer. Thus on the first clock period with the high front of a signal (from 20 ns to 40 ns) performed reset for resetting to zero all registers and establishment of the initial values. Then (in an interval of 40 – 60 ns) in the output register are written 0A value (in binary - 00001010).

Fig.4. Time diagram for data transmission port

It is necessary to note, that transmission of binary data performed sequentially, therefore reading output byte is performed in the opposite direction. To receive data on input line **rx** a periodic signal with a frequency of 9600 Hz is generated. The simulation result is shown on Fig. 5 (rx- input data line; r_data-byte received; array_reg - buffer FIFO).

Fig.5. The time diagram of the data receiving port

Also the special processor is developed. It performs the basic arithmetic operations (addition, subtraction, increment), as well as the bit-wise logical operations to verify the data correctness. Processor uses two types of memory: code memory to store instructions and data memory. Fig.6. demonstrates a program fragment.

```
0   0000
1   40AA        --movC r0,AA
2   41BB        --movC r1,BB
4   42CC        --movC r2,CC
5   0000
6   0000
7   71BB        --CMP r1,BB
8   910F        --CALL 1,0F jump to 0F if r1==BB, stack
9   0000
10  0000
11  0000
12  0000
13  0000
14  0000
15  0000
16  0000
17  C102        --XOR r1 xor r2 -> r3
18  F000        --RET  stack
```


Fig.6. Demonstration of a program fragment.

Simulation using Xilinx ISE Design suite allows to develop effective data transfering system.

Conclusion

This paper demonstrates the results of designing and simulation of the data transfering system. The developed controller can be used as basic for development of industrial devices of specialized assignment; the received results also can be used as a bright example for the students training.

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SUSTAINABLE DESIGN FOR SCHOOL BUILDINGS IN ALBANIA - KEY PRINCIPLES

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Abstract

The current situation of schools in Albania is such that there is an urgent need for reconstruction of existing schools and building new schools to meet the needs of the constantly growing number of students and the needs of increasing school standards in accordance with the time.Few of these schools ,meet the minimum norms on the basis of criteria which must be designed and built a school . In schools built and reconstructed after 90 years , it is noted a significant improvement in terms of quality of construction . But it must be said that this improvement still needs work . So it is very difficult to speak about sustainable schools in Albania ,because we don't have any till now.This article presents precisely the main design principles of a sustainable school (so necessary for the situation in Albania) , conditions that must be met ,so that this kind of design typology be durable and efficient in many aspects.The principles that are treated here include the following main points :
1 - Functionality and flexibility.
2 - Aesthetic treatment.
3 - Climate Comfort.
4 - Climate control and ventilation.
5 - Natural and artificial lighting.
6 – Acoustics.
7 – Energy efficiency .

Keywords: Sustainable, functionality, flexibility, control, efficiency

Introduction

The current situation of schools in Albania is such that there is an urgent need for reconstruction of existing schools and building new schools to meet the needs of the constantly growing number of students and the needs of increasing school standards in accordance with the time .

It must be said that all schools built before the 90's , for which there have been investments are in a very bad conditions as well as by construction and conceptive phase.

Very few of these schools meet the minimum norms and criteria on the basis of which must be designed and built a school . This is obvious especially from the large number of students in a class , very small room windows (lack of natural light) , the complete absence of thermal insulation , acoustic insulation , lack of heating system and ventilation , very poor quality of electrical installations and plumbing as well as the small number and poor hygienic conditions .In schools built and reconstructed after 90 years ,it is noted a significant improvement in terms of quality of construction as well as meeting some basic norms and criteria of a school building . Given the numerous investments that are being made and will be made in the future to improve the school system ,arises the necessity of implementing contemporary norms and criteria in the design and construction of new schools and the

renovation of existing ones . Term that includes this necessity is sustainability in design.In this article are elaborated the most important principles for a sostenible school.

Main Text

In Albania ,schools building (elementary,secondary and high schools) have problems such as:

-lack of classrooms and other educational spaces.

-high density of pupils in classes.

-lack of green spaces.

-use of dangerous materials that releases carbon gases in the air ,so harmful for the school comunity.

-lack of passive energy use .

-maximal electrical energy consume.

-high cost buildings.

-high acoustic pollution.

Below it is made a study for some albanian schools,about the number of pupils,classes,areas and other basic criterias.The study is made for the current situation in comparison with design criteria.

SCHOOLS	ACTUAL SITUATION						
ELEMENTS / SECONDARY SCHOOLS	Number of pupils	Number of classes	Number of pupils in classes	school zone area (m2)	Ko (%)	Built area m2 /pupil	Built area m2
"HASAN PRISHTINA"	1039	32	32	3490	46.5	1.53	1600
"KONGRESI I LUSHNJES"	817	24	34	2038	80	2	1638
"NIKET DARDANI"	543	20	27	2360	27	1.13	614
"XHEZMI DELLI"	342	14	24	2000	42	2.42	840
"LUIGJ GURAKUQI"	78	3	26	532	65	4.47	349
ELEMENTS / HIGH SCHOOLS	Number of pupils	Number of classes	Number of pupils in classes	school zone area (m2)	Ko (%)	Built area m2 /pupil	Built area m2
"A.Z.CAJUPI"	1256	35	36	3800	33	0.99	1250
"JORDAN MISJA"	1300	35	36	4100	35	1.19	1470

NORMS OF PROJECTING

REFERENCES : "L'edilizia scolastica"; "URBANISTIKA 1" ENVER FAJA; "NEUFERT"

Number of pupils	Number of classes	Number of pupils/ classes	Total zone area (m2/pupil)	Ko (%)	Built area m2 /pupil
		25	2000-10000 (7.5m2/pupil)	30-40	6.68 (accepted 5)
Number of pupils	Number of classes	Number of pupils in classes	school zone area (m2)	Ko (%)	Built area m2 /pupil
1039	41	25	7792.5	30-40	6940.5
817	33	25	6127.5	30-40	4085
543	22	25	4072.5	30-40	2715
342	14	25	2565	30-40	1710
78	3	25	585	30-40	390
Number of pupils	Number of classes	Number of pupils in classes	2000-10000 (19m2/pupil)	Ko (%)	Built area m2 /pupil
1256	50	25	23 864	30-40	8792
1300	50	25	24 964	30-40	9792

NEEDS FOR POSSIBLE EXTENSIONS

Number of pupils	Number of classes	Number of pupils in classes	school zone area (m2)	Built area m2	Conclusions
1039	+9	-7	+4302.5	+5340.5	The school has a high density of pupils and a lack of educational spaces.Estension of the school is needed .
817	+9	-9	+4302.5	+5340.5	The school has a high density of pupils and a lack of educational spaces.Estension of the school is needed .
543	+2	-2	+1712.5	+2101	The school has a normal number of students but its infrastructure is in a bad state and needs immediately reconstruction and a larger green space.
342	-	-	+565	+870	The school has a normal number of students but its infrastructure is in a bad state and needs immediately reconstruction and a larger green space.
78	-	-	+53	+41	The school has a normal number of students but its infrastructure is in a bad state and needs immediately reconstruction and a larger green space.It has lack in recreative and sportive spaces.
Number of pupils	Number of classes	Number of pupils in classes	school zone area (m2)	Built area m2	Conclusions
1256	+15	-11	+20 064	+7542	The school has a high density of pupils and a lack of educational spaces.Estension of the school is needed .
1300	+15	-11	+25 064	+8542	The school has a high density of pupils and a lack of educational spaces.Estension of the school is needed .

Based on this study , it is neccesary to project in order to some rules and principles that give sustainability to the building .Finally a sustainable school must respect certain principles ,so neccessary for the situation in Albania

It must be functional and flexible
Functionality
During the design phase of schools buildings should be created a balance between quality and cost efficiency operation . This balance can be achieved by various ways , such as:
• Rational dimensions of spaces ;
• Oriented circulation : Circulation spaces should not exceed 25 % of the built useful area. They should have specified dimensions and shold be approriate for the users of the school . Also they should be functional and respect some safety requirements ;
• The optimal number of areas : the number of spaces is determined initially by the tipology of the school .In small schools, where acceptable rate can not be achieved in particular for specialized teaching spaces , it is necessary a multifunctional space ;
• Maximum Compatibility : spaces should be designed with a maximum adaptability , which enables to adapt to changes and different subjects , in those cases where it fits with their functional requirements ;
• Grouping of spaces : spaces should be grouped in blocks in order to their function and interactivity.This would ensure easy identification of activities and their respective spaces , an easy communication between different spaces , unobstructed circulation through

areas and reception zone, an easy observation of space and optimal utilization of available land ;

    • Inclusion of needs : the place of spaces within the school must follow the basic necessities such as sanitary and hygiene rules , regulations and safety functional comfort , acoustic comfort , visual and climate comfort.

Flexibility

    • It must be provided enough space for flexibility to enable school staff ,to adapt the school environment and different teaching methods , and to enable planners to adapt buildings for the future needs of the school , which coincide with the curriculum and with potential future programs .

    • Flexibility required for buildings (and furnishings) enables multiple teaching methods to their classrooms (frontal teaching , small group work , learning in the form of seminars, etc. .) , Specialized laboratories and halls (practical work , demonstration and full group) , and spaces for multiple purposes and sports halls (possibility of regrouping of some classes) .

    • Types of sharing space program that are given in the project must be designed into structures that can be easily modified to suit the requirements in the future . Planning flexibility is an important design evaluation / school project ,to adapt the continuous evolution of educational thought , as well as construction techniques and technologies . Also helps to adapt the school to new uses through changes in planning with a minimal cost .

It must be aesthetic
Aesthetics

    • The importance of physical appearance of a public school should not be minimized . A school that is attractive , which corresponds to design and environment context , evokes a sense of pride and ownership among students , teachers and community . As with most of the buildings , the school is a symbol of knowledge and the advancement of the community .

    Precisely for this reason the architectural quality of school buildings should contribute to the school not only functionality , but also its integration into the community and its construction as a symbol by :

    • - establishing a good sense of architecture to students through harmony and proportion of built up areas , open spaces , views (facades) ;

    • - creating a pleasant environment in school by using good quality materials , colors and plants , and by creating a fluid circulation etc. .

    • - enabling an easy identification of the different spaces through their grouping by activity and by providing easy connections between buildings and spaces ;

    • - inclusion of cultural values and specific elements of the environment ,of the community in order to rise a feeling of accessibility and school pride . ;

Climate comfort:

Thermal Comfort usually involves two key parameters , which are :

    • the feeling of thermal comfort as a result of the balance between accumulated calories and lost calories of our body;

    • control of climatic conditions , including the position of the sun and its radiation , temperature , humidity and winds .

The climatic conditions of Albania

    • In Albania, prevails a Mediterranean climate , with warm summers and cold winters with Mediterranean and Alpine influences (the average temperature in the country ranges from +30 ° C (in summer) to -10 ° C (in winter) .

• Based on climatic conditions , Albania can be divided into three climatic zones :
• Northeastern , southeastern and northern -cold winters and cool summers ;
• Western Zone - southern wet winters mild and hot summers ;
• Middle Albania - wet winters and hot summers and mild.

Improving the climate comfort

• In relation to improving school facilities thermal comfort measures should be taken to control the climate , such as :

• Natural or passive measures , which include building orientation , position and dimensions of openings , quality of materials , thermal insulation , planting trees near buildings etc.

• Artificial or active measures , which include those electrical or mechanical elements , such as heating, ventilation or air conditioning .

• To control the climate effects on schools building , in the design process should be taken a few simple measures , such as :

• Orientation of buildings : recommended orientation of learning areas is north and south , since this orientation offers protection from the direct rays of the sun . This prefered orientation can be deviated by about ± 30 ° (due to the requirements of location or orientation of prevailing winds) , without having any major impact on the comfort of teaching rooms.

• Form of buildings is related to the possibility of cross- flow air to renew inside air with natural ventilation during the hot season , or by choosing the roof slope with four levels in areas with snow .

• Planted area : planting plants can play an essential role in the creation of microclimate in those cases when it is necessary . Planting effectively contributes to protection from dust , wind and sunlight . In addition, planting of shrubs and bushes makes possible the protection against sun rays reflecting from the earth .

•Appropriate elements of the building : this includes proper drainage from the roof and drainage around buildings ; creating shadows by folding the window ,using curtains sun that can bring extra protection from sunlight, especially in those cases when the orientation of the building is highly exposed to the sun .

•Necessary construction materials: includes materials (facades) that can create the possibility of reflection of the sun ; and insulation materials that protect the building in order to create good thermal comfort inside.

Active Climate Control

• Low Temperatures : comfortable lower level of temperatures can be considered between 20 ° C for learning areas, and 15 ° C for circulation areas . Efforts should be made to provide heat in order to achieve these levels in the indoor temperatures (usually should not be too high) .

• High temperatures : Albania climate is mostly dry and hot from May to September .
Most of the days are sunny . Hottest months of the year are : July and August with regional variations due to altitude . For a comfortable school , limit air temperature should be 28 ° C. However specialized halls such as computer labs , which have alarge number of computers , temperatures can exceed 38 ° C and then cooling is required . Other laboratories may need cooling due to activities that bring heat or need to limit the degree of ventilation during certain activities and internships .

Passive climate control.

• Passive climate control in school buildings is achieved in two ways , with orientation and reflection of sunlight .

• Best orientation for a school building (to have proper light through the window) is north - south . North orientation do not reflect directly the sunlight on the window , while the

south orientation reflects minimum rays on the window under a very small angle . In hot days , when the sun is at its zenith , angle radiation from the south windows is narrower . The sun , from this orientation may be reflected very easily .

• Sun reflection : For the reflection of the sun can be designed such devices that can operate in any orientation , since the angle of the sun is entirely predictable . However , due to seasonal changes , to avoid changing of sunlight fall , mobile elements are required . In practice reflection is usually a compromise , because , even in those cases when it is designed to reach the optimum orientation , reflection will be always present . When we orient the building through south , the window must be designed with an exterior exit level horizontally with the upper part of the window.

• Sunlight should not fall directly on windows , because the heat is more effective when it enters through the heated glass, by increasing the effect of heat . In the mean time it should be noted that the use of double glass is ineffective in stopping the sun , it is effective only in the prevention of loss of sunlight from outside.

Control of ventilation

Ventilation needed is 30 m³ / 1 pupil during an hour of lessons.For permanent residency is needed minimally   5 m³ / 1 pupil clean air , it is neccessary to change the air 4 times (4 x 5 = 20 m³ for one pupil) .

Ventilation can be natural and mechanical for special occasions .

Natural ventilation is continuous air changes in a natural way .(by opening the windows)

Mechanical ventilation is part of natural ventilation . It is necessary only in laboratories and workshops , where are released gases and dust, and in multipurpose space .

Lighting needs
Natural

The use of natural light should be the principle priority in a building school.
-Specific tasks for natural light :
-Work rooms and classrooms need large windows, that allow a deep natural lighting into rooms . The area of the window should cover at least 15 % of the floor area.In rooms ,that during the classes it is allowed the enter of the sunlight , should be provided protective curtains .
-Windows are not allowed in the same wall with the blackboard .

Natural lighting must meet these requirements :

The entring ray angle till the furthest reflected angle from the window should be between 25 ° - 30 ° .

Area of opening elements of windows should include 1/3 of the surface of the window.   Classes must be oriented to south - east .
Visual comfort in classrooms can be achieved :

By having a high level of lighting on desks surfaces.This can be achieved by determining the ratio between the area of the window against floor's area and window's level towards room's depth.It is recomended B / H = 3.5. This is achieved if the area of the window is like 20 % of the floor area for ribs report 1.5-1 or 25%.

By using uniform lighting distribution due to the depth and length of the classroom.For this it is neccesary that the parapet of the window should not be higher by more than 80 cm from the floor ;by using ribbon windows that improve the light uniformity .For deep classes it is recommended two sided windows or integrated natural and artificial lighting .

Surfaces of the walls , ceiling and floor must be rough to eliminate mirror reflections in order to create a difuse light.Colors and their nuances should be warm and light.

Best orientation is east , west , south-east , south-west and south : except drawing classes that must be oriented to north ,because diffuse light comes from here .

Artificial
The level of lighting in (lux)

Recommendations	
Spaces	(Lux environments demand)
Classes , blackboards , cabinets	300 lux
Hall of teachers , administration	300 lux
Library	300 lux
Gymnastics halls	200 lux
Courtroom drawing	300 lux
Laboratories , workshops , first aid environment	300 lux
Stairs , wardrobes , sanitary	100 lux
Entry secondary , secondary corridors , warehouses	100 lux

-Entry and exit routes should be illuminated with lights convenient (about 10 lux) .

Contrast
The maximum ratio of the density of light between two close surfaces is 5:1 and between two different surfaces is 100:1. Reflection Rank : possibly 70 % for ceilings , walls approximately 50 % , floor approximately 20 % , furniture , equipment and walls interior at least 30 %.

The object should be studied in order to the connection between the working and environmental surfaces .

Largest Contrast enhances object's vision .

Brightness
Brightness is caused by natural changes conditions and may cause damages to the eyes.Brightness can be reduced by taking the following measures :
Light colored windows reduces levels of contrast .
Increasing the number of lights in the room .
By coveraging the lighting lamps (in order not to shine directly)
Measures recommended for acoustics:
• To ensure a good listening environment ,during school design it is important to consider the location of the school : noise from outside can be controlled by projecting the school buildings as far as possible from noisy urban areas ; by orienting learning spaces away from noise sources ; by building fences around the school or by adding the planted area to limit the penetration of noise from outside (from markets , highways , stations etc. .) .

To guarantee an auscultation close to 85% is necessary that the noise that comes from outside does not exceed the limit of 55 dB .
• Noise rates between the two spaces should be:
• a) between two classes 50 dB
• b) divisions between floors max . 48 dB
• c) between the hall and physical education classes 60 dB
• d) in work environments should be below   85 dB

Environments that develop an intense noise (workshops , music classes) should be positioned away from learning classes .

Energy efficiency

Energy efficiency means that for the same service we use less energy.It is the key of reducing daily energy consumption and therefore reduces the cost of the building.This term should not be confused with energy conservation , because conservation meams to reduce the number of services to save energy , for example turning off a light is energy conservation , but the substitution of a lamp with an economic one is an energy efficiency .Both these processes reduce the emission of harmful gases and bad substances in the air .

Energy efficiency is measured in kWh/m² per year .

Based on the value of energy consumption school buildings are divided into :

• buildings with high energy consumption amounting to 70 kWh / m² per year.Here are included large schools and mostly outdated one.

• Buildings with an average energy consumption value from 50 to 68 kW h / m² per year

• Buildings with low energy consumption 25 to 48 kWh / m² per year .

• Passive Buildings 15-40 kWh / m² per year

• Building with 0 kWh / m² per year energy consumption .

In Albania we are still far away from the concept of a passive building although in recent years we are making big efforts.Most of elementary ,secondary and high schools that are built before the 90s , even though they are reconstructed over the years ,they haven't paid attention to their energy efficiency.The average consum of secondary schools in Albania is 65.3 kWh / m² per year , while for high schools runs 72.6 kWh / m² per year , (the value obtained from the pilot project " Energy consumption of Albanian schools ' year 2005, the Ministry of Education and Science) .

Conclusions

Characteristics of a sustainable school :

A high Architectural Design quality .

Functional and rational organization of spaces.

Compact volumes to prevent energy losses .

Planning possible extensions in the future , physical changes , during the design phase.

Availability of space required for the performance of all activities programmed for a certain typology of school .

Integration with the district community by projecting the school as a mix building that offers various recreational activities .

Respect human kind as a key ingredient to increase the longevity of the building .

Continuous improvement of learning conditions (ventilation , lighting , heating) to promote active participation in class.

Use of ecological materials in the facade and interior in order to meet the hygienic sanitary standards , which would not affect the health of pupils .

Integration of nature and its elements in the school environment to enhance air quality and recreational opportunities .

Avoiding misuse by increasing energy efficiency.The use of inexhaustible resources like sun , wind, water to save energy and reduce the cost of the building .

Use of passive and active systems .Regarding the process of heating , cooling and ventilation .

Best orientation of the building towards the south to use solar energy and to apply passive and active systems .

Design of classes in such way to meet the norms required for a good lighting. Maximum use of natural light and good modeling of the interior spaces by using rational shapes, materials and colors that reduce visual discomfort .

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Detyra e projektimit P.RR.Tirana –Bashkia Tirane.

HIGH PRECISION CALCULATION OF MOVE OUT CORRECTION IN GPR MEASUREMENTS

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Abstract

Ground penetrating radar (GPR) is a non-invasive geophysical method that can be used in shallow subsurface exploration. Using GPR it is possible to make high precision measurements of thickness of deposit layer and its distribution in research area. In cases when GPR measurements are performed by bistatic antenna system, time intervals after which reflected signals are received usually are measured relatively to arrival of direct signal. As a result the precise time interval that is necessary for signal to travel from antenna system to reflector is unknown. This paper provides description of precise *move out correction* value determination experiment and calculation method. Recommended method was tested on 3 different bogs in Latvia (Cenas tīrelis bog, Dzelves bog and Ķūķi bog). The main conclusions of described research are: Traditional method of *move out correction* calculation is inaccurate in cases when GPR antenna systems in process of radiolocation profiling are in direct contact with the ground surface. Suggested method of *move out correction* calculation is easy performable and gives accurate results.

Introduction

Ground penetrating radar (GPR) is a non-invasive geophysical method that can be used in shallow subsurface exploration (Daniels, 2004). GPR generates short electromagnetic impulses that are transmitted into the ground by transmitter antenna and reflected from buried objects or deposit layer with different electromagnetic properties boundaries. These reflections are detected by receiver antenna and recorded as GPR profile that contains information about time intervals after which reflected signals are received. Using GPR it is possible to make high precision measurements of thickness of deposit layer and its distribution in research area. Nevertheless to achieve mentioned precision it is necessary to determine time intervals after which GPR signals are detected with high accuracy.

In cases when GPR measurements are performed by bistatic antenna system, time intervals after which reflected signals are received usually are measured relatively to arrival of direct signal (signal that travels direct from transmitter antenna to receiver antenna). As a result the precise time interval that is necessary for signal to travel from antenna system to reflector is unknown. This problem is well known and usually is solved with addition of *move out correction* (Neal, 2004). In general application of *move out correction* is addition of extra time that was necessary for traveling of direct signal from transmitter antenna to receiver antenna to measured time interval after which reflected signal is received (Equation 1).

$$t = t_m + t_k \qquad (1)$$

where t is the time after which reflected signal is received, t_m is the measured time after which reflected signal is received relatively to direct signal and t_k is the time that was necessary for direct signal to travel from transmitter antenna to receiver antenna.

Time that is necessary for signal to travel from transmitter antenna to receiver antenna for set antenna system can be calculated with equation 2:

$$t_k = \frac{S}{v} \qquad (2)$$

where t_k is the time that is necessary for direct signal to travel from transmitter antenna to receiver antenna, S is the distance from transmitter antenna to receiver antenna and v is the speed with which GPR signal travels between antennas. Usually it is assumed that direct signal travels through the air thereby the signal propagation speed is equal to electromagnetic wave traveling speed in the air (0,2998 m ns[-1]) (Neal, 2004). This is correct for cases when used GPR antenna system in process of radiolocation profiling is not in direct contact with the ground surface.

Nevertheless many GPR antenna systems in process of radiolocation profiling are in direct contact with the ground surface. In such configuration of GPR antenna direct signal consists of sum of air signal and signal that travels along ground surface (Figure 1) (Daniels, 2004).
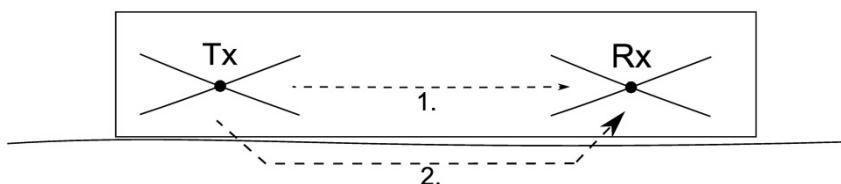
Figure 1. Individual components of direct signal. Where Tx is transmitter antenna, Rx is receiver antenna, 1. – signal that travels through air and 2. – signal that travels along ground surface.

Accordingly to above outlined thee is the hypothesis that the calculation of the time that is necessary for direct signal to travel from transmitter antenna to receiver antenna can not be based on the assumption that direct signal travels through the air nor calculated with equation 2.

This paper provides description of precise *move out correction* value determination experiment and calculation method.

The calculation metho

It is possible to calculate precise time interval what is necessary for direct signal to travel from transmitter antenna to receiver antenna using data that can be obtained in comparatively simple experiment.

In the beginning of the experiment GPR antenna should be placed on ground surface and then recording of GPR profile should be started (Figure 2, A). After acquisition of several traces GPR antenna should be lifted from ground surface in height of at least 50 cm (Figure 2, B). During experiment it is crucial to identify the traces that are recorded when GPR antenna system is in direct contact with ground surface and the traces that are recorded when GPR antenna system is lifted in the air.
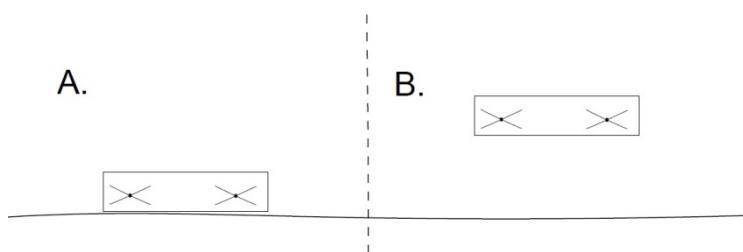
Figure 2. *Move out correction* determination experiment. A – initial pozition of antenna. B – antenna pozition in the end of experiment.

In Figure 3 is shown in such experiment obtained GPR profile. As one can see when antenna system is lifted direct signal is received several nanoseconds earlier.

In the end of the experiment antenna system is lifted in the air and it can be assumed that direct signal travels through the air and there is no component of ground surface signal. Thereby it is possible to calculate time interval that is necessary for signal to travel from transmitter antenna to receiver antenna by equation 2 using electromagnetic wave traveling speed in the air. Afterwards using in above described experiment obtained GPR profile there can be measured the time difference between time when direct signal was detected in position A. (antenna system is on the ground) and position B. (antenna system is lifted in the air).
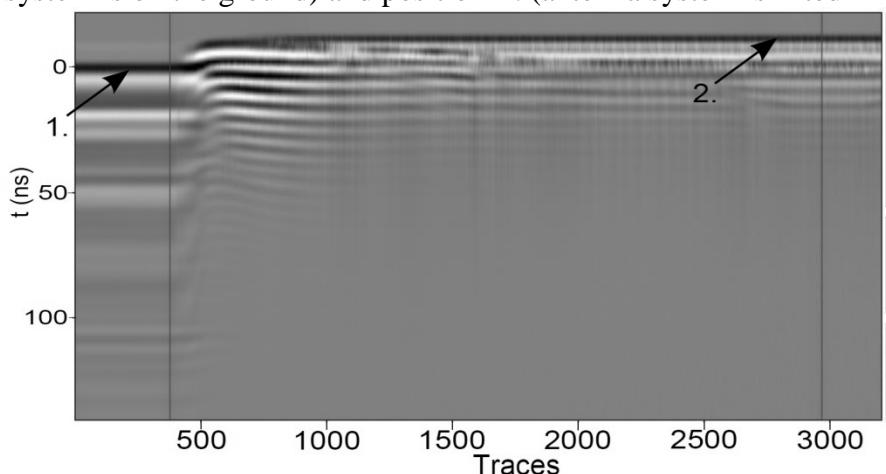
Figure 3. In experiment obtained GPR profile. 1. – identified direct signal when GPR antenna is on ground (corresponds to figure 2A). 2. – identified direct signal when GPR antenna is lifted in the air (corresponds to figure 2B).

Finally the addition of the time difference to calculated time interval that was necessary for direct signal to travel from transmitter antenna to receiver antenna in position B gives the time interval that is necessary for direct signal to travel between antennas in direct contact with the ground surface (Equation 3).

$$t_k = \frac{S}{c} + t_d \qquad (3)$$

where t_k is precise value of move out correction, S is the distance from transmitter antenna to receiver antenna, t_d is the measured time difference and c is electromagnetic wave traveling speed in the air.

Experiment results

Recommended method was tested on 3 different bogs in Latvia (Cenas tīrelis bog, Dzelves bog and Ķūķi bog). For determination of the depth of bog in all three research areas common midpoint measurements (Comas et al., 2011; Musgrave and Binley 2011, Lowry et al., 2009; Neal, 2004; Reynolds, 1997) were done. To evaluate precision with which depth of these bogs were determined using only GPR measurements the exact depths of bogs were determined directly using hand drill.

In the process of the depth calculation with data that are obtained during CMP experiment *move out correction* need to be applied. As a result precision of calculated depth values depends on precision with which *move out correction* values are determined. Thereby

using accuracy of calculated bog depths above suggested method of *move out correction* calculation can be evaluated. For comparison also bog depth values were calculated applying *move out correction* values that are calculated assuming that direct signal travels through air (Table 1).

Table 1. The experimental results of the bog depth determination.

	Directly determined depth of bog (m)	With Equation 3 calculated *move out correction* values (ns)	Determined bog depth during CMP experiment (traditional approach of *move out correction* calculation) (m)	Determined bog depth during CMP experiment (suggested approach of *move out correction* calculation) (m)
Cenas tīrelis bog	4,52	10	4,38	4,57
Dzelves bog	3,82	3,8	3,80	3,85
Ķūķi bog	6,48	4,6	6,47	6,52

As obtained results show in most of the cases it is possible to calculate bog depth with high precision using traditional approach of *move out correction* calculation. Nevertheless as it is shown in Table 1 in some cases application of traditional approach of *move out correction* calculation can induce inaccuracies. For example calculated depth of Cenas tīrelis bog strongly depends on calculation methodology of *move out correction*. It can be explained by the fact that ground surface in Cenas tīrelis bog was humid and as a result electromagnetic wave propagation speed along it was noticeably slower than in air. Therefore suggested *move out correction* calculation method was essential for accurate depth value calculation in particular research area.

As ground surface was relatively dry in Dzelves bog and Ķūķu bog, electromagnetic wave propagation speed values along them were close to electromagnetic wave propagation speed value in the air. Therefore traditional approach to *move out correction* calculation provided relatively precise results.

Conclusions

Traditional method of *move out correction* calculation is inaccurate in cases when GPR antenna systems in process of radiolocation profiling are in direct contact with the ground surface.
Suggested method of *move out correction* calculation is easy performable and gives accurate results.

If electromagnetic wave propagation speed along ground surface in research area is presumably slow it is recommended to use suggested method of *move out correction* calculation.

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STABILIZATION OF SOIL RESISTANCE IN NEW INSTALLATION IN THE COASTAL SOIL IN NIGER DELTA

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Abstract

Earthing is an intrinsic part of the electricity system and one of the requirements is to provide a sufficient low impedance to facilitate satisfactory protection and operation under fault conditions.

In the coastal area of Niger Delta where the soil resistance is low due to the salt content of the subsoil water and the nature of soil the wanted advantage results to nuisance tripping of the protective device. This situation is common with the residual current device (RCD). This experience last for a period of 3 months to 6 months after that becomes normal. A study was carried out to identify the reasons of the local problem.

The soil resistivity test was carried out in 10 different locations on the different soil at a depth of 1.0 to 1.5 meters, which is an approximate electrode planting depth for domestic installations. From the tests and analysis it was concluded that the low soil resistivity contributes to the nuisance tripping of residual current devices. If other protective devices (fuses) are used the nuisance tripping effect is not felt.

Keywords: Nuisance tripping, residual current device, Physico-chemical property of soil, Adiabatic Equation, Prospective short circuit current

Introduction

Earth (earth system) is a conducting connection, whether intentional or accidental by which an electric circuit or equipment is connected to the mass of earth or some conducting body of relatively large extent that serves in place of the mass of earth [1].

The reasons for earthing a system are

- To provide sufficient low impedance to facilitate satisfactory protection operation under fault conditions

- To ensure that living beings in the vicinity of substations are not exposed to unsafe potentials under steady state or fault conditions.

- To retain system voltages within reasonable limits under fault conditions and ensure that insulation voltages are not exceeded

- Provide an equipotential platform on which electronic equipment can operate.

In order to be able to carry out these functions and more, the earthing system must generally have low impedance so that in dispersing or collecting current from the ground, an excessive voltage rise does not occur [2, 3].

Earthing system is to ensure that in the event of an earth fault, any fault current which does result can return to source in controlled manner. By controlled manner, we mean that the return path is predetermined such that damage to equipment or injury to individuals does not occur. However, the impedance of the earthing system should be low enough that sufficient

earth fault current can flow to operate protective device correctly, which will in turn initiate the operation of circuit breaker or fuses to interrupt the flow of current [3, 4, 5].

Another area of earthing is bonding. Any exposed conductive metal work which can be touched is connected together via bonding conductors. Bonding is to ensure that should a live conductor come in contact with exposed conductive metal work, then the potential on all exposed conductive part becomes virtually the same.

Low impedance is possible when the soil resistivity is low. The resistivity is the resistance of the soil to the passage of current and it varies from soil to soil.
The soil in which the over flow of current from the earthing arrangement takes place is very complicated and heterogeneous in composition as well as structure. The main component parts of soil are hard particles of inorganic or organic origin and water. The electrical conductivity of hard components of soil in dry condition is negligible. It shows that chemically pure water similarly posses very high specific resistance [6, 7].

The different salts and alkali contained in the soil in presence of moisture, forms electrolyte which determines the electrical conductivity of the soil. In this way the specific resistance of soil depends very much on its chemical composition and moisture content. The moisture retaining capacity of soil does not only depend upon the quantity of suspended moisture and nearness to subsoil water but also on the structure of soil. Smaller the dimension of soil particles, greater the quantity of water retained by the soil; that is the greater is its moisture retaining capacity.

The resistivity of a soil can be determined by the quantity of water held by the soil and the resistivity of the water itself. It may be noted that resistance drops quickly to a more or less steady minimum value at about 15 percent moisture contents. A further increase of moisture level in soil will have little effect on soil resistivity. From the value given in table 1, in normal soil condition, the resistance remains fairly different for increase in moisture condition (15%-20%).

Table 1: Resistivity Values for different moisture and salt percentages.

Moisture content weight (%)	Resistivity ohm-m	Added salt by weight (%)	Resistivity ohm-m
0	$1,000 \times 10^4$	0.0	107
2.5	2,500	0.1	18
5	1,650	1.0	4.6
10	530	5.0	1.9
15	310	10	1.3
20	120	20	1.0
30	64		

The percentage of salt needed for the most effective earthing is about 5 percent weight of salt.

Protective Devices

The protection requirement in an electric circuit depends on the anticipated hazards, relative degree of protection required and the capacity of the undertaking to bear the cost of the protective devices.

In domestic installations protection is undertaken by fuses (rewirable and HRC), circuit breakers (MCB, RCCB ELCB) etc. A fuse acts both as protective and disconnecting device. The fuse protection is based on the concept of thermal heating given by I^2t (Amp^2s). A fuse breaks a short circuit in two stages-pre-arcing and then arcing.

The pre-arcing thermal stress corresponds to the minimum energy necessary for the fuse element to start melting. The arcing thermal stress corresponds to the energy limited

between the end of the pre-arcing and total breaking. The sum of the arcing and pre-arcing stress gives the total thermal stress [8, 9].
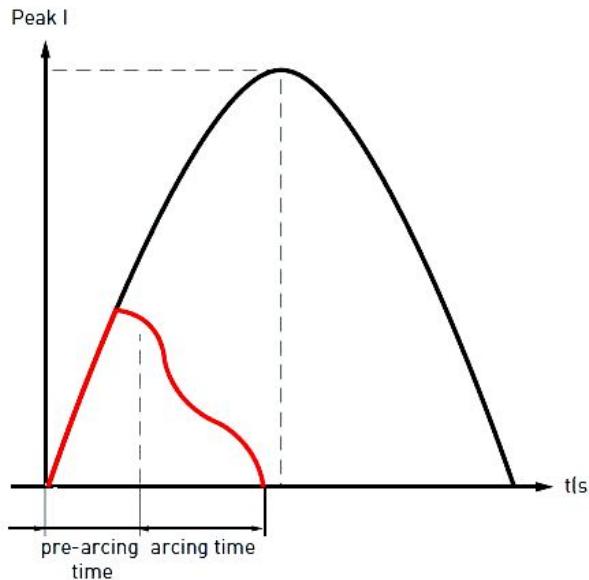
Figure 1: Pre-arcing and Arcing Curve (Thermal Stress)

The time versus current characteristics of a fuse are approximately I^2t constant (k) for large current (psc). The amount of heat energy that cable can withstand is given by K^2S^2. Hence the let-through energy should not exceed K^2S^2, that is

$$I^2t=K^2S^2 \qquad (1)$$

Therefore, $t = K^2S^2/I^2$, which is the maximum disconnection time in sec.

Where k = a factor depending on insulation material of conductor

S= conductor cross-sectional area

I=fault current in amps

t=duration of short circuit time in sec.

The value of current which assumes the correct operation of a fuse can be ascertained from the current/time performance graph for the fuse concerned.
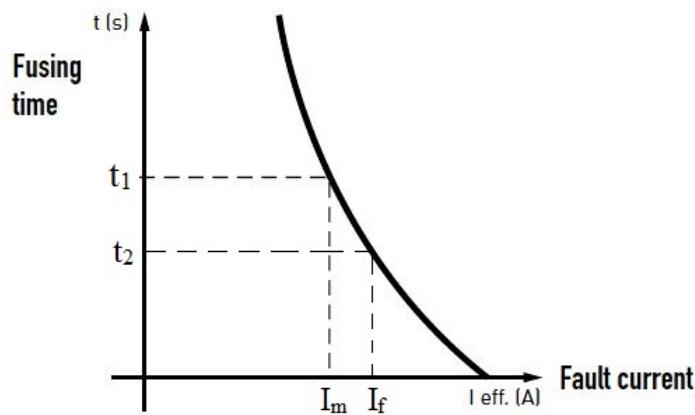
Figure 2: Current–time performance curve for a fuse

If the maximum disconnection time t_1 corresponds to a value of current I_m.

$$R_m = \frac{V}{I_m} \qquad (2)$$

If the fault current for instantaneous operation must be greater than I_m ($I_f > I_m$)

The impedance value Z_r for the fault current is I_f, then

$$I_f = \frac{V}{Z_r}$$

(3)

Circuit Breaker Operation

Overcurrents are detected by the different devices, thermal for overload current, magnetic for short circuits and electronic for both. Thermal consist of a bi-metal strip which if heated beyond the normal operating value becomes deformed, releasing the lock holding the contact. The reaction time of a bi-metal strip is inversely proportional to the intensity of the current [8, 10].

The magnetic release consist of a magnetic loop whose effect releases the lock holding the contact, thus triggering the breaking if there is a high over current. Thus, the responds time is very short.
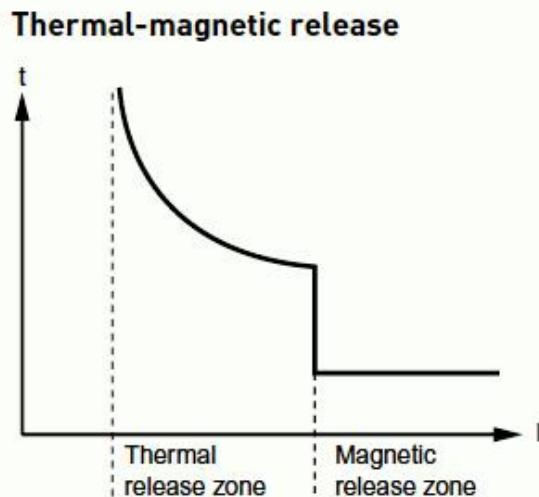
Figure 3: Thermal-magnetic release

Electronic Release

A coil placed on each conductor continuously measures the current in each of them. This information is processed by electronic module which controls the tripping of the circuit breaker when the values of the settings are exceeded [9, 11].
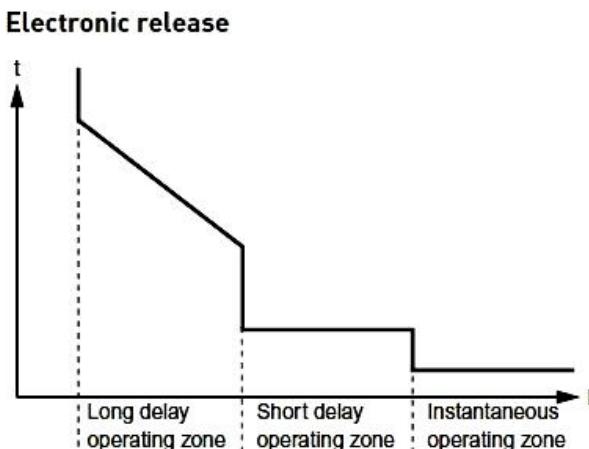
Figure 4: Electronic release curve

If there is a short circuit without any protection the current that flows through the installation is the prospective short circuit current (PSCC). When a short circuit crosses a circuit breaker, the circuit breaker has the capacity to a greater or lesser extent to allow only a part of this current to flow.

The short circuit is then limited in amplitude and duration. The purpose of limitation is to reduce

- thermal stress
- electrodynamics forces
- effects on electromagnetic forces

It also makes discrimination and combination easier. The limitation capacity of device is represented in the form of limiting curves. This is shown in figure
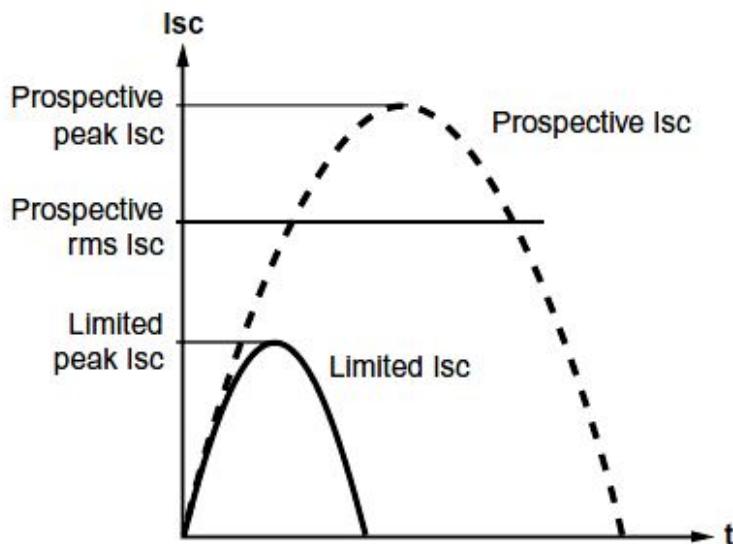
Figure 5: Limiting curve for prospective peak current

Current Limitation Curves: This gives the maximum peak current values (peak) limited by the devices according to the values of the prospective short circuit current. The limited current values are used to determine the size of the busbar and to check the withstand conductor and devices.
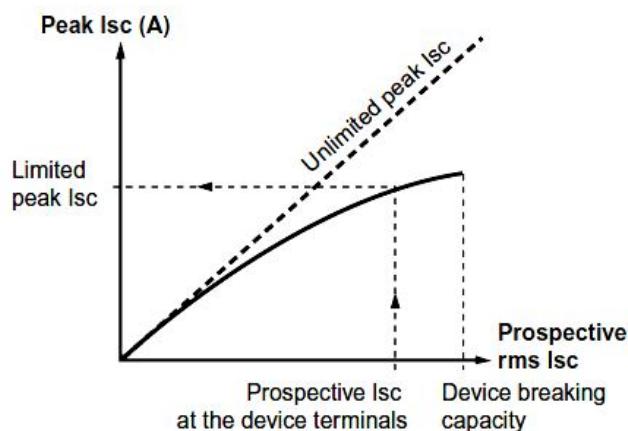
Figure 6: Current limiting that determines the different operations of RCD

Nuisance Tripping: Due to the nature of trip device of (RCD) circuit breaker, nuisance tripping occurs as a result of several factors. Included among these are

- Choice of wrong rating
- Harmonic current and voltage generated by an increasing number of loads.
- Constant load, leakage current both at power and higher frequency
- Florescent lighting or electronic ballastand house hold appliance
- Switching surges – opening and closing of capacitive and inductive circuits (RLC circuit).

With the recognition of such effect it was still realized that the unwanted tripping was within 90 to 180 days of the installation.

It was discovered that the cause of this effect was the stabilization of electrode resistance that takes place within the quoted period.

Methodology

The soil test was carried out in ten (10) different locations of different soil type. The instrument used was the four point electrode method (the Wenner method). The Wenner technique uses four equally spaced electrodes connected in a line. Current was passed between the outer two electrodes (c_1, c_2) and the voltage between the inner electrodes P1 and P2. The resistivity of the soil is proportional to V/I
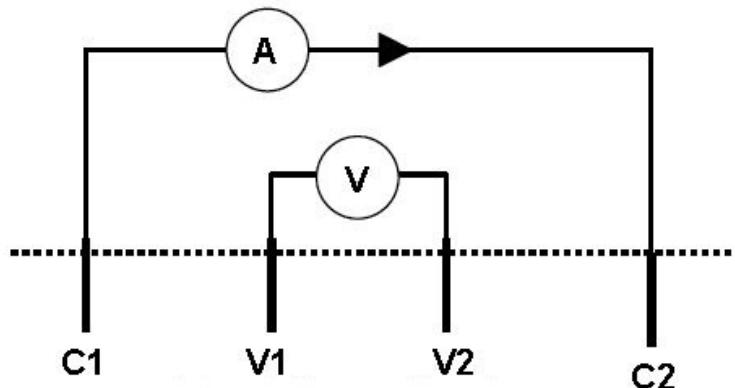
Figure 7: Wenner Configuration method

When the planting depth of electrode is much less than the distance between electrodes D, the formular takes the form

$\rho = 2\pi DR$

Where ρ = soil resistivity in ohm-

R = the value V/I in ohms

Results

The results of the measurements for the 10 sites are presented in table 2.

Table 2: Soil type, Resistivity, pH, Temperature and rainfall in some locations in Niger Delta

Site	Type of soil	Marshy ground water	Mean temp °C	Annual rainfall mm	Moisture %	pH	Resistivity Ω
Brass	Sandy subsoil mixture of sand and clay with marshy	1.2	32.6	2284	82	3.1	40
Bonny		1.2	33.1	2312	78	3.6	50
Degema	Sandy clay	1.8m	34	1878	77	4.1	180

Onne	Clay loam	3m	33.4	1.901	78	4.2	580
GRA CPH	Clay laom with sandy clay (surface)		34.5	1711	77	5.9	415
Borikiri PH	Clay loam	2.2	34	2065	79	4.0	165
Sagbama	Sandy clay	1.8	34.3	2341	81	3.9	102
Ekowe	Sandy clay muck	1.2-1.8	33.7	2290	82	6.1	80
Swali Yenagoa	Sandy clay	1.8-2.0	34.1	2209	80	5.6	240
Obogene Yenagoa	Clay loam	2.4m	33.9	2075	80.2	6.4	405

For decay vegetation areas (low drainage) and other humus areas were aggressive. This was seen in some area of Ekowe. These sites were more alkaline, especially some areas that pond.

Discussion

The effect of ohmic resistance can be predicted on the basis of the resistivity of soil and the distance between the anode and the cathode. The short circuit current of a cell is usually maximum at the beginning, decreases gradually with time and after a certain period then stabilizes. This behaviour is represented by asymptotic nature of cell current-time curves (4-6).

The reduction in initial current value is attributed to reduction in initial potential difference due to the displacement of initial anode potential in positive direction (anodic polarization). Anode polarization increases with retardation in chemical reaction between metal ions and electrolyte, concentration of metal ions in the anode region and passivation of metal. Certain cells deviate from this general pattern of the chronological behaviour of cell current. Some require a small period for stabilization after which the cell current becomes maximum [1, 12]. The cells constituted by a soil having some depolarizing agents register increment in the cell current at stage but after attaining the maximum, the behaviour becomes as usual. But in all such cases the current usually stabilizes within a period much earlier than 180 days and then the change in the cell current with time becomes mush less significant. Therefore the electrode potentials measured at the end of 180 days are the indices of the potential of the electrodes after the initial covering of the rapidly forming corrosion product, whose protective action becomes fairly constant and does not significantly increase with further increment in the film thickness.

This tripping of soil resistivity was common in the coastal area of brass, bonny and also on marshy areas with low resistivity. The ground water of Bonny and Brass contain various salts (electrolyte) so the resistivity is small, that is the resistivity was like the resistivity of water contained within the electrolyte.

From the foregoing reasons, the soil resistance is small and the earth resistance can be calculated as $\dfrac{2\rho\ell}{A}$

Conclusion

It has been established that the initial internal resistance of a cell is primarily due to the resistance offered by the soil intervening the two electrodes. As the corrosion proceeds the internal resistance increases due to the polarizing influence of the film of the products of the corrosion reactions. It is also realized that the internal resistance due to the soil at the initial period was fairly of the order of 10 percent of internal resistance at the end of the 180

days, that is the initial resistance is one-tenth of the normal value of the system value after 180days. In a fairly old installation the value may increase due to other factors. Therefore for areas with small earth resistance, nuisance tripping is likely in new installations. This also occur in area with small or no drainage and humus deposit areas.

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EFFECTIVE SPECTRUM SHARING METHOD USING POWER ALLOCATION ALGORITHM IN COGNITIVE RADIO NETWORKS

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Abstract

Major problem in cognitive radio network is frequent handoff between the spectrum bands which is sensed to be idle for the usage of the secondary users. Whenever the spectrum is utilized by the primary users the secondary user has to be looking for the free idle band in order to avoid the interference between the licensed and unlicensed user because of which the handoff between the secondary have been increasing between the idle spectrum bands. To avoid the frequent handoff and the efficient usage of spectrum of bands we propose a new power allocation algorithm. This algorithm not only adjusts the transmission power of the secondary user but also provides interference constraint between the primary and secondary user, through which the secondary user can obtain more spectrum for the usage. Finally the simulation result of the power allocation algorithm is illustrated and demonstration of the proposed scheme is shown.

Keywords: Handoff, power allocation algorithm, interference constraint, licensed, unlicensed

Introduction

The spectrum is a scarce natural resource and its efficient use is the utmost importance. In the development of future wireless systems the spectrum utilization functionalities will play a key role due to the scarcity of unallocated spectrum. Recent studies reveal that radio spectrum licensed to primary users is underutilized and the problem of "spectrum scarcity" is actually a problem of "spectrum access" [1]. Most spectrum bands are allocated to certain services but worldwide spectrum occupancy measurements show that only portions of the spectrum band are fully used. It has become essential to introduce new licensing policies and co-ordination infrastructure to enable dynamic and open way of utilizing the available spectrum efficiently. One promising solution to such problems is the Cognitive Radio. A ''Cognitive Radio'' is a radio that can change its transmitter parameters based on interaction with the environment in which it operates. The ultimate objective of the cognitive radio is to obtain the best available spectrum through cognitive capability and reconfigurability. Since most of the spectrum is already assigned, the most important challenge is to share the licensed spectrum without interfering with the transmission of other licensed users [3].

A typical cognitive radio consists of a sensor, a radio, a knowledge database, a learning engine, and a reasoning engine. A cognitive radio continuously learns from its surroundings and adapts its operational parameters to the statistical variations of incoming radio frequency (RF) stimulus. A cognitive radio selects a set of parameters based on knowledge, experience, cognition, and policies. The parameters chosen optimize some objective function. In the cognitive domain, knowledge or cognizance is obtained from

awareness of surroundings, based on input statistics from sensory observations and other network parameters [11].

The cognition cycle consists of three stages: observe reason and learn, and act. In the observe stage, the radio takes input statistics from the RF environment, updates the knowledge base, and tries to learn the trends with an ultimate aim to optimize a certain objective function during the act stage. It can be noted that, false input statistics in the observe stage can induce incorrect inference, which when shared might propagate throughout the network. As far as learning is concerned, several algorithms based on machine learning, genetic algorithm, artificial intelligence, etc., can be used. With the accumulated knowledge, the radio decides on the operational parameters in such a way that maximizes the objective function at any time instance. At times, different combination of inputs are tried to see if there is a significant change in the objective function. The results are stored in the knowledge base and also fed to the learning algorithms for them to evolve over time.

Spectrum Decision: Cognitive radio networks have to decide on the availability of channels before they can use them. The entity deciding on the occupancy compares the energy detected on a channel with a threshold; if energy is greater than the threshold, the channel is inferred to be occupied by a primary or a secondary. This process is termed as local sensing as it is done by a stand-alone cognitive radio. In an infrastructure based cognitive radio network, the local sensing results are sent to the central fusion center which combines the local results in accordance with a suitable fusion algorithm. The local sensing result may also be raw energy values; in which case the fusion center has to normalize the energy vectors from each node. Generally for larger networks, the local sensing result is a binary vector of 1's and 0's, where 1 denotes channel is occupied by a primary and 0 denotes absence of primary [11]. In contrast, in the ad hoc mode, the local sensing results are sent to all neighbors. A radio fuses the local sensing of its neighbors data before it can decide on the usage. The process of fusing data from other radios usually entails cooperation, and thus collaborative or cooperative sensing is usually employed. However, there is always a difference (both temporal and spatial) between the collected data and the result of the fusion. The possibility of this difference can be exploited by the malicious nodes.

Problem Formulation

In this paper, to reduce the frequently handoff among idle spectrum bands and fully utilize the spectrum resource for secondary users, we propose a new spectrum sharing scheme for the secondary user and focus on the problem of power allocation for secondary users. This new spectrum sharing scheme allows the secondary users to utilize all the spectrum bands (i.e. the spectrum bands occupied by primary users and the idle spectrum bands). And the secondary users firstly sense the state of spectrum bands before the data transmission. For the spectrum bands occupied by the primary users, the secondary users just only consider the interference constraints and adjust the transmit power in the spectrum bands, instead of handoff to idle spectrum bands. And for the idle spectrum bands, the secondary users can utilize them freely and only consider the total transmission power constraint. Under this new spectrum sharing scheme and the constraint conditions, we study the problem of distributed power allocation for secondary users and formulate the optimization problem as a Nash equilibria problem (NEP). Then we solve the NEP based on the variational inequality approach.

Assume P primary user and S secondary user with single transmitter receiver pair for each user. The frequency spectrum band is divided into T sub-channels. First the spectrum is sensed to determine whether it is idle or active then the power allocation is according to the sensing result. Let us consider T1 idle and T2 active sub-channels in a time slot where T=T1+T2 respectively.

Then NEP problem is formulated with of maximizing the transmission rate under the constraint condition. Therefore the NEP with prices can be formulated as follows

$$\max_{P_i} R_i(P_i, P_{-i}) - \sum_{p=1}^{P} \sum_{n=1}^{T_1+T_2} \alpha_{P,n|G_{pi}(n)|^2 P_i(n)}$$

Show that,

$$\sum_{n=1}^{T1} P_i(n) + \sum_{m=1}^{T2} P_i(n) \leq P_i^{tot}; \quad \forall\, i \in \{1,2,\ldots S\}$$

$$P_i(n) \leq P_i^{mask}(n); \forall n \in \Delta 1 \cup \Delta 2, \forall i \in \{1,2,\ldots,S\}$$

$$\sum_{i=1}^{S} P_i(n)\big|G_{pi}(n)\big|^2 \leq P_p^{peak}(n); \forall n \in \Delta 1$$

Where

$$R_i(P_i, P_{-i}) = \beta_{\omega 1} + \beta_{\omega 2}$$

$$\beta_{\omega 1} = \sum_{n=1}^{T1} lb\left(1 + \frac{P_i(n)|h_{ii}(n)|^2}{\mu_i^2(n) + \sum_{j\neq i} P_j(n)\big|G_{ij}(n)\big|^2}\right)$$

$$\beta_{\omega 2} = \sum_{m=1}^{T2} lb\left(1 + \frac{P_i(m)|h_{ii}(m)|^2}{\mu_i^2(m) + \varphi_i(m) + \sum_{j\neq i} P_j(m)|G_{ii}(m)|^2}\right)$$

In this formula, $P_i^{tot}, \forall\, i \in \{1,2,\ldots,S\}$ denotes the total power available for the ith secondary user, $P_i(n)$ denotes the transmit power for secondary user i in sub-channel t. $P_i^{mask}(n), \forall\, n \in \Delta 1 \cup \Delta 2$ denotes the spectral mask constraints that maybe imposed by radio regulatory bodies to limit the maximum power spectral density (PSD) that each secondary user can use over a specified band. $G_{pi}(n)$ denotes the channel gain in sub-channel n from the transmitter of secondary user i to the receiver of primary user p.

Power Allocation Algorithm
1. Sense the sub-channel state of primary users.
2. Based on the sensing results, the SU's take a transmission strategy with an iteration process.
3. In each iteration process, the PU updates its prices according to the interference.
4. Then SU estimate the prices and do the power allocation.
5. Until the prices satisfy a certain criterion, the power allocation for SU's is realized.
6. And when the set of prices is fixed, the power allocation for secondary users is determined.

This algorithm gives that at each time slot, the secondary users firstly take the spectrum sensing techniques to sense the sub-channel state of primary users. Then based on the sensing results, the secondary users take a corresponding transmission strategy with an iteration process. And in each iteration process, for those sub-channels occupied by the primary users, the primary users update its prices according to the interference and broadcast their prices to the secondary users [6]. Then the secondary users estimate the prices and do the power allocation.

Simulation Results
In this area the simulation result of the algorithm is been demonstrated. In this section we assume that the secondary user is having two ray propagation model with different channel fading in different channel. We assume that the total number of primary and secondary as P and S, so that P=20 and S=125 with 4 frequency spectrum and each spectrum

has 100 sub-channels totally. The total power of the user has been considered as 0.8 with the transmitting and receiving power.

In fig.1 the performance of the peak power with the average capacity has been shown. Here the capacity of the user increases with respect to the peak power. Also the interference between the primary user and secondary user reduces according to the peak power.
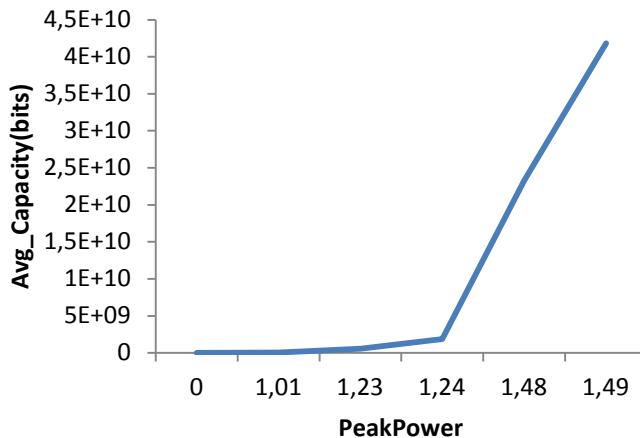
Fig. 1 Average Capacity vs Peak Power

In the fig.2 the convergence iteration count of prices of update for different number of secondary user. From the fig we see that the convergence iteration count of price with respect to interference increases with the increase of the number of secondary user.
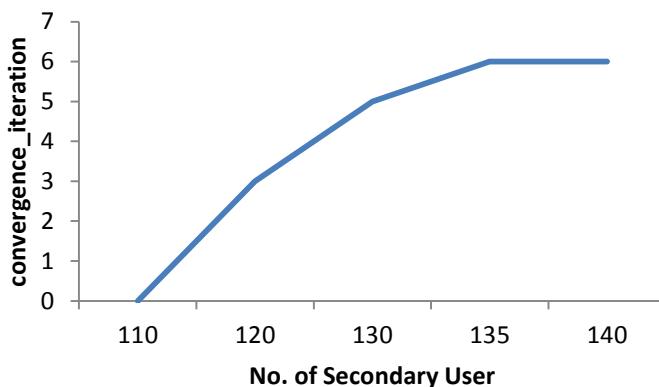
Fig. 2 Convergence iteration count vs Number of Secondary Users

In fig.3 we estimate the capacity of the secondary user with the increase of total power of the user and it is proven that the total power increases then the average capacity of the secondary user increase. It is proven by estimating the result with the different amount of total power and the simulation result is shown in the below figure.
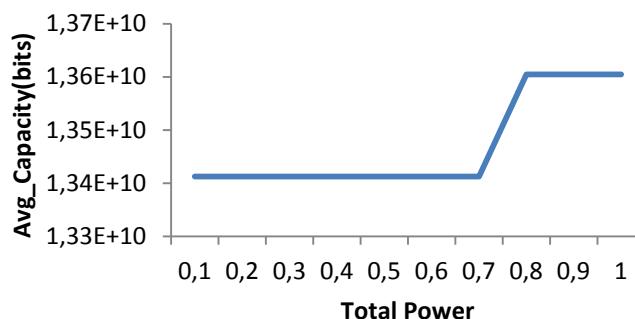
The Above simulation result shows that the power allocation algorithm of the new spectrum sharing has an effective utilization of the spectrum through the power allocation scheme to the secondary user.

Conclusion

In this paper, we have seen the optimal power allocation algorithm for a new spectrum sharing scheme. Here we have introduce the power allocation for the secondary user so that it reduces the interference between the primary user and secondary also allows the secondary user to utilize the spectrum even during the presence of primary user so that the spectrum is fully utilized and also the capacity of the user increases. The Nash Equilibrium Problem is also formulated and a variational inequality approach is been used to solve this problem. Finally the simulation result of the proposed scheme is demonstrated and the performance of the cognitive system also improved.

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ELECTRONIC VOTING: TO HAVE, OR NOT TO HAVE?

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Abstract

This article focuses on various factors related to electronic voting. The analysis therefore concerns formal requirements for electoral process, counting speed, number of invalid votes, counting errors, trust and electoral frauds, accessibility of the elections and turnout. In the finale the impact of e-voting is summarized and recommendation is delivered. The findings indicate that electronic voting can solve some problems in electoral design, but as well can deepen the existing ones and even create a new ones. It is therefore important to discuss it in context of respective electoral design, because there is no universal answer to the question contained in the name of the article.

Keywords: E-voting, elections, electronic voting, implementation framework

Introduction

There were never in human history possible to transfer information in such amounts, at such distances and in such time. The digital revolution conquered our world and started changing it. New possibilities of spreading information opened many doors and even more questions in many scientific fields.

Paraphrasing Shakespeare's Hamlet, to have, or not to have, that is the question of this article. The aim is to provide a comprehensive analysis whether to implement or whether not to implement electronic voting in elections.[17] The perspective will be primarily from the point of view of political science. However some overlaps mainly into informatics and law will be present. As a result there will be a methodological framework, a tool suitable for use in any country to evaluate the possible implementation of electronic voting and to measure its supposed impacts. The focus will be therefore laid on both advantages as well as on disadvantages.

First of all I will briefly introduce the definition of the terms, thereafter I will lay down the various aspects, which are need to take in mind, when considering the implementation of the e-voting. After that I will summarize it into methodological framework and close the papers by the conclusions and recommendation.

Definition

First of all, in order to discuss electronic voting, or e-voting, we need to define what it is? We could simply say that electronic voting is every voting which uses any electronic devices or techniques at any stage of electoral process. However, this definition would be too wide, because it will cover practically all types of voting, since counting the overall results from the fractional results is somehow computerized. Such a definition would not be therefore useful. So we have to look for some better.

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[17] In this text I am using the terms "electronic voting" and "e-voting" as mutually interchangeable.

Table 1 – Basic division of electronic voting	
Type	**Technique**
Voting in supervised environment (Voting at polling station)	DRE[18]
	Optic scanner[19]
Voting in unsupervised environment (Remote electronic voting)	Internet
	Digital television
	SMS
	Telephone

Council of Europe defines e-voting as "an election or referendum that involves the use of electronic means in at least the casting of the vote" (Council of Europe 2009, 16). I find this definition the most suitable for our needs in this article. However, it is quite predictable, that we will need more effort to distinguish different types of e-voting. There are plenty of definitions (see Council of Europe 2005, Kersting and Baldersheim (eds.) 2004, Alvarez a Hall 2004, Reterová 2008, Enguehard a Graton 2008), however for the purpose of this article we will content ourselves with basic division concerning the question, wheter the environment is or is not supervised. This means, whether or whether not the electoral officials have, or should have, full control on the electoral process. This division is contained in table no. 1.[20] It is quite a simplification, but for the purpose of this analysis is such a simplification sufficient without loosing any information relevant to the analysis.

Analysis
Formal demands of electoral process
The electoral law puts in a various countries various demands towards the process of the elections. For instance the voter registration, is it automatic or on request? What are the requirements for running in the elections? Etc. This legal framework has many aspects, but at this place we will focus on three of the fundamental legal aspect of free and democratic elections, which are challenged by the e-voting.

First of all, there is a question of maintaining the ballot secret. On one hand, there is a problem connected with family voting, which means that the vote is cast under pressure of close relatives. Thus it is not being the expression of free will of the voter (Enguehard and Graton 2008, 8) and on the other hand there is a problem with the security of the electronic envelope, in which is the vote cast electronically. Thus the guarantee of the secret ballot is highly questionable.

Secondly there is a problem in digital divide (Norris 2001), which means that not all the voters are skilled enough to participate in the e-voting process. This means that replacing the paper ballots by some kind of e-voting would, or should, make the elections inaccessible for some voters, the ones, who are not able or willing to participate via the electronic way. Thus the suffrage should be viewed as not universal and therefore unconstitutional in many countries. With this is closely connected the argument of saving money through using e-voting. This argument is fragile, since it is necessary to implement e-voting as a technique complementary to the paper ballots. So in a short term the e-voting will require additional

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[18] Direct-recording electronic voting system. In this paper I will understand under this term kiosk voting as well as voting terminals and intranet poll site voting.

[19] Votes are cast via a ballot in the polling station, the computerization is in fact, that the votes are scanned and counted by a computer.

[20] To be complex, we can as well define remote non-electronic voting, which will be the category for postal voting and similar techniques, or we can say, that paper ballot cast in the polling station is an example of non-remote and non-electronic voting, or the non-electronic voting in the supervised environment respectively.

money from public budgets. Some kind of saving is imaginable only in long term and hand to hand with reducing number of polling stations or leaving the paper ballot at all.

And finally, the principle of free elections requires that the votes are counted authentically, which means that there is an option for verification through recalculation for the purpose of judicial review. Some electronic techniques did not allow this recalculation, because the vote does not exist in a physical form.[21]

These are three main legal obstacles for e-voting implementation and as well the three main legal threats, which should be considered by legislators, who are thinking about to implement e-voting in their countries. This thread is not illusory, but real, the e-voting in all of its forms were abolished in several countries, for instance in 2004 in Ireland (Smith 2009, 7), the Netherlands in 2007 (Loeber 2008), Paraguay in 2008 and Germany in 2009 (Barratt i Esteve, Goldsmith and Turner 2012). It is important to understand that every cancellation of e-voting goes hand to hand with a wasting quite significant amount of taxpayer money.

Counting speed

It is important to have real electoral results as soon as possible. Any delay of delivering the final count should foster instability and even some sorts of public unrest. Long counting time should also hurt the credibility of the elections. It is undisputable, that e-voting in all of its forms greatly increase the counting speed of the elections. The result should be recorded de facto instantly.

Brilliant example of successfully reducing the time needed for counting the votes is Brazil, where implementation of DRE shortened it from approximately one month to 30 hours "only" (Reterová 2007, 219). However this can be applied only on electronically casted votes, so the speed increase depends on amount of votes casted this way, because for paper ballots there will be still necessity to count them manually.

Number of invalid votes

E-voting, in case that it is properly programmed, can as well eliminate any invalid votes, simply by not allowing voter to cast such a vote, or by permitting voter to cast invalid vote only after explicit confirmation.

It is important to look for the roots of the high numbers of invalid votes. (1) They can be cast as a sign of protest or (2) by an accident. In such case, the blame should go to low level of literacy, or basically to low level of election procedure awareness, or to the fact that electoral procedure is way too complicated. (3) And last but not least, the electoral law regarding the validity of the vote under the examination. The reasons for each country may differ, and detailed identification of the reasons for each country is not purpose of this paper. However, if we take a short look on the data[22] about percentage of invalid votes casted in the last parliamentary elections, we will see that there are totally 77 territories with percentage of invalid votes above 2 % out from the 160 territories monitored in the dataset. Regarding direct presidential elections instead of the parliamentary, we will get the number 61 out of 103. The high score is in parliamentary elections 19 % for Morocco in 2007, 15.6 % for Mauritania in 2006, 14.4 % for Algeria in 2007, 14.38 % for Indonesia in 2009, 11.45 % for Honduras in 2009, 11.25 % for Mozambique in 2009 and 10.58 % for Angola in 2008. The rest are under 10 %. In presidential elections is the score: 13.52 % for Comoros in 2010, 13.09 % for Angola in 1992, 11.9 % for Philippines in 2004 and 10.8 % for Yemen in 2006. Again, the rest are under 10 %.

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[21] This problem does not concern the optical scanners and some types of DRE, but it is inherent to all sorts of remote electronic voting.

[22] Accessible at the website of Institute for Democracy and Electoral Assistance, www.idea.int.

Among these countries are as well some of the developed countries, as it can be observed in table no. 2. For the countries with high share of invalid votes should be implementation of e-voting one of the solution of this problem. However closer examination of the reasons, why there are so many invalid votes, should be on the first place.

Table 2 – % of invalid votes in developed countries[23]		
Country	**Parliamentary elections**	**Presidential elections**
Chile	8.92 (2009)	3.39 (2010)
Luxembourg	6.45 (2009)	-
San Marino	6.43 (2012)	-
Belgium	5.8 (2010)	-
Australia	5.6 (2010)	-
Lithuania	5.48 (2012)	1.27 (2009)
Poland	4.52 (2011)	1.16 (2010)
Andorra	4.24 (2011)	-
Portugal	4.08 (2011)	5.07 (2011)
Palau	4 (2008)	-
Italy	3.59 (2013)	-
Liechtenstein	2.9 (2009)	-
Costa Rica	2.6 (2010)	2 (2010)
Saint Lucia	2.52 (2011)	-
France	2.14 (2012)	4.68 (2012)
Cyprus	2.08 (2011)	3.31 (2013)
Nauru	2.03 (2010)	-
Source: www.idea.int, ranked and selected by the author		

Counting errors

Research made by Ansolabehere and Reeves shows that there is approximately 1 % error in counting votes manually (Ansolabehere and Reeves 2004). This research was made however on the results of First-past-the-post electoral system in New Hampshire from 1946 to 2002, so it is likely to assume that under conditions of more complicated, or perhaps sophisticated, electoral systems[24] the results would exhibit larger share of errors.

E-voting can for sure lower the percentage of miscounted votes. But again it depends on amount of electronically casted votes. It can be said in general that impact of e-voting implementation is greater in more complex electoral designs.

Trust and electoral frauds

In any case, when e-voting is considered, it is necessary for its successful functioning, some level of public trust. Without this, at least elementary, confidence, e-voting can strongly damage the legitimacy of the elections.

Thus it is better to implement e-voting in countries, where there is strong public confidence towards government and generally towards electronic tools in the lives of citizens. One of the weak points, or perhaps the weakest one, of e-voting is problem with electoral frauds. When there is no ability to recount the votes and as well no option for voters to check, whether he or she really casted the vote for a party or candidate he or she intended to vote,[25]

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[23] With score 1, so the best, in Freedom House index.
[24] The First-past-the-post electoral system is simple regarding to examine the election results.
[25] This critique is not valid in case of optical scanners.

it is easier to conduct electoral frauds. So the manipulation of the results by the government or the officials is easy under e-voting.

Similar problem is with the voting in unsupervised environment. (1) There is risk with so called "family voting" (Krimmer and Volkamer 2005, 226) and other kinds of voting under some sort of pressure, so non-free voting is more likely, when votes are cast in unsupervised environment. (2) Also voting in unsupervised environment simplifies the situation for the ones, who are buying the votes, bribing the voters respectively.

Any sorts of e-voting, and the ones used in unsupervised environment, should be therefore implemented rather in territories with low level of risk of electoral frauds.

Accessibility of the elections

Another aspect of the election is its accessibility. It means as well the accessibility of the polling stations for the electors. This is mostly the problem for the voters abroad and for the voter swith some kind of disability (especially for the sightless and with similar disability, in general the voters with special needs).[26]

E-Voting, which can contain voice assistance, is therefore a good option to solve the problems in countries with plenty of voters living abroad and as a technique to make voting easier for people with disability.

Turnout

Last but not the least factor I would like to focus is turnout. First of all, is good to point out, that there is in political science on one hand approach, which considers the turnout to be a "brilliant indicator of quality of democracy" (Lijphart 1994, 4). On the other hand, is being pointed out that it is important to examine the reasons of non-participation in the elections and that one of the reasons can be satisfaction with current state (Novák 1998, 133). Important is as well the context of the elections. For voter, the non-participation can simply be the best strategic option, for instance in cases, where he or she has no opinion which party to vote, or in case, when he or she is satisfied with every likely scenario of the outcome. It cannot be said therefore, that high or low turnout, without examining the reasons, is a good indicator of quality of corresponding democracy (Lipset 1981).

In the light of results from Estonia, which was one of the pioneers of e-voting, it is quite unimportant at which position we stand in a dispute, which is sketched above. Because the data from the research made by Trechsel and Vassil shows, that possible contribution to the turnout via use of e-voting[27] is from 0.3 % in local elections in 2005 to 3.5 % in parliamentary elections in 2011 (Trechsel and Vassil 2011).

My role here is not to judge whether these numbers are high or law. Such a judgment is subjective. So I will be content to say, that the e-voting, in its remote form leads to an increase in turnout, however it would be naïve to expect an increase in tens of percent.

Conclusion and recommendations

All the described factors are summarized in SWOT analysis in table 3. It is quite obvious on first look, that e-voting has several strengths and as well several weaknesses, there are also some opportunities and, however, plenty of threats.

As it was shown above, the electronic voting has the ability to solve some problems connected to electoral process and as well the ability to make some problems even bigger.

Therefore I strongly recommend to think about it only as one of many electoral

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[26] Just this reason, to enable voting to sightless and similarly disabled, was the reason to implement system of iVote in New South Wales, Australia, where it is possible to cast votes via internet and telephone since the elections in 2011.

[27] In case of Estonia voting through the internet.

techniques[28] and to begin the discussion whether to implement or not to implement e-voting with description of current state of the facts. When the problems and weaknesses of respective electoral designs are known, the discussion if the solution can be to implement some sort of e-voting can start.

Table 3 – SWOT analysis of e-voting	
STRENGTHS Decrease of: • number of invalid votes • errors in counting Increase of: • accessibility of the voting (especially for voter with special needs) • counting speed	**WEAKNESSES** Disputable law and constitutional conformity Cost of implementation and maintaining Electoral frauds are easier to conduct
OPPORTUNITIES Increase in turnout* Saving the expenditure for voting organization (in long-term)	**THREATS** System failure caused by the hacker attack or by electoral official: • manipulation with the outcome • decommissioning system from operation Threats to the legitimacy of the election Failure to use the system because of low public confidence
not applicable for the systems used in the supervised environment (DRE and optical scanners) *Source: Author*	

The answer to the question to have it or not have it, is not scientific, but purely political one. The lawmakers have to consider the cost and possible benefits and thereafter they have to decide.

It can be said in general, that e-voting can be a viable option for territories with high level of confidence into government and officials, with high data network penetration throughout the population[29] and with problems with slow speed of counting and low accessibility of the elections and for the ones, which are facing a very low turnouts.

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[28] Alongside with e. g. postal voting or advance voting.
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THE MECHANISM FOR THE IMPLEMENTATION OF DIGITAL EDUCATIONAL RESOURCES IN THE "E-LEARNING" SYSTEM

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Abstract

The problems of implementing e-learning through the integration of teaching and information and communication technologies that radically increase the effectiveness of training and massive quality education. Sets out requirements for the characteristics of the system being interconnections with adjacent systems for the storage and use of digital learning resources (DLRs). The requirements to be met by DLR, placed on the portal «e-learning».

Keywords: E-learning, digital educational resources, national and regional server, web service

Introduction

According to the State Program for education development of the Republic of Kazakhstan for 2011-2020, the e-learning system will cover more than 70% of all schools in the whole country, sets priorities to create an unified informational environment. In particular, the necessity to "create a framework for an unified system of information and academic support of education and industry to create an information system for efficient object management and education processes." [1].

In Kazakhstan, the e-learning system has recently received the official recognition, it is actually represented as a separate section of the State Program of Education Development. The Education Development strategy (XXI century) aimed at the graduates training, whose principles must be "life-long learning" based on mobile info communicational interaction in the open information and educational space.

The platform for their studies in school today is a new paradigm of learning as the info communication legitimate objective process.

The mechanism for the transition to a new paradigm of education is based on e-learning and pedagogical integration of information and communication technologies, it provides the radical in the effectiveness of training and massive qualitative education.

Through e-learning goes the process of transformation of the traditional educational process in the acquisition of cognitive activity in the first place, of course, knowledge and skills in the subject studied, but beside of that also universal - such as searching, selection, analysis and presentation of information using the information for solving specific tasks in life, the ways of interaction in infocommunication, which are part of the personal information culture, so it's considered to be very necessary for full life and work in the information society.

The researchers in Western countries, however, that have already gained some experience in e-learning, express concerns saying that the e-learning expectations have been hugely exaggerated, and the e-learning development in the West is in crisis (Romiszowski, Woodill, etc.) [2,4].

The main reason for this, the researchers saw the wrong strategy in choosing, the rate of infrastructure development, network technology, the lack of methodological approaches to the development of the content and methods of e-learning courses.

In main, e-learning is developed by technical experts but no teachers, that leads to focus our attention on infrastructure development rather than on the development of educational content. The result of the content analysis of e-learning centers websites provides Woodill with the conclusion that only 73 companies of 1004 have mentioned on applied learning theories or methods. [2].

Contrary to the practice of e-learning systems of other countries, Kazakhstan plans to carry out in the unity of its backbone subsystems represented in the State Program for education development of the Republic of Kazakhstan for 2011-2020 years.

Digital learning resources (DLRs) are the foundation of e-learning. In this regard, the study of the mechanism of their development and usage raises an important task of modernization of the educational process and its technical support. For many teachers, a modern multimedia computer is a reliable assistant and effective training tool in teaching various school subjects. But the computer itself is useless if there is no access to information: it doesn't have the access to modern electronic resources in the Internet or on CDs. Using qualitative DLRs by teacher makes real to obtain adequate modern education for students.

Creation of digital educational resources is considered as one of the main direction of all education forms and levels informatization in Kazakhstan. Information technology development services in education, including the DLR and methodical software production, along with the creation and development of telecommunication structures of some educational institutions and the industry, quality systems of education is the basis of forming the infrastructure of education informatization.

Under DLR it's understood an information source containing graphics, text, digital data, voice, music, video, photo and other information aimed at meeting the goals and objectives of modern education. In one digital educational resource can be allocated informational (or informational and reference) sources, tools intended for information creation and management, various control elements.

Requirements for the system interconnections characteristics with adjacent systems for DLR storing and usage

The application-level interaction protocols should be based on the XML specifications. The XML usage is the guarantee of systems independence in the national information infrastructure even in case of using different software solution vendors services. Thus, it should ensure the mechanism of information resources development in the future.

In the process of creation and development, the appropriate standard meta descriptions should be developed for each type of document or message that the system uses to communicate, using standardized metadata types and in accordance with the specifications of XML.

XML should be used as a standard representation of the transmitted data.

The system should provide the support of XML-driven objects using built-in tools which provide at least following functions:

- reuse simplification;
- processing (DTD or schema);
- business-rules installation;
- storage functionality;
- attributes automatic filling;
- personalization and classification;
- references management;
- keeping all related files;

- life-cycle and access rights management.
For interaction with ministerial bodies informational systems the given system should provide the following functionality:
- developed Web services systems availability;
- Web services systems descriptions availability;
- interfaces to interact using message exchanging methods;
- the ability to process messages in accordance with the established rules and policies.
        Conjugation of the information systems of state bodies should be ensured by the presence of the following components:
- information systems of state agencies adapter interface, they should be data exchange standards compliant;
- Web services that implement the functionality of public services as well as services provided by other government agencies;
- Web-based services descriptions;
The integration with the government agencies information systems and educational institutions should be implemented in two ways:
- integration of the messaging layer;
- integration using Web services.

Integration with using Web services for sharing DLRs
        In this method the service-oriented approach should be used. Using loosely-coupled messages as a part of the integration server should minimize the relations between available resources and portal applications. Implementing changes to existing resources or portal applications should be possible without affecting the main system.
        State agencies informational systems interfaces that implement interactive services are recommended to determine using open standards Web services. The usage of XML-based interfaces among existing applications and portal applications limits the technology dependency and diminishes vendor lock-in possibilities.
        As the transport for delivering the messages should be used a protocol such as HTTP, HTTPS or SMTP. The document description and messages language should be XML. The message delivery between services should be organized using message envelopes reflected in SOAP standard. The body of the message should describe where and from whom the message is sent, regardless of the transport protocol used.
        The structure itself and the syntax of the interface messages that are sent between the services should be described using an XML-schema and WSDL languages.
To be able to find a web service from other available web services, the special web services registry keeping their metadata should be implemented. It should be created using UDDI specifications.

Main components of the DLR repository on an e-learning server
        The national and regional servers can host a variety of digital learning resources (DLRs) - a set of data in digital form which is applicable for use at the classes. Mainly, they are simple DLRs(elementary DLRs) suitable for using as a whole, and this doesn't allow the division into separate elements that can be used independently.
Examples of simple DLRs:
- an article written in MS Word, HTML with images, a PDF document, etc.;
- a JPEG picture;
- a JPEG picture with accompanying text in HTML format;
- a book as a collection of scanned pages in GIF format with TOC arranged in HTML;
- a HTML book (a HTML file set and associated images);

- a MP3 audio file;
- a DivX video file;
- a MS Power Point presentation;
- a separate media object of the course run on a specified technology platform.
Each DLR will be accompanied with a number of associated components:

A rubricator is the formal representation of the tree section. The rubricator includes the following basic elements: an ID in the parent partition identifier, the actual partition ID, and the name of the partition. In storage, two rubricator types are determined: storage rubricators and DLR rubricators.

Storage rubricators are "Class", "Subject" and "Subject categories" rubricator classifications are mandatory for all DLRs and should comply with the applied national standards. The auxiliary rubricators are "DLR type", "Collections description", "DLRs suppliers", "Rubricator types". All storage rubricators ("Class", "Subject", "Subject categories", "DLR type", "Collections description", "DLRs suppliers" and "Rubricator types") should be present in the DLR store.

DLR Rubricators are the rubricators relevant to textbooks content and lessons planning. They are provided by DLR suppliers, and each of them should be bound to a specific class of school education and a subject in accordance with national standards. It is important to distinguish the content of textbooks from lesson planning and take into account that between them can be relations.

A collection is a rubricator or a list of selected editorial resources on a certain topic or subject. It may not contain a single column, in this particular case, all the resources presented there are linked to the root - the name of the collection.
DLR declaration is the description of the DLR content and structure in SCORM form. For simple resources it is necessary to specify the startup file. The declaration file name is regulated: imsmanifest.xml.

DLR startup file is a file (HTML, image, etc.) from which an user should begin using the resource. It can be viewed using a standard Web browser (MS Internet Explorer or Mozilla). For those DLRs which require additional software installation, a special HTML file with instructions is placed. The software itself is not included to the resource but a Web address reference from which it can be downloaded. It is usually provided in the guide that comes along with the resource.

DLR metadata (description) is a DLR formalized description sufficient to search, select an understanding the details of the DLR properties, its purpose and usage. As the DLR metadata model a subset of IMS LOM standard is used: http://school-collection.informika.ru/develop/spec/#. The metadata file name can be chosen by resource supplier and is indicated in DLR declaration.

DLR ordered set is a set of educational resources described by the DLR declaration and intended for serial passage all of its member resources. The resources in ordered set can be physically located in the same zip-archive with manifest file (imsmanifest.xml), or in an external zip-archive. In this case, simple DLR references are set in the manifest file. The case of external links declaration isn't shown in this article.

A test exercise (complete description, full specification and sample test questions are given in the test description rules) is an ordered set of DLR, including test questions. Test questions are designed to control or exercise testing. The final result of the test is calculated based on estimates of the test questions and can be automatically put into the unified journal. It is also possible to include into a test job ordinary resources which are not test questions, but at least one test question should present in the test job. In the simplest case, a test job can consist of one test question.

DLR exchange format specifications

Before exchanging and placing in a public repository procedures, a DLR file, declaration and metadata files should be packed together into a PKZip v2.04g (.zip) archive file, or into a ZIP file according official RFC1951 specifications.

The archive file contains a resource in the form of a set of files and directories. The declaration (imsmanifest.xml), metadata and DLR startup files are mandatory. Metadata file name is specified in the declaration: LOM_resource.xml in case of DLRs, and LOM_rubricator.xml in case of rubricators. The startup file should be regulated in the list of files and should be set in the "href" attribute of the "<resource>" item. The specification leaves the choice of file names for DLR suppliers, but requires that file names in the archive can only include letters, numbers and '-','_','.' ,'[',']','+','(',')' symbols. Other characters are prohibited in file names. The slash symbol ('/', Unix-style slash) should be used as the directory and file names delimiter.

Each DLR or DLR rubricator is assigned with a global unique identifier (GUID). The GUID value is generated during DLR creation, and remains unchanged for all next versions of DLR resource.

The archive file names will be different in case of transfer of resource and DLR rubricator.   For DLR, the name is "DL_RES_<GUID>.zip", for the rubricator is "DL_RUB_<GUID>.zip" The abbreviation DL_RES relates to the phrase "digital learning resource", and DL_RUB to "digital learning rubricator" accordingly.
Examples of global unique identifiers:
fd0c4110-f204-11d9-8cd6-0800200c9a66
8559d902-7b97-7ddc-8fb4-11381f2b6369
An example of a file containing packed DLR:
DL_RES_fd0c4110-f204-11d9-8cd6-0800200c9a66.zip
An example of a file containing packed DLR rubricator:
DL_RUB_8559d902-7b97-7ddc-8fb4-11381f2b6369.zip

Each DLR or rubricator should have their own GUID assigned to them during the creation. The GUID in the XML description of the resource should match the GUID in the name of ZIP archive. The file containing an image of the resource and named "preview.png" (100x100 pixels) from archive can be used for preview purposes in search results.

DLR declaration specification

During DLR resources placement in central portal repository, there are XML files storing unique information on each shared resource are created. The appropriate namespace is reserved for each file.

Benefits and possible working issues of DLR storage

At the moment, the XML database is the most stable in production, and considered as high-speed and stable enough to possible external attacks. These databases can easily convert their reports to the most popular *.xls, *.doc data formats by request.
Such databases, however, would be very demanding on the central server and local storage hardware and software. If the program installation goes with using an XML database, it's worth to clarify technical specifications of hardware equipment according the following parameters, at first:
- the total size of stored data - at least 1 Tb;
- allowable response time for elementary search terms - no more than 4 sec (load up to 10 requests per second);
- allowable downtime during a single server restore - less than 60 minutes. The overall probability of storage availability, in general - not less than 0,99;

- 100 Mb/s connection channel to the Internet.

DLR developers should consider that the resources placed to the repository need to be stored in declared formats only.

Conclusion

In this article:

- analyzed the central and local DLR storages databases software maintenance;
- set a number of mandatory requirements for DLR database storage servers;
- determined the requirements to be met by DLR placed on the e-learning portal.

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COMPARATIVE ANALYSIS OF CYBERATTACKS ON ESTONIA, GEORGIA AND KYRGYZSTAN

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Abstract

The rapid informatization of the world which has started since the beginning of 90s led to the growing state interdependence from cyberspace. The Internet has become crucial to the society, economy, military of contemporary country. This situation became a new challenge for the national security and more and more often the term cyberwar has been used. Despite the fact that this phenomenon is not clearly defined the massive cyberattack on countries took place in the past.

The main aim of this article is to examine three cases of these attacks: on Estonia in 2007, on Georgia in 2008 and on Kyrygysytan 2009 and to try finding similarities and differences and answer the question who carried out these strikes and why. In order to do it the following factors will be analyzed: the political background of these countries and the relation with the neighbours, the time and scale of attacks and effect of them. In conclusion the article tries to find the most difficult answer who was a perpetrator. The three hypotheses were presented with evaluation of probability of them.

Keywords: Cyberattacks, Russia, Estonia, Georgia, Kyrgyzstan

Growing significance of cyberspace for countries

Since the beginning of 90s the information revolution has begun and the Internet- a tool created to allow communication between universities in the United States, became global. It led to the enormous and rapid increase in number of Internet Users. In 1995 when the measurement started it was 36 million people who accessed to the Internet now this number amounts to approximately 3 billion.[1]

The rapid development of the Internet caused that cyberspace became more and more used by the private companies, authorities of states and average people. A lot of elements of daily life was transferred into the virtual world and things like banking online, voting online became normal in many countries. Also the elements of state critical infrastructure was connected to the Internet and used advantage of it. The information revolution could not omit the military. It allowed them to the access to information in real time. The rapid informatization of the world has changed literally every aspect of life.

The wide spreading of the Internet significantly influences the national security of the states. The cyberspace became a tempting place for the activity of different hackers, groups of cybergangs and cybercriminal and cyberarmies of the countries. The architecture of cyberspace is very favorable for the assailants because when it was created the security was not among priorities. There are certain features which can ease carrying out strike. The potential aggressor is very difficult to trace. Secondly, conducting the hostiles acts in cyberspace is relatively cheap and required only computer with the access to the Internet and hacking skills. The third aspect is time of attack which can be conducted from every corner of the world in seconds. These factors cause that growing informatization of the world led to increasing hostile actions in cyberspace.

In 90s there were mainly attacks carried out by individual hackers who wanted to test its skills and they treated these like a hobby. However, more and more experts start to predict a forthcoming cyberwar. John Arquilla and David Ronfeld from The American think thank RAND published the "Cyberwar is coming" where they present the theoretical model of potential conflict in cyberspace.[2] When the publication was created it sounded as a science-fiction plot but in 21st century the probability that depicted scenarios will happen significantly has rose up. The cases of Estonia, Georgia and Kyrgyzstan could not be unanimously described as a cyberwar because there is no clear definition of this phenomenon but they represent the examples of massive cyberattacks against the state.

Estonia

Estonia is one of the Baltic Republics which was incorporated to the Soviet Union in 1940. After the dissolution of the Soviet Union Estonia regained independence and started the process of rapid economic, political and social reforms. It joined the European Union and NATO in order to ensure own security. Estonian authorities have seen the gravest threat in Russia and integration with Western structures was the method to overcome it.[3] One of the main strife in bilateral relations was the problem of Russian minority in Estonia which amounts to 26 % of society.[4]

In April 2007 the tensions with Russia significantly increased due to the decision of Estonian capital city – Tallinn authorities, to remove the statue of Bronze Soldier of Tallinn which commemorated the Soviet soldiers who had liberated Estonia. For the Estonians it was a symbol of oppression. For Russians it meant the destroying of the cultural heritage and the lack of respect for the Red Army which fought against Nazi Germans during II World War.[5] After the movement of the Bronze Statue the relationships between Estonia and Russia became very tensed. Kremlin accused Tallinn authorities of breaking human laws and demanded resignation of the Estonian Prime Minister[6]. Simultaneously, the serious riots on the streets between the police and Russian minority in Estonia[7], the protests in front of Estonian Embassy in Moscow[8] and the massive cyberattacks campaign erupted.

Estonia has been highly dependent on the Internet. Almost the whole country was covered by the WiFi Internet, all Government services were available online, 86 % of Estonian populations did banking online. In 2007 there was opportunity to vote electronically and 5,5 % of voters did it.[9]

On 26 April the growing volume of the cyberattacks was noticed and this day is commonly recognized as the beginning of massive cyberattack. The peak of the attack took place on May 9. Since that date the number of hostile acts started to decrease. On May 11 the Paid botnets[10] activity ended, the last attack took place on May 23.[11]

The DDoS[12] attack successfully targeted the websites of all government ministries, two major banks, and several political parties. Hackers were even able to disable the parliamentary email server and disabled the credits cards and automatic teller machines.[13] One of the Estonian banks which was a victim of cyberattack estimated losses around $ 1 million in damages.[14] However, when the ultimately losses were evaluated surprisingly the damages done by cyberattacks were relatively low.[15]

The majority of these attacks were DDoS attacks. It was not a completely new technique, in past there were a lot of incidents using DDoS.[16] However, in Estonia there was an interesting composition of mixing attacks from professional hackers probably from the Russian Business Network[17] who used botnets and so called patriotic hackers– individual young users of computers who were outraged by Tallinn authorities decision to move the statue.[18] There was a special Russian language forum with the downloaded tools and instructions how to carry out cyberattacks[19].

Despite the initial surprise Estonia was able to organize defense quickly and with help of allies overcome the dangers. Germany, Israel, Slovenia and Finland provided assistance to restore normal networks operations. NATO Computer Emergency Response Team also helped Estonia.

Cyberattack on Estonia in 2007 was widespread reflected in media and called the first cyberwar in history. It showed how the new technology could be used to attack a modern country. The attack which came from Russia - most of the DDoS attacks were addressed from Russian IP addresses. A lot of attackers used computers from Estonia – it was the Russian minority. Even though, the European Commision and NATO technical experts did not find any evidence that this attack was perpetrated by Russian authorities, these attacks was very favorable to Kremlin.[20] It seems even more probable when the member of youth Russian organization NASI affiliated with the ruling party of Vladimir Putin confessed that he stood behind attacks.[21]

The presumable aims of the cyberattacks were to try to influence Tallinn authorities to withdrawn from its decision of removing the monument. Second was to test Russian cyber warfare capabilities and look for the reaction of NATO when one of the members of this organization is attacked in new domain. The third one was linked with the fact that Estonian society is dependent on the Internet. Cyberattacks were carried out to show that both NATO and EU would not defend Estonian society from the Russian attack and the Russian did not need tanks to inflict damages to Estonia. All political targets were not achieved, the monument was removed and Estonia became a leader on cybersecurity field. The NATO have sped up its cyberdefence projects and created Cooperative Cyber Defence Centre of Excellence located near Tallinn.

Georgia

Georgia regained its independence after the collapse of the Soviet Union. Unlikely as others post soviet republic this country had a long history and the strong national consciousness. From the beginning of 90s this country looked for integration with West.[22] This trend was strengthened after 2003 when the Rose Revolution[23] erupted and the current president Eduard Shevardnadze was overthrown. The new elected president Micheil Saakashvili engaged into integration with Western Structures and also tried to reintegrate the breakaways Georgian provinces – South Ossetia[24] and Abkhazia.[25] His attempts evoked a strong reaction from Russia which led to the war in 2008.[26]

This conflict which started on 7 August and lasted for 5 days was a remainder of classical states versus states wars which seems to be forgotten in the 21st century. Despite the fact, that the war was classical and the behaving of the armies on battlefield reminds the 20 century, one aspect of it was a complete novelty. It was the first war which took place in the air, on the ground, on the sea and in new domain – cyberspace.

The first cyberattacks took place months before the outbreak of war. On 19 July, the security firm informed about the Distributed Denial of Service (DDoS) attack against the Georgian websites. The similar scenario with the attacks on bigger scale was repeated on 8 August and coincided with the Russian troops entering the South Ossetia. The attack carried out by Russian hackers could be shared into two phases. In the first phase attacking hackers focused mainly on Georgian news and government websites. Russians used botnets to conduct mainly brute DDoS attacks. The Georgian networks were more vulnerable to attack than the Estonian ones.[27] In second phase of the cyberattacks the list of targets embraced financial institutions, businesses, educational institutions, Western media and a Georgian hackers website. Beside the DDoS attack there were also web defacement[28] operations done with using an SQL injection[29] and the massive spamming on public email in order to clog them. During the second phase of operation a lot of patriotic hackers joined campaign against

Georgia[30]. Till 10 August the majority of the Georgian governmental Web sites were inoperative and Georgian Government was unable to communicate with the world using the Internet. Instead of normal content on the Georgian President website, there were images depicted M. Saakashvili as Hitler[31.] Also banks did not function in Georgia as well as the cell-phones[32]. Despite the fact that hacker were able to target Supervisory Control and Data Acquisition (SCADA)[33] systems these kinds of attack were not observed. According to Captain Paulo Shakarian from the United States Army it means that Russian hackers tested their skills and ability to carry out limited attack. In future, in potential attacks against NATO countries attack on SCADA system could evoke the article V and the response could be more serious.[34]

The attacks came from the territory of Russia and were the mixture of professional acts carried out by using the botnets and the attacks conducted by patriotic hackers who similarly like in Estonia case could find information and programs on the special forums.[35] There was a list of prioritized targets and the information about potential vulnerabilities and how to evade Georgian blockade on Internet connections from Russia. The center of this information campaign was the website StopGeorgia.ru where the amateurs could find tools to carry out the DDoS attacks.[36] Similarly like in Estonia case experts did not find a clear direction between the Russian authorities and attack but the experts from Project Grey Goose - a voluntary organization consisted of 100 volunteers stated that "the level of advance preparation and reconnaissance strongly suggests that Russian hackers were primed for the assault by officials within the Russian government".[37] However, it seems that again Russian Business Network was engaged into attacks. Analysis of the different experts pointed out Alexandr A. Boykov a RBN operative and Andrey Smirnov a spammer from Saint Petersburg as two main perpetrators of cyberattack on Georgia. They represented vast knowledge and experience in carrying out hostile acts in cyberspace.[38]

There were two other interesting aspects of the cyberattack on Georgia. First one is the coordination of the conventional strikes and cyberattack which are mostly unseen. Nevertheless, there are two situations which could indicate the cooperation between classical and cyber forces. First one was the fact that conventional strikes omitted attacking the media and communication facility leaving these targets for cyberattacks. The second example was an attack on websites of renting diesel-powered electric generators in order to support conventional strike against Georgian electrical infrastructure.[39] The second interesting aspect is the preparation of the cyber tools, instruction, special websites to carry out the strikes. It can indicate that Russia was preparing this war for longer time. The access to tool available to Russians and the instructions how to use them could not be prepared in one day.[40]

The Georgian authorities in the wake of massive disruption of Internet websites firstly tried to filter Russian IP addresses but the Russian very quickly changed their tactic and used non-Russian servers.[41] Later Georgian authorities asked the allies the United States, Poland and Estonia for help. Georgians servers were relocated.[42]

The cyberattack on Georgia was a manifestation of information warfare aimed at cutting off Georgian authorities and society from any news. The perpetrators of it pursued to two main aims. First one was to demonstrate to the whole world the fragility of Saakashvili regime who lost control over the own state and Georgia in wake of Russian invasion had been paralyzed. Second one was addressed to Georgian society to cut them off from any information and present own propaganda in order to spread chaos and disinformation to undermine their morale and faith in government. Third target is linked with the second phase of attacks directed against the economic system. It was probably aimed to inflict serious damages for economic development of Georgia and persuade people to stop supporting Saakashvili. All aims were not achieved mainly because of the aid from allies. The

government websites were restored and the Georgian society had an access to information and the United States promised financial help for Georgian government.[43]

Kyrygistan

The third country which suffered from massive cyberattacks was Kyrgyzstan. This republic located in the Central Asia was a part of the Soviet Union. After dissolution of it in 1991 Kyrygyzstan became a member of Commonwealth of Independence States. This relatively small country with about 77 000 meteres square and 5 millions of people was a close ally of the Russia. This situation changed in 2005 when the Tulip Revolution overthrew long term President Askar Akayev. The new president was more pragmatic and tried to balance between the United States and Russia.[44]

The cyberattack took place in January 2009 when the heated debate rolled over the country about the future of American air force base in Manas. The strongest protests against closing the base came from the opposition. Manas base was established after the 11/09 when the United States prepared to attack Afghanistan. Kyrygystan supported George Walker Bush Administration in these efforts and agreed on the American Base on its own territory. In 2005 Kyrgyz President Kurmanbek Bakiyev during the meeting with Secretary of State Condoleezza Rice admitted that the American and NATO forces could use base till the situation in Afghanistan would be stable.[45] At the beginning of 2009 there was a discussion about the prolonging the renting of the base or closing it. This second option was supported by Russian government which proposed 300 million USD loan and 1.7 mld of investments in energy sector in order to influence Kyrygystan government to undertake the favorable decision.[46] In February 2009 Bakiyev announced that he would ask Americans to leave the base.[47] However, after the long negotiations the agreement between the Kyrygystan authorities and the United States were dealt in June 2009. According to the new agreement the cost for renting rose up from 16 million USD to 60 million USD and additionally, the United States promised additional investments.[48]

The attacks, which started on 18 January 2009 took place for 2 weeks. Attackers successfully disrupted 3 from 4 Internet providers service (IPS) included the two mains Kyrgyzstan IPS (www.domain.kg, www.ns.kg). They used massive DDoS attacks. Because there are only 4 IPS in in Kyrygystan, the majority of Internet services collapsed.[49] It was impossible to send email or enter to certain websties[50]and also using mobile phones was hindered because of cyberattack. Almost 80% of Internet traffic was offline. Nevertheless, the average citizens of Kyrygystan did not suffer because of the cyberattack from a simple reason. Only a small number of Kyrgyz had an Internet access.[51] However, it is important to stress that the opposition to the leading president was interdependent on the Internet.[52]

The IP traffic was traced backed to Russian servers where the most of DDoS traffic was generated[53]. These servers were commonly used to the cybercriminals activity as well as to attack Estonia and Georgia. The IP address and networks were associated with the groups responsible for previous attacks in 2007 and 2008. Also the two groups which led them were similar to these from 2008.[54] The high probability existed that behind these attacks stood the RBN. The probable scenario looked that Russian officials hired hackers from RBN to carry out the massive cyberattacks.[55]

The attacks were probably a part of Russian mounting pressure to persuade the Kyrgyz President Kurmanbek Bakiye to close American base in Manas. Especially, Russians wanted to silence the opposition which was against closing the base and tried to influence the president. Indeed, the Kyrgyzstan incident was the first case where these attacks successfully realized the political aim which had been to persuade Kyrgyz authorities to close the American base.

Conclusion

All attacks which took place between 2007 and 2009 had a lot of similarities: the political background is similar, the methods used by the aggressor are similar and also the hypothetical perpetrators are similar. There are also some differences like the main aims of attack and the result of it. However, these three cases set examples of mass cyberattacks aimed at paralyzing structures of the states.

Firstly, the political background just before the attacks is similar. All three countries in that time had tensed relationship with Russia. In case of Estonia in 2007 it was caused by removal of the Bronze Soldier of Tallinn, in 2009 in Kyrygystan due to the heated debated about the future of Manas airbase. Ultimately, in case of Georgia it was a part of war but first time in a new domain – cyberspace. We clearly see that the cyberattacks carried out against these three former Soviet republics were done from political reasons.

The second interesting aspect is a technique of the attack. Here, we can notice similarities which can point out that the aggressor could be the same. However, the case of Georgia seems different and it was more sophisticated attack. The main tool of all attacks in all three cases were brute DDoS attack carried out firstly with using the massive botnet networks and later in case of Georgia and Estonia by patriotic hackers with using the earlier prepared tools. In case of Kyrygystan the patriotic hackers did not take part. The reason is that the attack on this Central Asia country was not so spectacular and did not gain the public support for this issue. The case of Georgia is slightly different. The attacks aimed at it were much more sophisticated and did not limit to the DDoS action mainly because it was a part of military campaign. It also embraced SQL injection attacks which could not be done by amateurs because it demands more advanced skills.

The third important point is the object of the attack. Here again we have a similar situation. In Georgia and Estonia the websites of government were disrupted, as well as the domains of banks and online newspapers. In case of Kyrgyzstan the attack was aimed at the providers on the Internet - which are only 4 in this country As the consequence of hostile action majority of the Internet services collapsed.

The fourth conclusion is linked with the vulnerability of the countries. It seems that the more dependent states from the Internet are more sensible on the attacks from cyberspace. Estonian citizens life was temporally hampered when the majority of Kyrgyzstan people did not spot that they were under the attack. It was caused that Estonia is highly dependent on cyberspace when Kyrgyzstan is not. On the other hand, the more advantageous countries like Estonia had more resilient networks and could easier restore their systems when they were under the attack. What is more, the disruption of the whole Internet is very difficult due to the big number of Internet providers.

The fifth point is the effectiveness of the action. In Estonia and Georgia cases the aggressors did not achieve their political aims. Both countries and their societies seemed to be resistant to the cyberattacks and did not revoke their policy after the cyberattacks. The different situation happened in Kyrgyzstan, where the cyberattacks combined with the political pressure influenced the decision to close the United States base. However, ultimately it changed and Americans could stay longer but for much more higher renting price.

One of the most important aspects of all three cases is the perpetrator of them. The architecture of cyberspace would not allow to unambiguously state who was responsible for cyberattacks. The fact is that the majority of the attacks came from Russia. We can conclude three hypotheses about it.

The first hypothesis is based on the assumption that attacks were carried out by the amateur, Russian, patriotic hackers who wanted to carry out the cyberstrike in order to express their outrage on the policy of Estonia and Georgia. This hypothesis is low probable mainly because of the lack of technical skills of these hackers. During the attacks the advanced

botnets consisted of thousands of computers were used. There are inaccessible for average users of the Internet. What is more, in Kyrgystan case the Russian social networks of hackers were not involved in. The first hypothesis seems less reliable.[56]

The second hypothesis assumed that attacks were carried out by the Russian cybercriminal groups on their own, especially by the Russian Business Networks. Using the advanced botnets in all three cases owned by Russian cybercriminals pointed out the engagement of Russian hackers. These groups pursue mainly profits and money. It is hard to point out the potential financial benefits from attacking the Georgian, Estonian and Kirgiz websites and because of it these hypothesis also seems unreliable.[57]

The third hypothesis lies on the assumption that Russian authorities hired cybercriminals from Russian Business Network to carry out strike against Estonia, Georgia and Kyrgyzstan. This thesis seems the most probable because of the following reasons. Russia wanted to punish these countries but could not especially in case of Estonia - a NATO member - conduct the states sponsor offensive. So it was convenient to hire cybercrminals who carried the offensive campaign on behalf of Russian authorities.[58] The second important aspect is a full control for Internet flow in Russia by the Russian authorities and such a big attack could not be noticed by them.[59]

To sum up, the cases of Estonia, Georgia and Kyrgystan present a three similar scenarios of massive cyberattacks against states. The similarities between them point out that the perpetrator was the same. These actions prove that the cyberthreats could not be underestimated and in the future the similar actions will take place even with a bigger success.

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PERFORMANCE ANALYSES OF SPECULATIVE VIRTUAL CHANNEL ROUTER FOR NETWORK-ON-CHIP

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Abstract

Network -On-Chip (NoC) is becoming the backbone of System on chip (SoC) architecture and router is the heart of an NOC architecture. This paper explores two types of Routers. First is the Speculative Virtual Channel Router for Network-On-Chip (NoC) and second, non- speculative Virtual Channel Router for Network-On-Chip (NoC). In the speculative Virtual channel router, Speculative virtual channel allocation and the speculative switch allocation takes place at the same time on the other hand in non-speculative virtual channel route channel allocation and switch allocation takes place serially. Major components of proposed routers are Input Port, Allocators and the contention free crossbar switch. Performance analysis on two parameters, Area and Delay for both types of design is presented with the help of "Xilinx ISE-13.1" design suite.

Keywords: Speculative, contention free cross bar, router, virtual channel

Introduction

System-on-Chip (SoC) design methodologies provide a powerful, capable and flexible solution to integrate complex systems on a single chip with the development of high-density VLSI technology. As the semiconductor technology increases we can place more number of heterogeneous IP (intellectual property) cores such as processors, DSPs, memory blocks, dedicated hardware accelerators, etc... on a single chip but these System-on-Chip(SoC) are major challenges in parameters like Delay, area, high-performance etc…[1] Recently Network-on-Chip is developed for better communication in System of chip; Network-on-chip does not uses dedicated wires for communicating between PE (Processing Element) instead it use exchange messages between PE (Processing element) over the network. [2]

Some of reason for which SoC need (Network-on-Chip) NoC are; by using NoC technology we can reduce the wire length required to route the data in SoC, also the longer wires have high electrical capacitance which lead to power dissipation, NoC technology simplifies the hardware requirement for routing and switching function. There are several architectures that can be used for Network-on-chip. However NoC's have three basic building blocks namely Network interface, switch and link [3]. Function of network interface is to connect the IP blocks to the network, it also convert request in to packet and further packet is divided into flits (Flow control unit), function of switch or router is to dispatch the packet in the network depending on routing scheme used and Link is used to connect the IP block to switch or switch to switch.

Outline for this paper is as follows: After the introduction, we discussed the concept of speculation in section 2. Then we discuss the concept of contention free crossbar in section 3.In section 4 we talk about the speculative virtual channel router without contention free

crossbar and non-speculative virtual channel router with contention free crossbar. In sections 5 and 6 we made comments on results.

Speculation
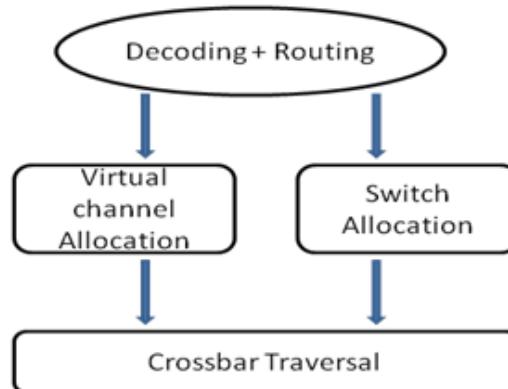
Fig1. Flow chart of packet in speculation

Basic concept of speculation is that, the Virtual channel allocation takes place in parallel with the Switch allocation as shown in fig above. Speculation can be understood by considering an example bellow.
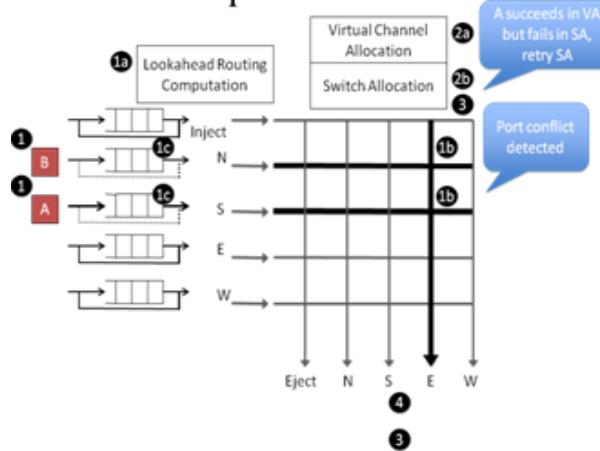
Fig2. Block diagram for speculation concept

In fig above we have five buffered input port out of five ports, two input buffered port wish to transfer the data. Let us consider two data packet be "A" and "B". Initially destination of both the packet is checked and it was found that both wish to acquire the "E" output port of crossbar. In the first attempt one out of two packet which has higher priority has been allocated the virtual channel and at the same time switch allocation is done for the same packet due to this one packet is routed to the "E" output port of the crossbar at a single clock, let us consider this packet be "B". Since both "A" and "B" wish to acquire same output port therefore along with packet "B", Packet "A" succeeds in virtual channel allocation but fails in switch allocation, this packet will retry for the switch allocation in next clock after the transfer of "B" packet. Speculation reduces the delay since it perform both the channel allocation and switch allocation in single clock and if packet fails in switch allocation, that packet is transfer in next clock till that time it is stored in buffers available at input port and packet does not get lost, this idea is known as speculation.

Contention Free Crossbar

Crossbar switch is the heart of data routing, purpose of crossbar switch is to route data from one input port to any of output port. An arbiter is the important component of crossbar switch. Arbiter is nothing but the device which selects one output from the number of input

depending upon the logic we apply. In case of crossbar, we are having an arbiter which is having the same number of input and output that of crossbar. At the input of crossbar we have to identify three quantities i.e. Data, destination and request. Data is the information that we wish to route at the output side, destination is the address of the output port at which we want to send the data and third quantity is nothing but the request, when it is high it means that data of that respective input port is to be routed. Each input port of crossbar is associated with individual arbiter i.e. if we have 5*5 crossbars then at every input port we have one arbiter which itself has 5 input and 5 output, these five inputs of arbiter are nothing but the request from each input port of crossbar and output of arbiter is the grants which is connected to the output port of crossbar. Bellow FSM decides the high and low condition for the grant, depending on these condition packets from input side is routed to the output side of the crossbar.
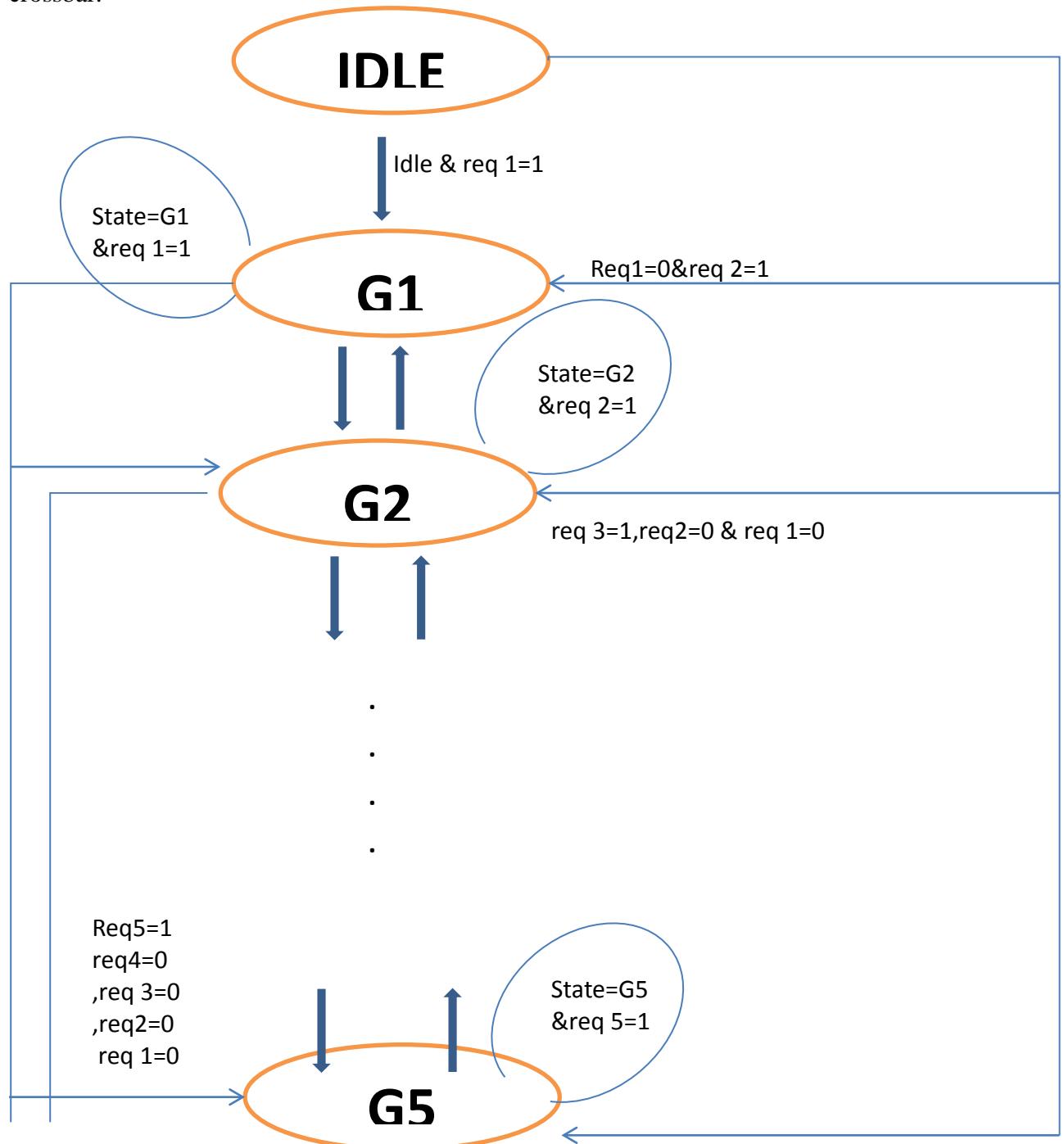
Fig3. FSM table for arbiter.

In crossbar switch which are having arbiter as it component it might be possible that if two or more packets at the input of crossbar send request to acquire same output port than it might be possible that some packets get lost because only one packet at a time can access the crossbar switch. In order to avoid this problem we use buffers/memory along with arbiter so that packet which are failed to acquire output port of crossbar can be stored in that buffer and can be transferred in next clock cycle, this type of crossbar is nothing but the contention free crossbar. The block diagram for Contention free crossbar is shown bellow.
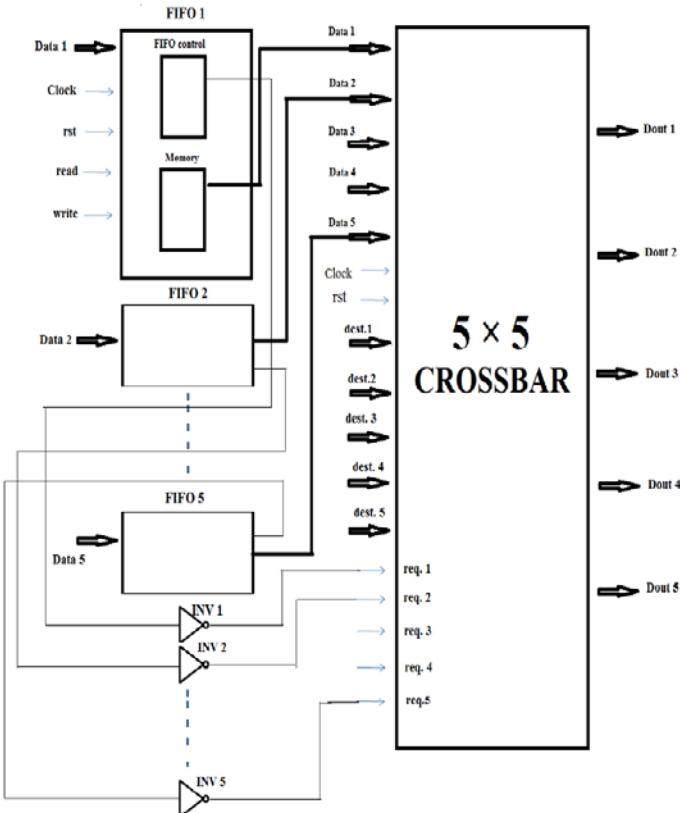
Fig4. Block diagram Contention free crossbar

In contention Free crossbar switch we have used an FIFO unit that will store the data from one user and data from other user will be routed successfully when two different users are requesting the same output port. FIFO unit consist of FIFO control unit and memory unit. FIFO control unit have clock, reset, write request & read request as input and address, empty, full, read enable, write enable as output. Whenever any user send data the request of FIFO control unit is made high and write enable signal goes high and the data is stored in memory unit. As the memory is not empty therefore request of crossbar goes high and data is routed successfully. In our contention free crossbar switch all the data is routed via memory unit, hence when two user request for the same output port at same time than one data is transferred and other is stored in memory unit for the time first data routed successfully, in next clock value of empty signal is checked again this time empty signal is low and again the request is made to send the second data. [4][5][6][7]

Speculative virtual channel router without contention free crossbar and non-speculative virtual channel router with contention free crossbar.

The basic difference between speculative virtual channel router and non-speculative virtual channel router is that in speculative virtual channel router virtual channel allocation takes place in parallel to the switch allocation; on the other hand in non-speculative virtual

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channel router first the channel allocation takes place and then the switch allocation. In this paper we had compared the speculative virtual channel router without contention free crossbar (simple crossbar) Vs non-speculative virtual channel router with contention free crossbar. Reason for comparing this specific configuration is, in first configuration we are using speculation technique along with the simple crossbar switch, here the speculation technique allocate the virtual channel at the input port and switch at the crossbar so that the packet is directly transferred to output. In second configuration we are using the buffers at the input of crossbar so that if the user has higher frequency to transfer packet then the packet does not lost instead stored in the memory unit and transferred in next clock.[8]

Result

All the parameter analysis regarding to the above work is done for Spartan 3 (XC3S50) device and "Xilinx ISE-13.1" whose results are shown bellow.

The area analysis for Speculative virtual channel router without contention free crossbar (simple crossbar) is shown below.

Device Utilization Summary			
Logic Utilization	**Used**	**Available**	**Utilization**
Number of Slice Flip Flops	540	1,536	35%
Number of 4 input LUTs	293	1,536	19%
Number of occupied Slices	343	768	44%
Number of Slices containing only related logic	343	343	100%
Number of Slices containing unrelated logic	0	343	0%
Total Number of 4 input LUTs	293	1,536	19%
Number used as logic	285		
Number used as Shift registers	8		
Number of bonded IOBs	86	124	69%
Number of BUFGMUXs	1	8	12%
Average Fanout of Non-Clock Nets	2.94		

Table1. Area analysis for speculative virtual channel router

The area analysis for Non-Speculative virtual channel router with contention free crossbar is shown bellow.

Device Utilization Summary			
Logic Utilization	**Used**	**Available**	**Utilization**
Number of Slice Flip Flops	561	1,536	36%
Number of 4 input LUTs	882	1,536	57%
Number of occupied Slices	527	768	68%
Number of Slices containing only related logic	527	527	100%
Number of Slices containing unrelated logic	0	527	0%
Total Number of 4 input LUTs	882	1,536	57%
Number used as logic	746		
Number used as Shift registers	136		
Number of bonded IOBs	86	124	69%
Number of BUFGMUXs	1	8	12%
Average Fanout of Non-Clock Nets	3.33		

Table2. Area analysis for non- speculative virtual channel router

Conclussion

From last section we conclude that area required for speculative virtual channel router without contention free crossbar is 343 slices i.e. 44% of total slices available, where as in case of non-speculative virtual channel with contention free crossbar the area required is 527 slices which is 68% of available slices. Therefore area required for speculative virtual channel router is greater than that of non-speculative virtual channel router. Other than the area, frequency is also an important factor. The minimum period for speculative virtual channel router without contention free crossbar (Simple crossbar) is 3.800 ns therefore speculative virtual channel router work on maximum of 263.130 Mhz. On other hand non-speculative virtual channel router with contention free crossbar the minimum period is 8.247 ns so it can work on maximum frequency of 121.254 Mhz.

Configuration	**Area**	**Maximum frequency**

Speculative virtual channel router without contention free crossbar	44%	263.130 MHz
Non-Speculative virtual channel router with contention free crossbar	68%	121.254 MHz

Table3. Comparative table on the basis of analysis done for Spartan 3 (XC3S50) device and "Xilinx ISE-13.1"

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CLUSTER ANALYSIS USING AFFINITY COEFFICIENT IN ORDER TO IDENTIFY RELIGIOUS BELIEFS PROFILES

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Abstract

We present an application of Ascendant Hierarchical Cluster Analysis (AHCA) to a dataset related to religion, in order to find a typology of religious beliefs profiles of individuals who live on São Miguel island (Azores) according to the frequency they go to the Mass. AHCA was based on the weighted generalized affinity coefficient for symbolic or complex data, and on classical and probabilistic aggregation criteria; the probabilistic ones belong to a parametric family of methods in the scope of the VL methodology. Additionally, we applied some validation measures (based on the values of the proximity matrix and adapted for the case of similarity measures) to evaluate the obtained results (clusters and partitions).

Keywords: Cluster analysis, affinity coefficient, VL methodology, complex data, validation measures

Introduction

With the advent of computers, it is usual to record very large datasets, so it is imperative to summarize these data in terms of their underlying concepts, which can only be described by a more complex type of data, called symbolic data (Diday, 2000). Rows correspond to symbolic objects (data units), whereas columns correspond to symbolic variables, which may take values such as subsets of categories, intervals of real axes, or frequency distributions. They are also called complex data. Each entry of the table can contain just one value or several values (Bacelar-Nicolau, 2000; Bock and Diday, 2000; Doria et al., 2013). Thus, the symbolic data types are generalizations of classical data types.

An important source of symbolic objects is provided by relational databases containing a set of individuals that are distributed into some groups. Moreover, the symbolic objects can be used to define queries from a database and for concept propagation between databases (Bock and Diday, 2000).

A modal variable Y, with domain (or range or observation space) y, defined on a set E={a, b, ...} of objects, is a mapping $Y(a)=(U(a), \pi_a)$, $a \in E$, where π_a is a non-negative measure in y, such as a frequency distribution, a probability or a weight distribution on the domain y and $U(a) \subseteq y$ is the support for π_a in the domain y. If π_a is specified by a histogram, Y is called a histogram variable. Y is a (bar or) diagram variable if the observation space y is finite and π_a is described by a bar diagram (Bock and Diday, 2000). In this paper, we

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concentrate on data units described by modal variables and use the weighted generalized affinity coefficient (Bacelar-Nicolau, 2000) as the basis of hierarchical clustering algorithms (classical and probabilistic aggregation criteria) in our approach to this subject.

Section 2 is devoted to the weighted generalized affinity coefficient for the case of modal variables in the field of Symbolic Data Analysis. Some measures of validation to evaluate the quality of the results of an AHCA are referred in Section 3. We present, in Section 4, the main results (best partitions according to some validation measures) obtained with the application of the AHCA to complex data related to religion, in order to investigate the proximity of religious beliefs profiles of individuals who live on São Miguel island according to the frequency they go to the Mass. Finally, Section 5 contains some final considerations about the developed work and the obtained results.

Weighted Generalized Affinity Coefficient for the Case of Modal Data

In the scope of Cluster Analysis, Bacelar-Nicolau (1980, 1988) introduced the affinity coefficient, as a basic similarity coefficient (between the pairs of columns or rows of a data matrix), from the affinity coefficient between two discrete probability distributions proposed by Matusita (1951). Afterward, that coefficient was extended to different types of data, including complex and heterogeneous data (Bacelar-Nicolau, 2000; Bacelar-Nicolau et al., 2009, 2010).

Considering a set of N symbolic data units described by p modal variables, $Y_1,...,Y_p$, the so called weighted generalized affinity coefficient (extension of the affinity coefficient to the case of symbolic data) $a(k,k')$ between a pair of statistical data units k, k' (k, k'=1,…,N), is defined as follows (Bacelar-Nicolau, 2000, 2002; Nicolau and Bacelar-Nicolau, 1999):

$$a(k,k') = \sum_{j=1}^{p} \pi_j \cdot aff(k,k';j) = \sum_{j=1}^{p} \pi_j \cdot \sum_{\ell=1}^{m_j} \sqrt{\frac{x_{kj\ell}}{x_{kj\bullet}} \cdot \frac{x_{k'j\ell}}{x_{k'j\bullet}}} \qquad (1)$$

where: aff (k,k';j) is the generalized local affinity between k and k' over the j-th variable, m_j denotes the number of modalities of the j-th variable; $x_{kj\ell}$ is a absolute frequency or a relative frequency (real non-negative value) of individuals (in unit k) which share category ℓ of variable Y_j; $x_{kj\bullet} = \sum_{\ell=1}^{m_j} x_{kj\ell}$, $x_{k'j\bullet} = \sum_{\ell=1}^{m_j} x_{k'j\ell}$ and π_j are weights such that $0 \leq \pi_j \leq 1$, $\Sigma \pi_j = 1$. The weighted generalized affinity coefficient, $a(k,k')$, takes values in the interval [0,1] and satisfies a set of proprieties which characterize affinity measurement as a robust similarity coefficient (e.g. Bacelar-Nicolau, 2000, 2002). The weighted generalized affinity coefficient appears to be an appropriate resemblance measure between elements (symbolic data units or symbolic variables) in cases where we are dealing with complex data from large databases.

A suitable adaptation of formula (1) may be considered if real or frequency negative values appear, and in that case the meaning of $x_{kj\ell}$ depends on the type of j-th variable. Bacelar-Nicolau et al. (2009, 2010) demonstrated that the weighted generalized affinity coefficient is appropriated when mixed and complex variables types are present in a database and the same coefficient works for those variables types. However, here the analyzed dataset contains only modal variables.

Given a similarity matrix, a dataset can be classified through classical aggregation criteria or probabilistic ones. The probabilistic approach of AHCA, named VL methodology (V for Validity, L for Linkage) is a set of agglomerative hierarchical clustering methods, based on the cumulative distribution function of basic similarity coefficients (Lerman, 1970; Bacelar-Nicolau, 1988; Nicolau and Bacelar-Nicolau, 1998).

Validation in Ascendant Hierarchical Cluster Analysis (AHCA) of Complex Data

The several comparative coefficients between elements and aggregation criteria raise pertinent questions as to identify: i) the best measure or the best criterion to use, ii) the most significant partition resulting from a classification algorithm, and iii) whether the clusters obtained reflect the real structure of the data.

Measures of validation based on the values of the proximity matrix between elements, such as, for instance, the global statistics of levels (STAT) (Bacelar-Nicolau, 1980; Lerman, 1970), the P(I2mod, Σ) measure, and the γ index, proposed by Goodman and Kruskal (1954), can be used, even in the case of symbolic data (see, Sousa et al. 2013). In addition, to determine the appropriate number of clusters, we used other two measures (adapted for the case of similarity measures) defined as follows:

The Sil measure (Sousa, 2005) is based on the Silhouette plots (Rousseeuw, 1987), and if the ith object belongs to cluster C_r, which contains n_r (≥ 2) is defined by:

$$Sil(i) = \frac{\dfrac{1}{n_r - 1} \sum\limits_{j \in C_r \wedge j \neq i} s_{ij} - \dfrac{1}{N - n_r} \sum\limits_{j \in \Omega \backslash C_r} s_{ij}}{max\left\{ \dfrac{1}{n_r - 1} \sum\limits_{j \in C_r \wedge j \neq i} s_{ij},\ \dfrac{1}{N - n_r} \sum\limits_{j \in \Omega \backslash C_r} s_{ij} \right\}}, \tag{2}$$

with $-1 \leq$ Sil(i) ≤ 1, where $N - n_r$ is the number of elements that do not belong to cluster C_r.

This measure takes into consideration the average of the similarities between an element i belonging to cluster C_r and all other elements that do not belong to this cluster. The determination of the average of the Sil(i) values for all objects i belonging to each cluster and for the c clusters may be useful. We can also use the transformation of the Sil(i) values defined by Sil*(i)= (1+Sil(i))/2, in order to obtain values between 0 and 1.

U Statistics (Mann and Whitney, 1947) provide relevant test statistics for assessing the adequacy of a cluster, combining the concepts of its compactness and isolation. Let:

$$U_{ijk\ell} = \begin{cases} 0 & se\ \ s_{ij} > s_{k\ell} \\ 1/2 & se\ \ s_{ij} = s_{k\ell} \\ 1 & se\ \ s_{ij} < s_{k\ell} \end{cases}, \tag{3}$$

where s_{ij} are values of the similarity matrix between pairs of elements of the set to classify.

We consider that for each cluster C of size r (Gordon, 1999):

$W \equiv \left\{ (i,j) : i,j \in C, i < j \right\}$ is the set of $r(r-1)/2$ within-cluster pairs, and

$B \equiv \left\{ (k,\ell) : k \in C, \ell \notin C \right\}$ is the set of $r(n-r)$ between-cluster pairs.

The global U index, U_G, is defined by:

$$U_G \equiv \sum_{(i,j) \in W} \sum_{(k,\ell) \in B} u_{ijk\ell}. \tag{4}$$

The local U index, U_L, is defined by:

$$U_L \equiv \sum_{i \in C} \sum_{j \in C \backslash \{i\}} \sum_{k \notin C} u_{ijik}. \tag{5}$$

The "best" cluster is the one that presents the smallest value of these indexes. In the case of a cluster-L* we have U_G=0 and in the case of a ball cluster we have U_L=0 (Gordon, 1999)

In a methodological framework and in order to evaluate the obtained partitions, the values of STAT, DIF, P(I2modΣ) and γ indexes (for each partition) were calculated. In addition, the values of the Sil* index and of the U statistics were calculated for the clusters of the most significant partitions (according to the previous indexes).

Application to real data: A questionnaire related to religious beliefs

A questionnaire was used in order to investigate the proximity of religious beliefs profiles of individuals who live on São Miguel island (Azores) according to the frequency of their visits to the Mass. The initial classical data matrix (517 x 10) is constituted by 517 respondents (individuals) and 10 statements (items) corresponding to 10 categorical variables (V1 – God is one, but in three persons, V2 – Christ is God, V3- Christ performed authentic miracles, V4 – The Pope is never wrong when he speaks of the truths of faith, V5 – Something exists after death, V6 – Christ saved us by dying for our sins, V7 – The devil exists, V8 – The good are rewarded and the bad are punished in the afterlife, V9 – The sacrament of confession forgives our sins, V10 – Everyone is born with original sin), each of them, with four not ordered modalities (Believe (BEL), D- Doubt (DOUBT), Don't Believe (D_BEL), Don't know/no response (NR)).

Individuals were distributed into eight groups by a SQL query according to the frequency that the individuals of each group go to the Mass: "Never", "Rarely", "on Important Dates or Celebrations (IDC)", "only for Weddings, Baptisms or Funerals (WBF)", "Once or Twice a month (OT)", "every Sunday (S)", "every Sunday and during the Week (SW)", "when they Feel it's Necessary (FN)" . The symbolic data table (see Table 1) describes a set of eight symbolic objects (the rows) by a set of ten modal variables**.** The data units "Never", "Rarely", "IDC ", "WBF", "OT" "S", "SW and "FN" contain, respectively, 14, 60, 29, 62, 41, 228, 14 and 69 individuals and each entry of Table 1 contains a frequency distribution.

Table 1. Symbolic Data Matrix

	V1	V2	…
Never	BEL(0.29), DOUBT(0.21), D_BEL(0.29), NR(0.21)	BEL(0.36), DOUBT(0.14), D_BEL(0.36), NR(0.14)	…
Rarely	BEL(0.63), DOUBT(0.20), D_BEL(0.06), NR(0.08)	BEL(0.68), DOUBT(0.13), D_BEL(0.10), NR(0.08)	…
IDC	BEL(0.72), DOUBT(0.17), D_BEL(0.03), NR(0.07)	BEL(0.69), DOUBT(0.03), D_BEL(0.14), NR(0.14)	…
WBF	BEL(0.58), DOUBT(0.19), D_BEL(0.13), NR(0.10)	BEL(0.61), DOUBT(0.15), D_BEL(0.11), NR(0.13)	…
OT	BEL(0.85), DOUBT(0.05), NR(0.10)	BEL(0.80), DOUBT(0.10), D_BEL(0.02), NR(0.07)	…
S	BEL(0.88), DOUBT(0.05), D_BEL(0.01), NR(0.06)	BEL(0.90), DOUBT(0.03), D_BEL(0.01), NR(0.06)	…
SW	BEL(0.93), DOUBT(0.07)	BEL(0.71), DOUBT(0.07), D_BEL(0.07), NR(0.14)	…
FN	BEL(0.75), DOUBT(0.06), D_BEL(0.09), NR(0.10)	BEL(0.86), DOUBT(0.04), D_BEL(0.04), NR(0.06)	…

The AHCA of the eight symbolic data units is based on the weighted generalized affinity coefficient (Nicolau and Bacelar-Nicolau, 1999; Bacelar-Nicolau, 2000, 2002) with equal weights $\left(\pi_j = 1/p\right)$. We used four aggregation criteria, one of them classical, Single

Linkage (SL), and three probabilistic, AV1, AVB, and AVL (Lerman, 1981; Bacelar-Nicolau, 1988; Nicolau, 1980, 1983; Nicolau and Bacelar-Nicolau, 1998).

Table 2. The Most Significant Partitions

	The most significant partitions	Indexes
SL / AV1 / AVB	Lev. 5 - {WBF, FN, IDC, Rarely, S, OT};{SW}; {Never}	STAT= 4.4914 γ=1.000
	Lev. 6- {WBF, FN, IDC, Rarely, S, OT, SW}; {Never}	P(I2mod, Σ)=0.8728
AVL	Lev. 4 - {WBF, FN, IDC, Rarely};{Never}, {S, OT}; {SW}	STAT= 3.7935 P(I2mod, Σ)=0.8995 γ=0.9728

Table 2 presents the results corresponding to the most significant partitions provided by the four aggregation criteria, according to the validation indexes in the last column of this table. Table 3 presents the values of the Sil* index and the values of U statistics for the partitions presented in Table 2.

The STAT, γ indexes and the U statistics allow us to conclude that the most significant level (the best cut-off level) corresponds to a partition into three clusters given by the methods SL, AV1, and AVB: {WBF, FN, IDC, Rarely, S, OT} {SW} {Never} (see Tables 2 and 3). The first cluster contains the individuals that seldom go to the Mass and the individuals that go to the Mass with some frequency. The second cluster contains the individuals that go to the Mass every Sunday and during the week. Finally, the third cluster contains the individuals who never go to the Mass.

Table 3. U statistics and values of the Sil* index

	Cluster 1	Cluster 2	Cluster 3	Cluster 4
Partition UL/UG Sil*	{WBF, FN, IDC, Rarely, S, OT} 0/0 0.6028437	{SW} 0/0 ---	{Never} 0/0 ---	
Partition UL/UG Sil*	{WBF, FN, IDC, Rarely, S, OT, SW} 4/21 0.5666344	{Never} 0/0 ---		
Partition UL/UG Sil*	{WBF, FN, IDC, Rarely} 1/2 0.3818336	{Never} 0/0 ---	{S,OT} 0/0 0.3196 724	{SW} 0/0 ---

```
WBF       --*-----*                        WBF       --*-----*
               |--*                                        |--*
FN        --*-----*  |                      FN        --*-----*  |
               |--*                                        |-----*
IDC       --*--*   | |                      IDC       --*--*   | |   |
               |-----*  |                                  |-----*  |--*
Rarely    --*--*       |--*                 Rarely    --*--*   | |   | |
                       | |                                    | |   | |
S         --*          | |                  Never     --*-------------*   |
               |----------*  |--*                                         |
OT        --*             | |               S         --*             |   |
                          | |                                |-----------*  |
SW        --*-------------*  |              OT        --*               |-----*
                            |                                           |
Never     --*----------------*             SW        --*-----------*
```
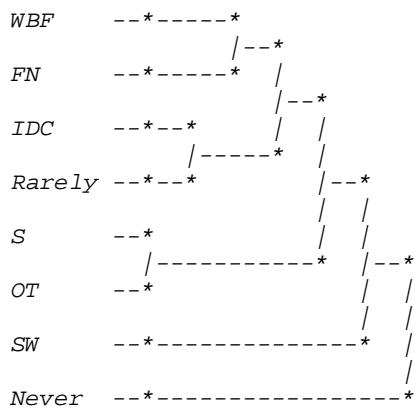
Figure 1. Dendrogram obtained by the AV1/AVB methods
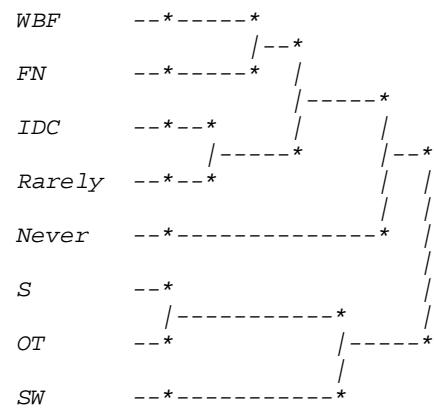
Figure 2. Dendrogram obtained by the AVL method

Figures 1 and 2 show the dendrograms associated with the AV1/AVB and AVL methods, respectively.

Table 4- Responses given by the individuals belonging to each cluster (%) - three profiles

V1					V2				V3				V4			
	BEL	DOUBT	D_BEL	NR	BEL	DOUBT	D_BEL	NR	BEL	DOUBT	D_BEL	NR	BEL	DOUBT	D_BEL	NR
C1	78%	9%	5%	8%	81%	6%	5%	8%	80%	8%	2%	10%	53%	25%	10%	12%
C2	93%	7%	0%	0%	71%	7%	7%	14%	93%	7%	0%	0%	93%	7%	0%	0%
C3	29%	21%	29%	21%	36%	14%	36%	14%	43%	7%	29%	21%	29%	21%	36%	14%

V5					V6				V7				V8			
	BEL	DOUBT	D_BEL	NR	BEL	DOUBT	D_BEL	NR	BEL	DOUBT	D_BEL	NR	BEL	DOUBT	D_BEL	NR
C1	55%	21%	9%	15%	79%	7%	5%	10%	35%	26%	23%	16%	36%	25%	23%	16%
C2	79%	21%	0%	0%	93%	0%	7%	0%	57%	21%	14%	7%	57%	29%	14%	0%
C3	21%	36%	29%	14%	43%	14%	36%	7%	21%	14%	64%	0%	14%	29%	50%	7%

	V9				V10			
	BEL	DOUBT	D_BEL	NR	BEL	DOUBT	D_BEL	NR
C 1	52%	23%	13%	12%	49%	19%	15%	17%
C 2	79%	7%	7%	7%	93%	0%	7%	0%
C 3	14%	29%	57%	0%	21%	21%	36%	21%

Reading the dendrogram associated with the AV1/AVB aggregation criteria from top to bottom (see Figure 1), the most frequent response given by the individuals of clusters 1 and 2 has been "Believe". The 2D Zoom Star, as showed in Figure 3, doesn´t distinguish the clusters 1 and 2, but from the observation of Table 4, it can be seen that there are differences between the profiles associated to these two clusters. These differences also could have been observed from a 3D Zoom Star containing the information associated with Table 4 (bar graphs for each variable). There are more individuals belonging to the cluster 2 who go to the Mass every Sunday and during the week, comparatively to the individuals belonging to the cluster 1, that believe that: "V1 – God is one, but in three persons" (93% versus 78%), "V3- Christ performed authentic miracles" (93% versus 80%), "V4 – The Pope is never wrong when he speaks of the truths of faith" (93% versus 53%), "V5 – Something exists after death" (79% versus 55%), "V6 – Christ saved us by dying for our sins" (93% versus 79%), "V7 – The devil exists" (57% versus 35%), "V8 – The good are rewarded and the bad are punished in the afterlife" (57% versus 36%), V9 – The sacrament of confession forgives our sins" (79% versus 52%), and "V10 – Everyone is born with original sin" (93% versus 49%) (see Figure 3 and Table 4). Note that none of the individuals of the cluster 2 answered "Don't Believe" nor "Don't know/no response" to the statements of the variables V1, V3, V4, and V5.
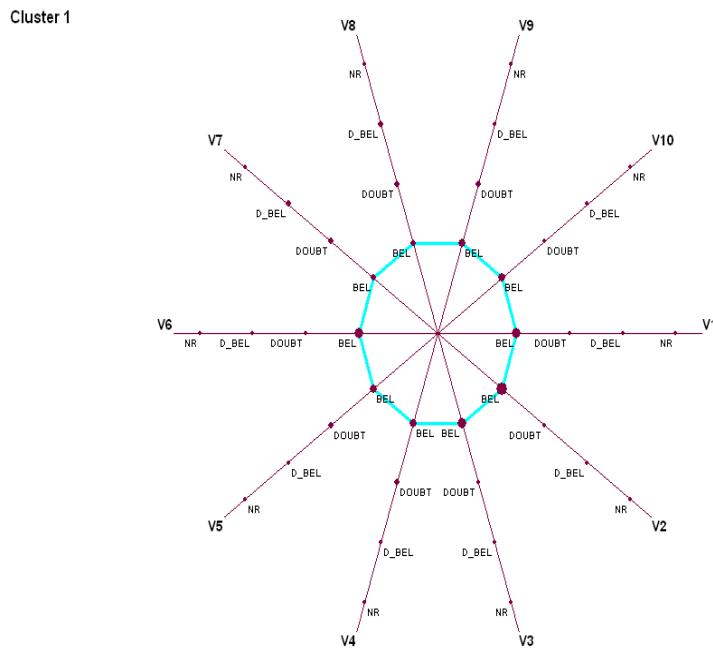
Figure 3. 2D Zoom Star representation for the clusters 1 and 2

The individuals who Never go to the Mass (individuals belonging to the cluster 3, considering the dendrogram associated with the AV1/AVB methods read from top to bottom) have a profile which can be well represented by the 2D Zoom Star showed in Figure 4, where the axes are linked by a line that connects the most frequent values of each variable (the main characteristics of the symbolic objects). Most respondents included into this cluster don't believe that "V7 – The devil exists" (64%), and that "V9 – The sacrament of confession forgives our sins" (57%). About 50% of them don't believe that "V8 – The good are rewarded and the bad are punished in the afterlife". A large proportion of these individuals don't believe that "V4 – The Pope is never wrong when he speaks of the truths of faith" (36%), and that "V10 – Everyone is born with original sin" (36 %). A large proportion of them doubts that "V5 – Something exists after death" (36%). Moreover, 29% of the individuals belonging to the cluster 3 believe that "V1 – God is one, but in three persons"

whereas 29% of these individuals don´t believe in that. 36% of them believe that "V2 – Christ is God" whereas 36% don´t believe in that. Interestingly, a large portion of them believe that "V3- Christ performed authentic miracles" (43%), and that "V6 – Christ saved us by dying for our sins" (43%).
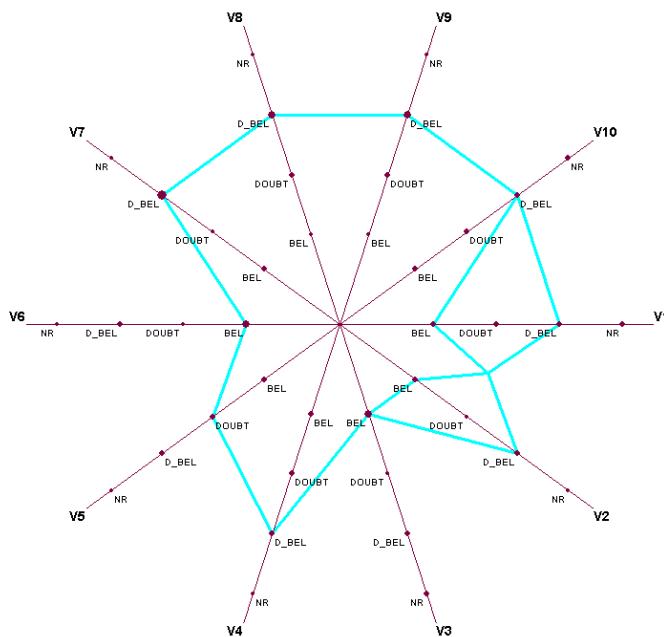
Figure 4. 2D Zoom Star representation for the cluster 3

Note that until the best cut-off level of the AVL method (level four) the hierarchies corresponding to the four obtained dendrograms provide the same four classes, although ordered in a different way (consensus partition): {{WBF, FN}, {IDC, Rarely}}, {S, OT}, {SW}, {Never } (see Figures 1 and 2). Although, the profiles corresponding to the clusters {SW} and {Never} are very different, in the dendrogram associated with the AV1/AVB methods, these two clusters are joined in the latest levels in a chain effect. The subclasses {S, OT} and {IDC, rarely"} were found by all aggregation criteria applied, and the subclass, {WBF, FN} was found by all aggregation criteria except by the SL.

Conclusion

The example presented allowed us to illustrate the application of the weighted generalized affinity coefficient in the classification of complex or symbolic data units described by modal variables, and the extension of the VL methodology to the classification of this type of data. Taking into consideration the importance of the validation of the results of a Cluster Analysis, we described, in Section 3, the extension of some validation indexes used in the case of classical data matrixes to the case of validation in AHCA of symbolic data.

From the application of the AHCA to the data set under investigation and using the referred validation measures, findings indicate a robust typology of religious beliefs of the individuals of our sample according to the frequency that they go to the Mass. The three selected clusters (represented by new symbolic objects) correspond to distinct profiles of religious beliefs, which were characterized in the last section by a p-multivariate vector of relative frequencies (expressed in %). The applied measures of validation proved usefulness to determine the appropriate cut-off levels of the dendrograms. Moreover, the consensus

partition into four classes (obtained at level four by all applied aggregation criteria) is also conceptually relevant.

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ECONOMETRIC SCALES OF EQUIVALENCE, THEIR IMPLEMENTATIONS IN ALBANIA

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Abstract

Econometric scales are, by one consent, considered a necessary tool in poverty analysis, welfare comparison and income distribution analysis. The calculation of equivalence scales based on a food ratio applied as a welfare measure is well known as the Engel's method. In this paper, the aim is to calculate the econometric scales based on a food ratio applied as a welfare measure; parametric regression is used for the estimation of the Engel curves. The Engel method is based on the observation that, for any given household composition, the share of food expenditures on total expenditures is inversely related to income. That is to say, two household with different number of members but that have the same food expenditure achieve the same level of welfare even if they have different incomes (major to the larger household). The method is applied to the data set of Household Budget Survey in Albania in 2008. The economic resources to achieve a given level of welfare are not directly proportional to the household size. The poverty line is estimated using the method of expenditure of consumption mediana. As the same methodology is applied two times, introducing as single element of diversification in the analytical process, two different equivalent scales, the final result can be considered a sort of a 'analysis of sensibility'.

Keywords: Equivalence scales, econometric scales, parametric regression, Engel curves, poverty line

Introduction

For the development of poverty line and the use of an economic variable which could be an income or expenditure consumption, the key is to choose the reference unit, that is to say, to evaluate the welfare of a single individual or the hole household. There are different reasons that the household is preferred: in general the statistical institutions and the banks often refers to the household balance data, the multiple relation of economic scales related to expenditure for residence and durable goods. There are two more aspects that influence the analysis:

- Usually the household is considered made of all the members that lives in the same residence and are connected by blood, emotional relationship or marriage.

- It is pretended that all the members of the household have the same level of welfare.

If we choose the unit of household, the question is how to make comparable incomes (expenditure consumption) of household that change among them for the demographic characteristics that influence the economic variables. In general, in order to compare the

incomes of two heterogenic households among them, in amplitude and composition, we should use the equivalent scales.

Formally, an equivalent scale can be defined as a ratio of the expenditure of one household with certain demographic characteristic to achieve welfare level and the expenditure of another household taken as reference that achieve the same welfare level.

Equivalence scales are indexes that measure the relative cost of living of households of different sizes and compositions. They are made up of two elements: the "consumer unit equivalence", which takes account of the needs of the household members according to their characteristics, and "economies of scale", which mean that the marginal cost goes down with the addition of new members to the household. Even if from the operative point of view there are easier procedures to make equivalent scales, one uncertain thing is that in literature there are many equivalent scales, and we have to choose which one to use. Some of those are described below:

Equivalence scales
1.   Econometric scales
2.   Subjective scales
3.   Budget standard scales
4.   Social assistance benefit scales
5.   Pragmatic scales
6.

Econometric scales

The strength of modern econometric derivations of equivalence scales is that they draw on well - developed models of households behavior which characterize the relationships between household welfare (utility) and household characterize and expenditure**.**

Subjective scales

The subjective scale is based on the data of the surveys in which different household with different demographic characteristics are asked for different welfare levels (low, medium, high).

Budget standard scales

In the budget standard approach equivalence scales are derived from judgments of experts, standards of living are described by first producing a specific sets of goods and services, pricing the components and then aggregating the budgets. Moreover budget standard scales are defined with reference to a subsistence or poverty standard of living**.**

Social assistance benefit scales

The 'social assistance benefit scales' are scales adopted by the public institution in order to establish which household have the right to access certain public services and/or to facilitated rates.

Pragmatic scales

Pragmatic scales adopt easy calculated schemes and are implemented in studies related to inequalities and the study of poverty among different countries.

Econometric scales
Rothbarth method

A rather similar to Engel method has been advanced by **Rothbarth, 1941**. This method assumes «adult goods» as the appropriate welfare indicator. Adult goods are those goods that are consumed only by adults and not by children (e.g. alcoholic drinks, tobacco,

etc.). In this context, two households are at the same level of welfare if they have the same *absolute* level of expenditures on those goods. The intuitive reason is that when a child arrives it is likely that consumption of adult goods falls for a given level of income. Lower levels of adult goods would mean lower levels of welfare for adults.

Engel method

The Engel method is based on the observation that, for any given household composition, the *share of food expenditures on total expenditures* is inversely related to income. From this empirical regularity, Engel derived that the share of food expenditures could be assumed as an appropriate welfare indicator to compare households of different compositions. In this way, two households of different sizes or composition but with the same share of food with total expenditures could be thought of as having the same level of welfare. An interesting model proposed by Van Ginneken (1982) considers a double logarithmic function for the explanation of the Engel curve, as follows.

$$\log A_i = \alpha + \beta \log Y_i + \gamma \log N_i + u \qquad (1)$$

Where A_i is the expenditure devoted to food, Y_i is the total consumption expenditure and N_i is the family size, u is residue of model . When the consumption elasticity is fixed with respect to the family size, $\varepsilon = \dfrac{\beta}{1-\gamma}$ it is possible to obtain the equivalence scale in a recursive way:

$$\begin{cases} e_1 = 1 \\ e_{n+1} = e_n (1 + \dfrac{\varepsilon}{n}) \end{cases}$$

Implementation of Engel method in Albanian population

Using the data related to the expenditure of a sample of households, it is possible to estimate the parameters of the model. The data are collected from household budget survey in Albania in 2008. This consists of 3599 interviewed households' representative of the whole Albanian population. First of all a very simple model for the Engel food curve was estimated, in order to have a first look of the economies of scale present in Albania that take into account the model proposed by Van Ginneken (1982). Parametric Engel regression curve is estimated for several types of households, distinct in accord with household size. The consumption expenditure for households of different size is made equivalent to that of a two member household using equivalent coefficients which take into account different needs and scale economies that occur as the number of household members increase. Dividing household consumption expenditure by the coefficient referred to the household size, the equivalent consumption expenditure is obtained which can be directly compared to that of a two-member household.

The analysis begins with an exploratory phase of sample data regarding the food ratio and the total spending for each of the six typologies.

$$\log A_i = \alpha + \beta \log Y_i + \gamma \log N_i + u$$

The coefficient calculated   α=0,914 β=0,727, γ=0,106

And then the coefficient $\varepsilon = \dfrac{\beta}{1-\gamma}$

$$e_1 = 1$$

$$e_{n+1} = e_n(1 + \frac{\varepsilon}{n})$$

$$e_2 = e_1(1 + \frac{0.8}{1})$$

$$e_2 = 1,8$$

$$e_3 = e_2(1 + \frac{0,8}{2})$$

$$e_3 = 2,52$$

$$e_4 = e_3(1 + \frac{0.8}{3})$$

$$e_4 = 2,85$$

In the table below the equivalence coefficient are calculated taking into account the household with one member and the household with two members.

Tab.1. Equivalent coefficients estimated according to the one member and two members household.

Number of members	Household with one member (equivalent coefficient)	Household with two members (equivalent coefficient)
1	1	0,55
2	1,8	1
3	2,52	1,4
4	2,85	1,73
5	3,42	2,076
6	3,97	2,4

Comparison of headcount poverty in Tirana estimated according to the expenditure of consumption mediana in the absence and presence of econometric scales
Looking at first to the expenditures data's per consumption of the households resident in Tirana 2008, it has been decided to estimate the *equivalent* expenditure of the individuals dividing the amounted expenditure per consumption in every household unit to the number of the correspondent components. That is to say, each single individual of the sample (taking part in the selected household under study) will be associated with an 'equivalent expenditure', and a household expenditure per member. A similar procedure, give arise to the hypothesis that in a household can not be realised a 'economical scale'. Even though, that hypothesis is considered less realistic, at exploration matters, can offer point of

reflection and lead to interpretational results under the 'sensibility' of the methodology of analysis against the different operative choices. As the same methodology is applied two times, introducing, as single element of diversification in the analytical process, two different equivalent scales, the final result can be considered a sort of a 'analysis of sensibility'.

After associating the 'equivalent expense', the distribution of this variable is sorted on an increasing scale and each element (that is to say, each value of 'equivalent expense') is given as a weight result of the number of the members of the household and the household weight. It will be consolidated by defining the position of the median and the consumer expenditure according to which the individual can be considered poor. Naming this product as frequency, there has been estimated the cumulated frequencies in order to have for each value of the equivalent per member expenditure, the number of the individuals that represents an amount of expenditure per consumption minor or equal to that given in consideration. The next step is individualizing the 'median position', dividing in half the total of the cumulated frequencies. Equivalent consumption expenditure correspondent to the median position is been assumed as median per-capita consumption expenditure. It has been preceded with an estimation of the incidence assuming the poverty line of the consumption expenditure 'median'. The threshold of the relative poverty is estimated measuring the 50% of the expenditure of consumption mediana. That is to say, in base of the process made above, an individual may be considered 'poor' if represents a consumption (equivalent) expenditure of import, minor or equal to 4846.5 Lek per month.

As the hypothesis to exclude econometric scales that are realized in correspondent to the most numerous household (and this can appear less 'realistic'), the procedure made by the determination of a poverty line based on the expenditure of consumption mediana is repeated to the given data using the 'per capita equivalent expenditure' with equivalent coefficients. So, for every member of the household in the sample, the equivalent expenditure per capita is determined dividing the expenditure of consumption of the members by the correspondent coefficient of equivalent, having the one member household as base.

From this elaboration it is obtained a poverty line per capita5756,2, i.e a little above that obtained by the equalization of the coefficients of the equivalence scales of different household size. In table 2 are listed the different compositions, in base of the household size, the proportions of household unit 'deprived' from the total of nucleus of identical size that make up the sample in examination. In this table, it can be observed the 'misbalance', at a structural level, produced by the method of construction of the poverty line, based in the expenditure of consumption mediana, supposing the absence of 'econometric scales' for the household nucleus with size bigger than unit.

Tab 2. The incidence of relative poverty calculated in different household sizes. Tirana – 2008. Vlerat ne %

Household size	Incidence of the relative poverty calculated in base of the mediana of the expenditure of consumption in absence of econometrical scales.	Incidence of the relative poverty calculated in base of the mediana of the expenditure of consumption in base of the equivalence coefficients.

1	3,09	5,3
2	6,82	11,8
3	11,27	10,6
4	14,95	12,5
5	21,85	14,7
6	36,56	16,08

Conclusion

Since the poverty threshold value, during the years, depends on the changes in the distribution of
household consumption expenditure, the estimate of relative poverty may rise even during periods of growth or greater wellbeing. In fact, if economic development produces a rise in consumption expenditure for all households, but this increase is stronger among households with the highest expenditure levels, inequality rises as far as the poverty line value. This produces an increase in the number of poor households, even though the households with the lowest levels of consumptions expenditure have really improved their standards of living.

The methodology used in the determination of poverty line by the expenditure of consumption mediana in absence of econometric scales, even thought has not a high accuracy due to the informal factors, it gives a general picture of the distribution of poverty in Tirana according to household size. With this study we can draw up and outline the concept and definition of the level of poverty in Tirana as a multidimensional phenomenon correlated with qualitative and quantitative variables. The calculated results shows an increased poverty corresponding to larger household size. We note an increasing poverty for the household size with more than 4 members. It is also observed the 'misbalance', at a structural level, produced by the method of construction of the poverty line, based in the expenditure of consumption mediana, supposing the absence of 'econometric scales' for the household nucleus with size bigger than unit. The headcount poverty based in expenditure mediana based in the equivalence coefficients is not directly proportional to the household size.

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THE ELECTROMAGNETIC FIELD OF THE POINT HERTZIAN RADIATOR IN UNIAXIAL MAGNETIC CRYSTAL

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Abstract

Earlier received new analytical solution of the equation of Maxwell are expressed by several wave potentials, one of them is constructed by means of an integrated sine and a cosine. In this work asymptotic solution from the analytical solution of the equations of Maxwell for electromagnetic field strength of the emitter radiator of Hertz in uniaxial magnetic crystal are received.

Keywords: Asymptotic solution, radiator of Hertz, crystal

Introduction

At the solution of many problems of radio engineering, telecommunication and other scientific and technical branches it is much important to know structure of an electromagnetic field in the considered part of space. These issues include, for example, the development of radiating systems, ensuring electromagnetic compatibility of radio devices and telecommunications systems, and etc. For calculation the electromagnetic field in each case it is required to solve the corresponding electrodynamic problem.

In work [1] the method of calculation of an electromagnetic field of an electric dipole in a homogeneous medium with uniaxial anisotropy of electric and magnetic properties with use of vector potential was considered.

 Now at a high level the mathematical apparatus of the theory of the generalized functions is developed. The class of the generalized functions contains the juddering and singular generalized functions, in particular, and a class of smooth functions. In work [2] for the solution of such task the method of the generalized functions is used.

In the presented work electromagnetic field of a point radiator of Hertz in a far zone for the uniaxial anisotropic medium, a tensor of magnetic permeability which has a diagonal appearance with various diagonal components is investigated. Elements $\hat{\mu}$ are selected in the form of a diagonal matrix: $\mu_{zz} = \mu_1 , \mu_{xx} = \mu_{yy} = \mu$, which corresponds to the magnetic uniaxial crystal. The axis of a crystal is directed along an axis z.

Statement of the problem

In work [2] exact solutions of the equations of Maxwell for electric and magnetic dipoles in uniaxial magnetic crystals are received. Exact solutions are received as the sum of two independent solutions. The first composed one of decisions is defined by the wave potential Ψ_0 and a vector of the moment of the electric dipole $\boldsymbol{p}_0^\varepsilon$, operating along an axis of a magnetic crystal:

$$\begin{cases} \boldsymbol{E}_1 = \dfrac{-1}{\varepsilon \varepsilon_0}(\nabla\nabla + k_0^2)(\Psi_0 \boldsymbol{p}_0^\varepsilon), \\[2mm] \boldsymbol{H}_1 = i\omega \cdot [\nabla, (\Psi_0 \boldsymbol{p}_0^\varepsilon)], \end{cases}$$

(1)

where ∇ – operator of Hamilton,

$$\nabla = \frac{\partial}{\partial x}\mathbf{e}_x + \frac{\partial}{\partial y}\mathbf{e}_y + \frac{\partial}{\partial z}\mathbf{e}_z, \qquad \Psi_0 = \frac{-\exp(ik_0 r)}{4\pi \cdot r},$$

$$r = \sqrt{x^2 + y^2 + z^2}, \qquad\qquad k_0^2 = \omega^2 \varepsilon_0 \varepsilon \mu \mu_0, \qquad \boldsymbol{p}_0^\varepsilon = (0,0, p_z^\varepsilon).$$

The second composed analytical solutions are defined by wave potentials Ψ_0, Ψ_1^m, Ψ_2^m and a vector of the moment of the electric dipole $\boldsymbol{p}_\perp^\varepsilon$, which located perpendicularly to an axis of a crystal of z:

$$\begin{cases} \boldsymbol{E}_2 = -\dfrac{1}{\varepsilon_0 \varepsilon}(k_n^{\mu 2}(\boldsymbol{p}_\perp^\varepsilon \Psi_1^m) - k_0^2 \nabla_\perp(\nabla, (\boldsymbol{p}_\perp^\varepsilon \Psi_2^m)) + \nabla(\nabla, (\boldsymbol{p}_\perp^\varepsilon \Psi_0))), \\[2mm] \boldsymbol{H}_2 = -i\omega(\nabla_\perp \dfrac{\partial}{\partial z}\mathbf{e}_z[\nabla, (\boldsymbol{p}_\perp^\varepsilon \Psi_2^m)] + \mathbf{e}_z(\mathbf{e}_z[\nabla, (\boldsymbol{p}_\perp^\varepsilon, (\Psi_0 - \Psi_1^m))]) - [\nabla, (\boldsymbol{p}_\perp^\varepsilon \Psi_0)]), \end{cases}$$

(2)

here the wave potential Ψ_1^m and the radius vector r' for the magnetic anisotropic medium are determined by:

$$\Psi_1^m = -\sqrt{\frac{\mu}{\mu_1}}\frac{\exp(ik_n^\mu r')}{4\pi \cdot r'}, \qquad r' = \sqrt{x^2 + y^2 + \frac{\mu}{\mu_1}z^2}. \tag{3}$$

The wave number k_n^μ for uniaxial magnetic crystal:

$$k_n^\mu = k_0 \sqrt{\frac{\mu_1}{\mu}}, \qquad \nabla_\perp = \nabla - \frac{\partial}{\partial z}\mathbf{e}_z, \qquad \boldsymbol{p}_\perp^\varepsilon = (p_x^\varepsilon, p_y^\varepsilon, 0).$$

The function Ψ_2^m is defined by the integral sine and cosine:

$$\Psi_2^m = \frac{-i}{8\pi k_0}\Big[\exp(ik_0 z)(\mathrm{Ci}(k_0(r-z)) + i\cdot\mathrm{si}(k_0(r-z))) + \exp(-ik_0 z)(\mathrm{Ci}(k_0(r+z)) +$$

$$+ i\cdot\mathrm{si}(k_0(r+z))) - \exp(ik_0 z)(\mathrm{Ci}(k_n^\mu r' - k_0 z) + i\cdot\mathrm{si}(k_n^\mu r' - k_0 z)) - \tag{4}$$

$$- \exp(-ik_0 z)(\mathrm{Ci}(k_n^\mu r' + k_0 z) + i\cdot\mathrm{si}(k_n^\mu r' + k_0 z))\Big].$$

The integrated sine and cosine:

270

$$\text{Ci}(z) = \gamma + \ln(z) + \int_0^z \frac{\cos z - 1}{t} dt, \qquad \text{si}(z) = \int_0^z \frac{\sin z}{t} dt - \frac{\pi}{2}, \qquad (5)$$

$\gamma = 0.5772$ – Euler number.

In this part it is required to find the asymptotic solution of the exact solution of vectors of intensity of an electromagnetic field for an electric dipole in the far zone, which is located parallel to and perpendicular to an axis of uniaxial magnetic crystal.

Solution of the problem

To find the strength of electromagnetic field for the point electric dipole operating parallel to an axis of a magnetic crystal in a far zone, it is necessary to consider communication of the Cartesian system of coordinates with spherical system of coordinates [3]:

$$x = r \cos\varphi \cdot \sin\theta, \quad y = r \cdot \sin\theta \cdot \sin\varphi, \quad z = r \cdot \cos\theta. \qquad (6)$$

Now I differentiate (1) and using (6), it is possible to obtain an asymptotic solution of intensity of electromagnetic field for a point electric dipole, acting parallel to the magnetic axis of the crystal in the far zone:

$$E_r = E_\varphi = H_r = H_\theta = 0,$$

(7)

$$E_\theta = \frac{k_0^2 p_z^\varepsilon \cos\theta \cos\varphi \cdot \exp(i(k_0 r - \omega \cdot t))}{4\pi\varepsilon\varepsilon_0 r},$$

(8)

$$H_\varphi = -\frac{\omega \cdot k_0 p_z^\varepsilon \exp(i(k_0 r - \omega \cdot t)) \cos\theta \cos\varphi}{4\pi \cdot r}. \qquad (9)$$

The received solutions (7)-(9) correspond with solutions for a dipole in the isotropic medium.

Further asymptotic solutions of intensity of electromagnetic field for a point electric dipole in the far zone, which is located perpendicularly to an axis to uniaxial magnetic crystal (2) will be received.

Using (6) in (3), it is easy to convert the radius vector r' and the wave potential Ψ_1^m for uniaxial magnetic crystal of the Cartesian coordinate system in the spherical coordinate system:

$$r' = r\sqrt{\frac{\mu}{\mu_1}\cos^2\theta + \sin^2\theta}, \qquad (10)$$

$$\Psi_1^m = -\sqrt{\frac{\mu}{\mu_1}}\,\frac{\exp(i(k_n^\mu r\sqrt{\frac{\mu}{\mu_1}\cos^2\theta + \sin^2\theta}\, - \omega\cdot t))}{4\pi r\sqrt{\frac{\mu}{\mu_1}\cos^2\theta + \sin^2\theta}}. \tag{11}$$

The asymptotic solution of the integral sine and cosine (5) at $z \to \infty$:

$$\mathrm{si}(z) \approx -\frac{1}{z}\left(\cos(z) + \frac{\sin(z)}{z}\right), \qquad \mathrm{Ci}(z) \approx \frac{1}{z}\left(\sin(z) - \frac{\cos(z)}{z}\right), \tag{12}$$

By means of (12) it is possible to find the asymptotic solution of function Ψ_2^m (4) in a far zone (Fig.2):

$$\Psi_2^m \approx \frac{\Psi_0 r^2 - \Psi_1^m \cdot r'^2}{k_0^2 (r^2 - z^2)}. \tag{13}$$
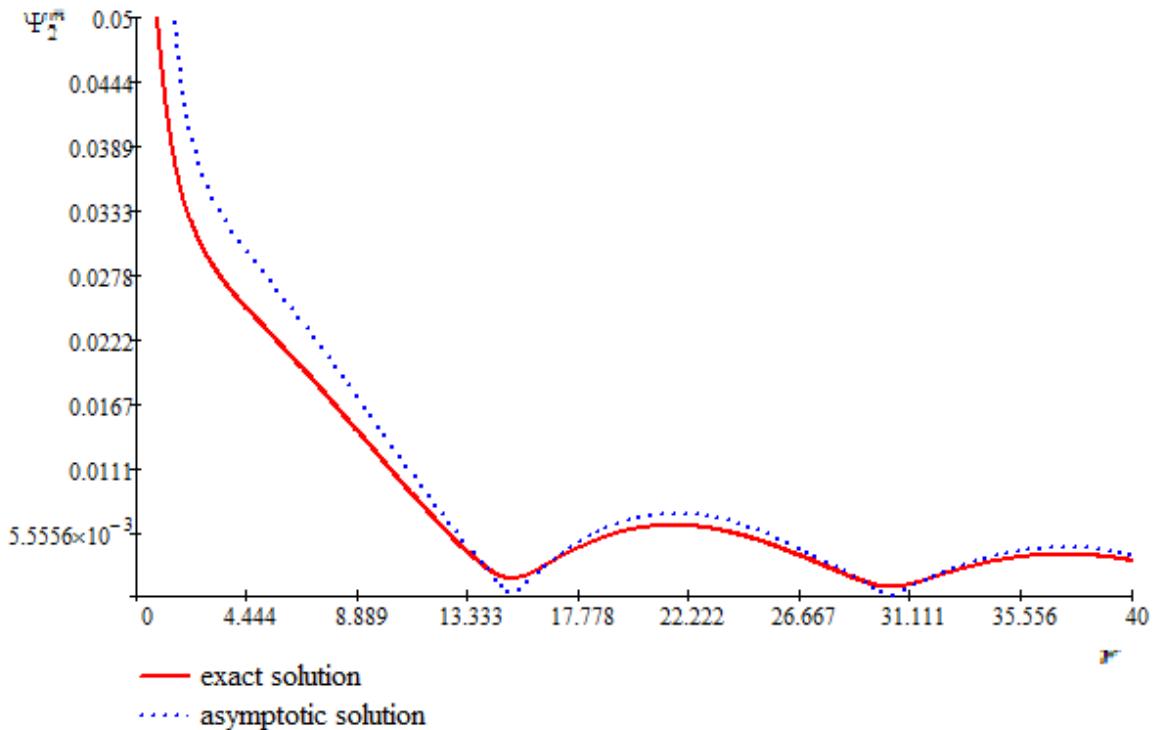
Fig.2. Comparative graph of the exact and the asymptotic solution function Ψ_2^m

The components of the vectors of intensity of electromagnetic field (2) are:

$$
\begin{cases}
E_{2x} = -\dfrac{1}{\varepsilon_0 \varepsilon}(k_{\mathrm{n}}^{\mu 2}\, \dfrac{\partial^2}{\partial x^2}(p_x^{\varepsilon}\Psi_1^m) + \dfrac{\partial^2}{\partial x^2}(p_x^{\varepsilon}\Psi_0) - k_0^2\, \dfrac{\partial^2}{\partial x^2}(p_x^{\varepsilon}\Psi_2^m)), \\[3em]
E_{2y} = -\dfrac{1}{\varepsilon_0 \varepsilon}(\dfrac{\partial^2}{\partial x \partial y}(p_x^{\varepsilon}\Psi_0) - k_0^2\, \dfrac{\partial^2}{\partial x \partial y}(p_x^{\varepsilon}\Psi_2^m)), \\[3em]
E_{2z} = -\dfrac{1}{\varepsilon_0 \varepsilon}\, \dfrac{\partial^2}{\partial x \partial z}(p_x^{\varepsilon}\Psi_0),
\end{cases}
\tag{14}
$$

$$
\begin{cases}
H_{2x} = i\omega \dfrac{\partial^3 (p_x^{\varepsilon}\Psi_2^m)}{\partial x \partial y \partial z}, \\[3em]
H_{2y} = i\omega(\dfrac{\partial^3 (p_x^{\varepsilon}\Psi_2^m)}{\partial y^2 \partial z} + \dfrac{\partial}{\partial z}(p_x^{\varepsilon}\Psi_0)), \\[3em]
H_{2z} = -i\omega \dfrac{\partial (p_x^{\varepsilon}\Psi_1^m)}{\partial y},
\end{cases}
\tag{15}
$$

As a result of differentiation (14), (15) in the far zone will be the following:

$$
\begin{cases}
E_{2x} = -\dfrac{k_0^2 p_x^{\varepsilon} x^2}{4\pi\varepsilon_0\varepsilon}(\dfrac{\exp(i(k_0 r - \omega\cdot t))}{r^3} - \dfrac{1}{x^2+y^2}(\dfrac{\exp(i(k_0 r - \omega\cdot t))}{r} - \\[2em]
\qquad\qquad - \sqrt{\dfrac{\mu_1}{\mu}}\dfrac{\exp(i(k_n^{\mu} r' - \omega\cdot t))}{r'}) - \sqrt{\dfrac{\mu_1}{\mu}}\dfrac{\exp(i(k_n^{\mu} r' - \omega\cdot t))}{r'}), \\[2em]
E_{2y} = -\dfrac{p_x^{\varepsilon} xy}{4\pi\varepsilon_0\varepsilon}(\dfrac{k_0^2\exp(i(k_0 r - \omega\cdot t))}{r^3} - \dfrac{1}{x^2+y^2}(\dfrac{\exp(i(k_0 r - \omega\cdot t))}{r} - \\[2em]
\qquad\qquad\qquad\qquad - \sqrt{\dfrac{\mu_1}{\mu}}\dfrac{\exp(i(k_n^{\mu} r' - \omega\cdot t))}{r'})), \\[2em]
E_{2z} = -\dfrac{p_x^{\varepsilon} xz}{\varepsilon_0\varepsilon}\dfrac{k_0^2\exp(i(k_0 r - \omega\cdot t))}{r^3},
\end{cases}
\tag{16}
$$

$$
\begin{cases}
H_{2x} = -\dfrac{\omega k_0 xyz}{x^2+y^2}(\dfrac{\exp(i(k_0 r - \omega\cdot t))}{4\pi r^2} - \dfrac{\exp(i(k_n^{\mu} r' - \omega\cdot t))}{4\pi r'^2}), \\[2em]
H_{2y} = -\dfrac{\omega k_0 y^2 z}{x^2+y^2}(\dfrac{\exp(i(k_0 r - \omega\cdot t))}{4\pi r^2} - \dfrac{\exp(i(k_n^{\mu} r' - \omega\cdot t))}{4\pi r'^2}) + \omega k_0 z\dfrac{\exp(i(k_0 r - \omega\cdot t))}{4\pi r^2}, \\[2em]
H_{2z} = -\omega\cdot k_0 y\dfrac{\exp(i(k_n^{\mu} r' - \omega\cdot t))}{4\pi r'^2}.
\end{cases}
\tag{17}
$$

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Further to proceed to the solution of the problem, we consider the components of an arbitrary vector moving from a Cartesian coordinate system in the spherical coordinate system [3]:

$$\begin{cases} A_r = A_x \sin\theta\cos\varphi + A_y \sin\theta\sin\varphi + A_z \cos\theta, \\ A_\theta = A_x \cos\theta\cos\varphi + A_y \cos\theta\sin\varphi - A_z \sin\theta, \\ A_\varphi = -A_x \sin\varphi + A_y \cos\varphi. \end{cases} \quad (18)$$

Now taking into account (6) and using (18) it is possible to find of intensity of electromagnetic field for the point electric dipole, which is operating perpendicular to the axis of magnetic crystal in the far zone:

$$E_r = H_r = 0, \quad (19)$$

$$E_\theta = \frac{k_0^2 p_x^\varepsilon \cos\theta\cos\varphi \cdot \exp(i(k_0 r - \omega\cdot t))}{4\pi\varepsilon\varepsilon_0 r}, \quad (20)$$

$$E_\varphi = -\sqrt{\frac{\mu}{\mu_1}}\, \frac{k_n^{\mu 2} p_x \sin\varphi \cdot \exp(i(k_n^\mu r' - \omega\cdot t))}{4\pi\varepsilon\varepsilon_0 r'},$$

(21)

$$H_\theta = \frac{\omega\cdot k_0 p_x \exp(i(k_n^\mu r' - \omega\cdot t))\sin\varphi}{4\pi r((\mu/\mu_1)\cos^2\theta + \sin^2\theta)},$$

(22)

$$H_\varphi = \frac{\omega\cdot k_0 p_x \exp(i(k_0 r - \omega\cdot t))\cos\theta\cdot\cos\varphi}{4\pi\cdot r}. \quad (23)$$

The received asymptotic solutions (19)-(23) when using limit transition $\mu_1 \to \mu$ correspond with solutions of other authors for the isotropic medium. In fig.2 sections of the directional pattern of a dipole of the Hertz, which is located perpendicular to an axis are shown to uniaxial magnetic crystal in a far zone.
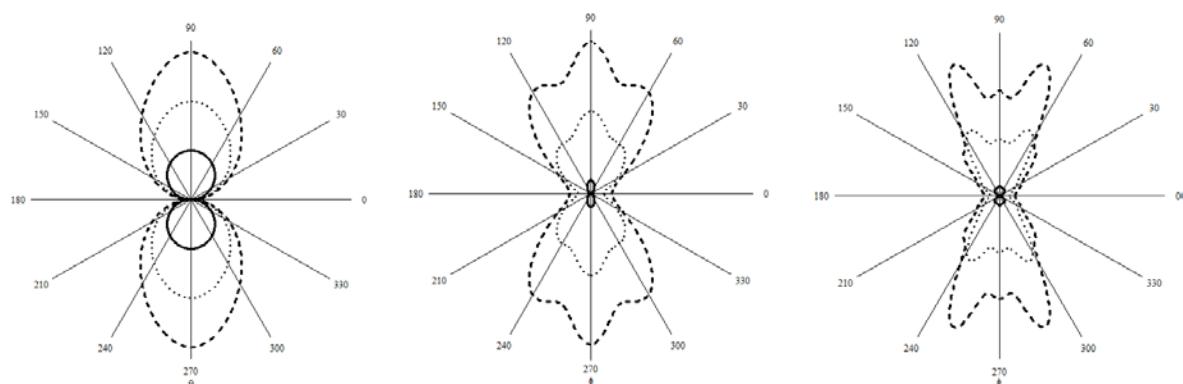
a) $r = 1$, $\phi = \pi/2$ б) $r = 4$, $\theta = \pi/2$ в) $r = 8$, $\theta = \pi/2$

$$— \mu_1 = 2, \quad \cdots \mu_1 = 5, \quad -- \mu_1 = 8$$

Fig.2. Sections of the directional pattern of a dipole of the Hertz, which is located perpendicular to an axis to a magnetic crystal

Conclusion

Thus, in this work asymptotic decisions from the new analytical solution of Maxwell's equations for intensity of an electromagnetic field of a dot radiator of Hertz in a uniaxial magnetic crystal are received.

From drawing it is visible that directional pattern forms at various values of radius of the sphere changes, i.e. the more sphere radius, it is more than local petals. And also the magnetic anisotropy is higher the intensity of radiation of electromagnetic waves on an axis of a crystal of z is maximum. In the direction of the emitter (axis x) doesn't occur the radiation of electromagnetic waves.

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THERMAL COMFORT EFFECTS ON PHYSIOLOGICAL ADAPTATIONS AND GROWTH PERFORMANCE OF WEST AFRICAN DWARF GOATS RAISED IN NIGERIA.

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Abstract

Physiological traits and growth performance of West African dwarf (WAD) goats raised under hot-humid conditions were assessed, 12 growing WAD goats managed intensively were used for the study. Temperature and relative humidity of the farm were monitored across seasons (rain and dry) using thermo-hygrometer, the study was conducted during rainy and dry seasons to compare parameters in normal and heat stress conditions. Months of December, 2012 to February, 2013 were considered as the dry season, while the months of March, 2013 to May, 2013 were considered as the rainy season. Data obtained for temperature and relative humidity were used to develop an index for measuring thermal comfort level for the goats. Data were collected on growth performance and physiological characteristics of the goats. Rectal temperature and respiration rate were significantly affected (P<0.001) by temperature humidity index (THI). However, pulse rate was the only physiological trait of the goats that was not significantly affected (P>0.001) by THI. Also, the body weight and average daily gain of the goats significantly differed with increase in the THI. Rising ambient temperature and relative humidity as expressed in form of THI are associated with poor growth performance as well as adverse effects on physiological characteristics of the animals.

Keywords: Growth performance, physiological traits, temperature humidity index, WAD goats

Introduction

Domestic animals are homeotherms that tend to maintain a constant body temperature through a balance of heat gain or loss. Homeotherms have optimal temperature zones for production within which no additional energy above maintenance is expended to warm or cool the body, West (2003). The environment surrounding an animal at any particular instant influences the amount of heat exchange between it and the environment. Under humid tropical climatic conditions, high temperature and relative humidity are major environmental factors that result in heat stress which influences the productivity and physiological development of animals. Among the climatic components that may impose influence on the

animals are ambient temperature, humidity, air movement, radiation and photoperiod of which temperature is the most important, Rashwan et al., (2004).

West African dwarf (WAD) goats are found in large number in Southern parts of Nigeria, they possess the widest margin of adaptation amongst the ruminants (Oni, 2003).

They are multi-functional animals that play significant roles in the economy and nutrition of rural and urban dwellers. However, the major constraint to its productivity in tropical and sub-tropical areas is high temperature. This effect is aggravated when it is accompanied by high ambient humidity (Marai et al., 2000; Abdel-Hafez, 2002). Climate all over the world has been changing during the last decade, temperature and humidity are also changing in all areas of the world, (Suksuwan, 2001). Temperature humidity index (THI) is commonly used as an environmental factor to predict production losses of an animal exposed to hot and humid climatic conditions, (Karaman et al., 2007). The THI is an indicator of thermal climatic condition which is estimated from measurement of temperature and humidity (LPHSI, 1990; Marai et al., 2001). Thus this study sought to assess the thermal comfort effects on growth performance and physiological traits of WAD goats raised in South-western Nigeria.

Materials and Methods

The study was conducted at the Teaching and Research Farm of the Federal College of Animal Health and Production Technology, Ibadan, Nigeria (7.3907^0N, 3.8923^0E) between December, 2012 to May, 2013. Temperature and relative humidity in the goat unit were monitored across seasons (rain and dry) and across day periods (minimum temperature in the morning and maximum temperature in the afternoon) two to three days using a DeltaTrak thermo-hygrometer . As far as possible, this instrument was hung on the wall inside the pen to provide a record of the temperature and relative humidity experienced by the goats.

Based on the recordings of farm ambient temperature and relative humidity, the study was conducted during rainy and dry seasons to compare parameters in normal and heat stress conditions. Months of December, 2012 to February, 2013 were considered as the dry season, while the months of March, 2013 to May, 2013 were considered as the rainy season periods.

Data obtained for temperature and relative humidity were used to develop an index for measuring thermal comfort level for the goats. It was measured according the following equation as developed by Marai et al., (2001): $\text{THI} = \text{db }^0\text{C} - \{(0.31 - 0.31 \text{ RH})(\text{db }^0\text{C} - 14.4)\}$ where db ^{0}C is the dry bulb temperature (^{0}C) and RH is the relative humidity (RH%)/100. 12 WAD goats of the same age (9 months) were used for this study. Initial weight of the animals was taken at the first day of the study, subsequently this was repeated once in a week .Feed consumption was also recorded twice a week to monitor animal growth from which average daily gain was estimated.

Physiological parameters to obtain categorical heat stress indices were taken on each animal and these include rectal temperature, respiration rate and pulse rate. These physiological parameters were measured two times a week to avoid undue stress on the animals .The rectal temperature was measured using a digital rectal thermometer inserted into the rectum and left in position, thereafter the reading was taken. Respiration rate was recorded as the number of frequency of flank movement per 20 seconds and later calculated as breaths /min (Thwaites et al.,1990). Pulse rates was also recorded as beats per seconds by placing the stethoscope on the chest of the goats to determine the rhythmic beats of the heart which was later calculated as beats /min (Thwaites et al.,1990).

Data Analysis

Data collected on growth performance (body weight and average daily gain) and physiological characteristics (rectal temperature, respiration rate and pulse rate) of the

animals were statistically analysed using statistical analysis system (SAS, 2004). One-way analysis of variance (ANOVA) was performed to compare variations in growth performance and physiological characteristics of the animals as influenced by ambient temperature and relative humidity. Duncan's Multiple Range test was used to separate the means where significance was indicated. The summary statistics for climatic variations were also calculated within each season.

Results and Discussion
Average climatic data during dry and rainy seasons
The average temperature, relative humidity and THI of two seasons were shown in Table 1. The mean temperature, relative humidity and THI during dry season were 32.89 ± 0.57^{o}C, 47.25 ± 1.54% and 29.50 ± 0.99 respectively. The mean temperature, relative humidity and THI during rainy season were 24.59 ± 0.44, 54.00 ± 0.99 and 25.27 ± 0.15 respectively.

Table 1.Mean temperature, relative humidity and THI during dry and rainy seasons

Variables	Seasons	
	Dry	Rain
Temperature (^{o}C)	32.89 ± 0.57	24.59 ± 0.44
Relative humidity (%)	47.25 ± 1.54	54.00 ± 0.99
THI	29.50 ± 0.99	25.27 ± 0.15

Effects of THI on some physiological traits of WAD goats
Effects on Rectal Temperature
Table 2 shows ANOVA of the effects of THI on heat tolerance of WAD goats as measured by rectal temperature. The rectal temperature of the goats was significantly affected (P<0.001) by THI . Highest rectal temperature (39.61 ± 0.09 ^{o}C) was obtained when THI was greater than 27.50, followed by 39.52 ± 0.08 ^{o}C when THI was between 25.50 – 27.50; 38.99 ± 0.15 ^{o}C when THI ranged between 23.50 – 25.50 and the least rectal temperature (38.95 ± 0.10 ^{o}C) was obtained when THI was less than 23.50 (Table 3). Rectal temperature of the goats increases with corresponding increase in THI values. The animal's body temperature expressed in rectal temperature increases, when the body fails to maintain its heat balance. Significant variation in rectal temperature observed in the animals was as a result of their exposure to heat stress as registered by THI (Marai et al., 2001). Similar result was obtained in rams as reported by (Abdel- Hafez, 2002).

Table 2. Analysis of Variance (ANOVA) of the effects of THI on rectal temperature of WAD goats

Source of Variation	df	Sum of Squares	Mean Square	F-ratio	Sig. level
RT	3	40.74	13.59	10.22	<0.0001
Error	524	696.90	1.33		
Corr. Total.	527	737.67			

Significant (P<0.001). RT – rectal temperature

Table 3. Multiple range analysis for rectal temperature of WAD goats

Factors (THI)	n	Mean	Standard Error	Duncan grouping
<23.50	132	38.95	0.10	B
23.50 - 25.50	132	38.99	0.15	B
25.50 – 27.50	132	39.52	0.08	A
>27.50	132	39.61	0.09	A

Effect on Pulse rate

Table 4 shows the ANOVA of the effects of THI on heat tolerance of WAD goats as measured by pulse rate. The pulse rate of the goats was not significantly affected ($P < 0.001$) by THI. However, the pulse rate increased with change in values of THI. Ismail et al., (1995) reported significant difference in pulse rate of Barki sheep between winter and summer. However, Alexiev et al. (2004) reported the pulse rate to accelerate during the peak hour of the heat load in ewes that had ad libitum access to water due to the increased cutaneous blood flow; the same authors also reported breed differences in the rate of cutaneous cooling. Thus, at very high temperatures, the pulse rate may decrease due to a decrease in the metabolic rate.

Table 4. Analysis of Variance (ANOVA) of the effects of THI on pulse rate of WAD goats

Source of variation	Df	Sum of squares	Mean square	F-ratio	Pr>F
PR	3	6036.13	2012.04	1.21	0.3053[ns]
Error	524	871156.19	1662.51		
Corr. Total	527	877192.32			

[ns]-not Significant ($P > 0.001$), PR- Pulse rate.

Table 5. Multiple range analysis for pulse rate of WAD goats

Factors (THI)	n	Mean	Standard Error	Duncan grouping
<23.50	132	117.64	3.69	A
23.50 - 25.50	132	117.63	5.08	A
25.50 – 27.50	132	122.63	2.61	A
>27.50	132	126.84	3.98	A

Effects on respiration rate

The result of ANOVA of the effects of THI on heat tolerance of WAD goats as measured by respiration rate is shown in Table 6. THI had significant effects ($P < 0.001$) on respiration rate of WAD goats. The respiration rate differ significantly when THI was greater than 27.50 and was between 25.50 - 27.50; but did not differ significantly when THI was less than 23.50 and ranged between 23.50-25.50. Highest respiration rate (70.40 ± 2.45 breaths/min) was obtained when THI ranged between 25.50-27.50 while the least (49.27 ± 2.86 breaths/min) was obtained when THI was less than 23.50 (Table 7).This is an indication that respiration rate of WAD goats increases under hot ambient temperature with high relative humidity. Thus, WAD goats are stressed thermally when respiration rates increase with corresponding increase in THI since respiration rate can be an indicator of heat stress as elucidated by Habeeb et al., (1992). This result agreed with report of Marai et al., (2002b) that there was an increase in respiratory frequency in sheep with regard to the effect of humidity, when a load of high relative humidity was superimposed upon an already high ambient temperature. The increase in respiration rate of the goats was related to an increase in the perception of warmth which is the most obvious reaction.

Table 6. Analysis of Variance (ANOVA) of the effects of THI on respiration rate of WAD goats

Source of variation	df	Sum of square	Mean square	F-ratio	Sig. level
RR	3	47533.40	15844.47	15.91	<0.0001
Error	524	521711.23	995.63		
Corr. Total	527	589244.64			

[**] - Significant ($P < 0.001$); RR- Respiration rate

Table 7. Multiple range analysis for respiration rate of WAD goats

Factors (THI)	n	Mean	Standard Error	Duncan grouping
<23.50	132	49.27	2.02	B
23.50 - 25.50	132	50.90	2.86	B
25.50 – 27.50	132	70.40	2.45	A
>27.50	132	64.24	3.42	A

Effects of THI on growth performance of WAD goats
Effect on Body weight of WAD goats.

Table 8 Shows the result of ANOVA of the effects of THI on body weight of the goats. Body weight of the animals was significantly affected (P<0.001) by THI. The body weight differ significantly when THI was greater than 27.5, ranged between 25.50-27.50 and when it was greater than 27.50. However, the body weight decreases with corresponding increase in THI values such that highest body weight (7.16 ± 0.17kg) was obtained in the goats when the THI was less than 23.50 and the lowest (6.07 ± 0.12kg) was obtained when the THI was greater than 27.50. The effects of interaction between elevated ambient temperature and high humidity on body weight are the products of a decline in feed intake. Similar results were reported in earlier studies; the daily feed intake and feed conversion also significantly decreased in Suffolk lambs under hot conditions in a climatic chamber (30.5 ◦C), compared to a group under shelter (19.3 ◦C), during spring (Padua et al., 1997). Marai et al., (2007) also reported that exposure of sheep to heat stress is accompanied by changes in the biological functions. It includes the depression in feed intake and utilization.

Table 8. Analysis of Variance the Effects of THI on Body Weight of WAD goats

Source of variation	df	Sum of square	Mean square	F-ratio	Sig. level
BW	3	95.94	31.98	13.63	<0.0001
Error	524	1229.44	2.35		
Corr. Total	527	1325.39			

Significant (P<0.001); BW-Body Weight.

Table 9. Multiple range analysis for body weight of WAD goats

Factors (THI)	n	Mean	Standard Error	Duncan grouping
<23.50	132	7.16	0.17	A
23.50 - 25.50	132	6.99	0.11	AB
25.50 – 27.50	132	6.72	0.19	B
>27.50	132	6.07	0.12	C

Effect on Average Daily Gain (ADG) of WAD goats.

The result of ANOVA of the effects of THI on ADG of WAD goats is shown in Table 10. ADG of the goats was significantly affected (P<0.05) by THI. ADG of the goats reduce with increase in THI such that the goats had highest ADG (4.50±0.03g) at the lowest THI (Table 11). Increase in ADG at lower THI can be attributed to higher feed intake when the temperature and relative humidity of the environment are favourable for the goats; the lower the THI of an environment, the more is the comfort level for the goats. Similar results were reported in earlier studies on sheep; Habeeb et al., (1992) reported that elevated ambient temperatures are considered as some of the environmental factors that can influence ADG. Lamb ADG values were recorded to be lower in summer than in winter in lambs, as well as in a psychrometric chamber (30–40 ◦C) compared to a shelter (20–30 ◦C), for Suffolk sheep (Marai et al., 1997a; Padua et al., 1997). Similarly, body weight, growth rate, total body solids and body solids daily gain were impaired following exposure to elevated temperatures (Marai et al., 1997a; Ismail et al., 1995). Marai et al., (2007) elucidated that

the effects of elevated ambient temperature on growth performance are the product of a decrease in anabolic activity and the increase in tissue catabolism. This decrease in anabolism is essentially caused by a decrease in voluntary feed intake of essential nutrients.

Table 10. Analysis of variance of the effects of THI on average daily gain

Source of variation	df	Sum of square	Mean square	F-ratio	Sig. level
ADG	3	0.126	0.059	1.06	<0.021
Error	79	4.379	0.055		
Corr. Total	82	4.554			

Significant (P<0.05)ˑ, ADG - average daily gai

Table 11. Multiple range analysis for average daily gain of WAD goats

Factors (THI)	n	Mean	Standard Error	Duncan grouping
<23.50	132	4.50	0.03	A
23.50 - 25.50	132	3.90	0.07	B
25.50 – 27.50	132	1.90	0.25	C
>27.50	132	1.07	0.09	C

Conclusion

The effect of heat increases when heat stress is accompanied with high relative humidity. Physiological traits and growth performance of the goats varied at different thermal comfort level as determined by THI. High THI (rising ambient temperature and relative humidity) values are associated with poor growth performance as well as adverse effects on physiological characteristics of the animals. However, WAD goats tolerate higher levels of THI more than values proposed by Marai et al., (2001) as comfort level for sheep and goats. Management strategies are needed to improve goat production by minimizing thermal stress on the goats in order to attain optimal animal comfort. However, further studies are needed to elucidate the tolerance level exhibited by WAD goats.

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THE CONNECTION OF THE SATISFACTION OF PATIENTS FOR THE OLD AND NEW DENTURES

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Abstract

Introduction. One of the ultimate goals of prosthetic treatment is the achievement of the patient's satisfaction; defined as "patient's' cognitively based evaluation of, and affectively based response to the important aspects of the structure, process and result of their service.The purpose of this study was to investigate the relation between patient's satisfaction with their old and new removable total dentures. This study aims to help the doctor to determine a diagnose of the new dentures based on the old denture's satisfaction of the patient.Methods and Results 78 patients, 36 men and 42 women,aged 40-80 years old, who were volunterely chosen, were examined and treated with new dentures for a period of two years in the University Dental Clinic, Tirana and in the „Tabaku" Dental Private Clinic. They answered a subjective questionnaire about their satisfaction from the old dentures and the new dentures 3 months after delivery. Results. Analyzing the results using the t-Test, it was found that the relation between patient's satisfaction from old and new denture for the following factors was statistically significant:The comfort of the denture, The factor related to the fit of the upper and lower denture, Their appereance, The ability of the patients to speek ($p < 0.05$).

According to the results some factors had a stronger relation of the patient's satisfaction with the old and new dentures according to the statistical results.The test performance shows that some factors can be used as indicators to diagnose the prognosis of the new dentures.

Keywords: Complete dentures, satisfaction, relation

Introduction

Improvement of oral health and quality of life is the main goal of contemporary dentistry, since it has been considered as an important part of patient's well-being. Eliminating oral pain and the problems connected to chewing and speech, as well as the improvement of

aesthetic contributes the improvement of oral health.

The quality of complete dentures assessed by clinicians does not always come to accordance with the subjective judgment of the patients. Although a number of studies failed to show statistically significant relations between the two variables,other studies could show weak or moderately significant associations.

Allen and McMillan (2003) found that patients who choose to replace complete dentures and partial dentures with implant-retained dentures have a poor OHRQOL and some of these issues remain post-treatment. However, patients who seek to replace their existing complete dentures with new complete dentures have a better OHRQOL than those seeking implant-retained dentures. They suggest that these patients are best left with conventional dentures even though implant-retained dentures may provide more stability and retention.

The aesthetics of the upper denture and the lack of stability of the lower one are the main complaints of the patients. One of the factors for the dissatisfaction related to the dentures may be attributed to the level of oral perception of each patient, a phenomenon known as oral stereognosis.

The satisfaction level of the patient is influenced by several factors, including the dentures quality and the plated area, the quality of interaction in the patient-dentist relationship, past experiences with full dentures, and the psychological personality. In harmony, such factors may promote the improvement of the mastication, the speech, and the aesthetics of the teeth, besides producing less discomfort and pain sensitivity, favoring the comminution of harder food. Wearers of conventional full dentures have their masticatory functions reduced between 1/4 (one fourth) and 1/7 (one seventh) when compared to adults with natural teeth, depending on the age and the type of food.

Main Text

This study was conducted at department of Prosthodontics,Unversity Dental Clinic,Tirana,Albania and in the private Dental Clinic "Tabaku".

The duration of study was two years.Patients included were complete denture user's who had worn dentures succesfully for a significant period of time and now wanted to replace the dentures.After a preliminary examination,patients were excluded if they exhibited symptoms of temporomandibular disorders,xerostomia,orofacial motor disorders,severe oral manifestations of systematic disease or psychologic or psychiatric conditions that could influence their response to treatment. Dentures were produced by an acrylic base with full balanced occlusion with hard resin artificial teeth. A conventional protocol was used:

preliminary impressions for fabrication of custom trays, the final impressions was made with a custom tray with border-molded impression compound,followed by a polyvinyl siloxane impression.Horizontal and vertical jaw relation was recorded with wax occlusion rims.

Dentures were tried in the mouth at the wax setup stage and patients were allowed to return for adjustment after insertion. On insertion, dentures were checked in the mouth for adaptation of the borders and denture bearing surfaces using pressure indicating paste and were relieved as needed. Oral hygiene instructions were provided.

The questionnaires were provide by one evaluator only, being this in charge only for the elucidation of possible doubts that could arise along the answers, therefore not interfering with their contents. The application of the questions started when the patient was comfortably sat in the chair. Individuals were invited to express their opinions about the conditions of their dentures through seven questions of the Questionnaire I, in a scale ranging from 0 (zero) to 3 (three), where 0 represents the total satisfaction and 3 represents the total dissatisfaction.

Table 1: Distribution of the answers to questionnaire on patient satisfaction with old dentures (Questions/answers)

Factors related to patient's satisfaction	Very satisfied	Fairly satisfied	Dissatisfied
Comfort	45 (57%)	13(16 %)	20 (25%)
Fit(Upper)	50 (64%)	13(16%)	15 (19%)
Fit (Lower)	35 (44%)	20(25%)	23(29%)
Ability to eat food	42(53%)	16(20%)	20 (25%)
Ability to taste food	40(51%)	24(30%)	14(17%)
Appearence	44(56%)	19(24%)	15 (19%)
Speech	50(64%)	9(11%)	19(24%)

Table 2: Distribution of the answers to questionnaire on patient satisfaction with new dentures (Questions/answers)

Factors related to patient's satisfaction	Very satisfied	Fairly satisfied	Dissatisfied
Comfort	65(83%)	7(8%)	6(7%)
Fit(Upper)	70 (89%)	1(1%)	7 (8%)
Fit (Lower)	49 (62%)	13(16%)	16(20%)
Ability to eat food	42(53%)	16(20%)	20(25%)
Ability to taste food	56(71%)	14(17%)	8(10%)
Appearence	64(82%)	10(12%)	4(5%)
Speech	59(75%)	12(15%)	7(8%)

The results

After the patients answered to the questionnaire for the old and the new dentures we pointed out the following results:
 73% of the patients were satisfied with the comfort of their old dentures;91% of the patients were satisfied satisfied with the comfort of their ew dentures.
80% of the patients were satisfied with the fit of their upper old dentures,90% of the patients were satisfied with the fit of their upper new dentures.
69% of the patients were satisfied with the fit of their lower old dentures,78% of the patients were satisfied with with the fit of their lower old dentures.
73% of the patients were satisfied with the ability to eat food with their old dentures,73% of the patients were satisfied with the ability to eat food with their new dentures.
88% of the patients were satisfied with the ability to taste food with their old dentures,88% of the patients were satisfied with the ability to taste food with their new dentures .
80% of the patients were satisfied with their appearance with their old dentures,94% of the patients were satisfied with their appearance with their new dentures..
75% of the patients were satisfied with their speech with their old dentures,90% of the patients were satisfied with their speech with their new dentures .
Analyzing the results using the t-Test, it was found that the relation between patient's satisfaction from old and new denture for the following factors was statistically significant:
-The comfort of the old and new dentures
-The fit of the upper and lower denture
- The patient's appereance
-The ability of the patients to speek

Conclusion

According to the results the factors related to the fit of upper and lower dentures, their comfort, their appereance,the ability of the patients to speak had a stronger relation of the patient's satisfaction with the old and new dentures according to the statistical results.

Discussion

Many factors may influence patient's satisfaction with their dentures: quality of bone tissue and oral mucosa of denture bearing area, the adaptability of the neuromuscular mechanism, individual feeling of security by denture wearing, influence of the surrounding muscles on denture flanges, viscosity of saliva, patient's age, position of occlusal plane, occlusion, hygiene, type of food, etc. . Tissue changes that occur on denture bearing area due

to alveolar ridge resorption lead to poorer denture retention and stability which consequently affects patients' satisfaction . Often dentists and patients judge the concept of success differently. Dentists consider dentures to be successful when they meet certain technical standards, whereas patients evaluate them from the viewpoint of personal satisfaction.However, to evaluate success in terms of patients satisfaction is critical to the outcome of complete denture treatment. The ability to adapt to new dentures and the prognosis will generally diminish in proportion to the health status. Some of the diseases that adversely affect patients satisfaction with their dentures include hyposalivation, Parkinson's disease, myasthenia gravis, bulbar palsy and diseases with either a strong connection to emotional stress or impairing mental health.The success of conventional complete denture is variable and depends on the patient showing sufficient adaptive capacity to overcome the many limitations of complete dentures by the process of habituation.This study aims to help doctors to diagnose the prognosis of the new dentures based on the satisfaction of the patients with their old dentures.

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Simplified versus comprehensive fabriaction of complete dentures :patient ratings of denture satisfaction from a randomized crossover trial

SOCIAL DETERMINANTS OF DIFFERENTIAL ACCESS TO HEALTH SERVICES ACROSS FIVE STATES OF SOUTHEAST NIGERIA

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Abstract

Differential access to health remains a critical problem facing health care delivery system in Nigeria. The composition and character of social determinants that generate such unequal and uneasy access differ across geo-political zones of the country due to diversity of social-cultural attributes. This study, anchored on cross-sectional survey design and guided by three research questions examined the determinants of differential access to health services across the five states of southeast Nigeria. A sample size of 200 respondents drawn through multi-stage and simple random sampling techniques constituted the study participants. A multiple triangulation of instruments comprising questionnaire, in-depth interview and focused group discussions were combined and complemented each other in the data gathering process. The study found that access to health services is strongly affected by factors like level of education, gender, patriarchal social arrangement, rural residence, poverty, religious and cultural beliefs about certain diseases and location of health facilities etc. It was recommended that provision of health services must be complemented with institutional arrangement and massive public enlightenment that counter several social constraints that prevent access and full utilization of health services by the people of southeast Nigeria.

Keywwords: Differential access, health services, social determinants, healthcare system, socio-cultural attributes

Introduction

Man's quest for optimal level of health is a cultural universal across societies. This could be explained by the fact that good health is crucial both for man's survival and his ability to meet set goals and aspirations on planet earth. For man to live and function to his fullest capacities, use of health facilities is critical. That is why societies have over the years, developed patterns of health services to care for their people. Nonetheless, quality of population's health; how fairly health facilities are distributed across the social spectrum and people's accessibility or use of such facilities have remained problematic especially among the poor.

Administrators of health care delivery services often concentrate on improving the quality of staff skills, protocols of treatment, availability of supplies and environment of health facilities. Yet, while these interventions are important, they do not always address many of the obstacles to accessing services faced by the population. Often, health services of a reasonable quality may exist, but few use them. Equally important are concerns about physical and financial accessibility of services, knowledge of what services exist, education about how to best utilize self and practitioner-provided services and cultural norms of treatment.

According to the Behavioural Model propounded by Anderson and Newman (1973), visit to a health facility is determined by three factors:

a.   Predisposing factors such as age, gender, race/ethnic group and social services.

b.   Enabling factors which include conditions that facilitate or inhibit the use of health services such as insurance coverage, income, distance to the health centre etc.

c.   Need or health status variables which may include perceived need and urgency, level of distress and presence of psychiatric co-mortality. Their argument implies that when all the aforementioned factors are inadequate, it results to poor utilization of health facilities.

On the other hand, Maine (1997) in his Delays Model outlined three barriers to use of health facilities which include; delay in the decision to seek care, delay in getting to the facility and the delay in obtaining appropriate care at the facility. According to him, the first two delays constitute demand barriers (use barriers). The delay in the decision to seek care may be due lack of information and education, or unavailability of resources at the time of need particularly as risk-pooling (health insurance) with its advantages towards equity is yet to be fully operational. Similarly, delay in getting to the facility is likely due to financial handicap or due to ignorance of appropriate transport means to the facility.

In Nigeria, health service is on the concurrent list whereby the three tiers of government, namely federal, state and local government levels to incur expenditure. The private sector also plays key roles in health care delivery in Nigeria. These include 'private for profit' and 'private not for profit' health care institutions owned by individuals, corporate firms, nongovernmental organizations and faith based groups.

The utilization of health services have remained low in Nigeria although there has been increasing public expenditure on the provision of modern health care. This suggests that a myriad of complex and potentially confusing choices interplay before the decision to go for treatment and consequent arrival at a facility. Often times, those considerations are strong enough to divert interest to other treatment options even when the condition could be best managed in public health facilities. It means therefore that provision of accessible and cost effective health services to patients requires thorough understanding of factors associated with the use of health services. (see Joweth 1999, Wagstaff ,2000)

In Southeast Nigeria, the use of health facilities tends to be more developed in high income groups than among their low and medium income counterparts. Alder and Estrove (2006) noted that the more socio-economically advantaged individuals are, the better their health. On the other hand, the poor are more likely to be ill, but are less able to access health care (Corner and Norman, 2001).

Similarly, as physical environment varies in characteristics from place to place it has implications for the pattern of use of health facilities by residents. Indeed facility use behavior of residents in Southeast Nigeria may be shaped by a number of factors which include the size of household finances (income) and structural issues like bad roads, poor transportation systems and distant location of health facilities (based on political considerations other than on equity). All these may result in non use or in delay in use and consequent complication of ailment.

 Furthermore, low level of education limits information about health. High level of illiteracy in Southeast Nigeria contributes to low life expectancy because the individual may not recognize early symptoms of illness nor seek prompt medical advice. Illiteracy leads to low appreciation of the benefits of use of health services. According to State of the World's Children Report (2004), an extra year of education can prevent two maternal deaths per 100,000 live births.

The problem of low use of health facilities is so critical that Professor Amobi Ilika, a former commissioner for health in Anambra State, lamented that although the state subsidizes health care for antenatal, malaria and infant treatments by 75% while HIV-AIDS,

tuberculosis and immunization services are free in both private and public hospitals, yet associated illness and diseases are on the rise because use of these services remain very low (Ministry of Health, Anambra State, 2010).

It is against the foregoing background and problems that the study was undertaken to examine social determinants of differential access to health services in the five states of Southeast Nigeria.

Research Questions

The following research questions guided the study:
a)   To what extent are available health facilities/services in Southeast Nigeria used/ accessible to the residents of the area?
b)   What is the perception of residents of Southeast Nigeria about forms of differential access to health services in their area and the role of government in generating such differentials?
c)   What are the major socio-economic and cultural factors that affect or determine use /access to health facilities and services by residents of Southeast Nigeria?

Study Hypotheses

The following hypotheses were formulated and tested in the study:
1) There is a significant relationship between level of educational attainment of residents of Southeast Nigeria and their use of health facilities in the area.
2) The female gender is more likely to use the health facilities /services more than the male gender in Southeast Nigeria.
3) There is a significant relationship between level of income of residents and their use/access to health facilities in Southeast Nigeria.

Theoretical thrust

The theoretical platform on which this paper is anchored is the Health Belief Model (HBM). This is a health behaviour change model first developed in the 1950s by social-psychologists – Kegel Rosenstock and Houchbaum. HBM is a conceptual tool used to understand, explain and predict health behaviour (curative and preventive), including reasons for non-compliance with recommended health action. In its attempt to explain and predict heath related responses, HBM tries to understand the roles that knowledge, beliefs, perception and attitude play in shaping personal decisions and actions relevant to disease situations or health services.

Corner and Norman (2001) identified broad areas of application of HBM. These include:
-      Preventive health behaviours like dieting, exercising, vaccination and family planning
-      Health risk behaviour e.g. smoking and prostitution.
-      Sick role behaviours which refer to compliance with recommended treatment requires.
-      Clinic use which includes physical visit to health facilities for a number of reasons.
-      The assumption of HBM is that observed health behavior are related or hinged on four perception indicators listed below:
-      Perceived susceptibility (an individual's assessment of their risk of getting the conditions preached against).
-      Perceived severity (an individual's assessment of the seriousness of the condition and its potential consequences).
-      Perceived barriers (an individual's assessment of the influences that facilitate or discourage adoption of promoted behaviour).

-       Perceived benefit (an individual's assessment of the positive consequences of adopting the behaviour).

These items of perception however, respond to the modifying or mediating factors that influence use of health facilities. HBM is a suitable theoretical framework for this study because it addressed utilization of health facilities and why people may not take up or patronize available and sometimes free medical services. The individual's perceived barriers such as low income, difficult terrain; distant location of health facilities, low level of knowledge, etc could discourage anticipated positive responses which promote health.

Area of the Study

The study was located in southeast geo-political zone of Nigeria which is made up of five states out of which Anambra and Ebonyi states were randomly selected from for study. The indigenous ethnic group in the two states is the Igbo, of whom Ifemesia (1979) observes that their territory covers an area of over 15,800 square miles. Nwala (1985) circumscribed the area between 6° and $8\frac{1}{2}^o$ East longitude and $4\frac{1}{2}^o$ and $7\frac{1}{2}^o$ North latitude. He noted that Igbo land is densely populated which is true of Anambra and Ebonyi states whose populations as at 2006 were 4,177,828 and 2,176,947 respectively (National Population Commission, NPC 2006).

Anambra and Ebonyi states are rich in natural resources and arable soil. Land cultivation, trading, arts and crafts, animal husbandry and civil service positions are major economic activities in the two states. However, people of Anambra state are more involved in entrepreneurship and commerce whereas Ebonyi state is notable for her agricultural prowess.

Despite presence of democratically elected civilian governments in Anambra and Ebonyi states, many intricate socio-political structures and pressure groups that characterize Igbo traditional societies have remained visible and functional. As such gerontocracy, village assembly, titled men, women groups etc are still relevant to grass root administration in both states. Similarly, Christianity enjoys greater follower ship in the area but exists side by side with traditional religion which still has many adherents.

Methods

The cross-sectional survey design was adopted for this study. The study population consisted of all adults resident in both states whose total sum up to 3,515,370 (NPC, 2006). A sample size of 200 respondents, adequate for applicable tests and constituting 0.0057% of the study population was used to generate quantitative data. These participants were drawn from the two state capitals (50 from each capital) and a rural community close to each capital city (50 from each rural community). Purposive sampling technique was used to select streets or routes from where households and respondents were drawn. Convenience of availability was also applied to select respondents who cut across segments of the large population in little proportions. In addition to 200 respondents who responded to the questionnaire, there were 32 participants in the focus group discussion (16 from each state); and 6 respondents who were interviewed (3 each from Anambra and Ebonyi states).

The questionnaire with twenty two (22) items of closed and open ended character was other administered in English language after pre-tests outside the study area to ensure reliability and suitability. It was interpreted in vernacular for illiterate respondents. There were also four Focus Group Discussion (FGD) sessions with nine participants each (conducted in English language) with male and female groups in each state segmented across rural-urban divide. The third tool was In-depth Interviews (IDI) with medical records staff, doctors and community leaders in both states. Both FGD and IDI participants were persons who have not responded to the questionnaire. Two field assistants, field notebooks, tape recorder were used for fieldwork that lasted approximately three weeks.

Findings

Out of 200 uniformed questionnaires administered, 182 were retrieved and used for analysis.

Table I: Demographic Characteristics of the Study Population (n =182).

	Variables	Frequency	Percentage
Sex	Male	78	42.9%
	Female	104	57.1%
	Total	**182**	**100%**
Age	18 – 27	108	59.3%
	28 – 37	28	15.4%
	38 – 47	20	11.1%
	48 – 57	9	4.9%
	58 – 67	8	4.4%
	68 and above	9	4.9%
	Total	**182**	**100%**
Religion	Christianity	176	96.7%
	Islamic	-	-
	African Traditional religion and others	6	3.3%
	Total	**182**	**100%**
Marital Status	Single	120	66.0%
	Married	54	29.7%
	Separated	-	-
	Divorced	1	0.5%
	Widowed	7	3.8%
	Total	**182**	**100%**
Occupation	Farmer	15	8.2%
	Trader	104	57.1%
	Student	25	13.7%
	Civil Servant	29	16.1%
	Artisans/Others	9	4.9%
	Total	**182**	**100%**
Educational attainment	No formal education	4	2.2%
	primary	18	9.9%
	Secondary	49	26.9%
	Tertiary	85	46.7%
	Above 1st degree	26	14.3%
	Total	**182**	**100%**
Monthly income	None/Below N18,000	58	31.9%
	N18,000-N38,000	46	25.3%
	N39,000-N59,000	19	10.4%
	N60,000 and Above	59	32.4%
	Total	**182**	**100%**

Table 1 shows that 78 (42.9%) of the respondents were males while 104 (57.1%) were females.   The table also shows that 108(59.3%) of the respondents were within the ages of 18-27. Therefore, majority of the respondents were relatively young. The **mean age** of

respondents was **27.3 years old.** Table 1 further shows that 176 (96.7%) of the respondents were Christians.   On the other hand, 120 (66.0%) constituting majority of respondents were single, 54(29.7%) were married. Only 1(0.5%) was divorced. The low number of divorcees in the sample could be related to the high cultural premium on stable marriage.

Table 1 further shows that 85(46.7%) of the respondents have attained tertiary education while 4(2.2%) have no formal education. Finally, Table 1 suggests that the level of poverty is high in the area. This is because 58(31.9%) of the respondents earn below the national monthly minimum wage of N18,000 while only 59 or 34.4% earn above N60,000 per month.

Analysis of Research Questions: The analysis are presented below:-

Research Question 1: To what extent are health facilities and services in Southeast Nigeria accessible to residents in the area? The findings are shown at table 2, 3 and 4

Table 2: Distribution of Respondents by their views on extent to which health facilities/services are accessible to all residents of Southeast Nigeria.

Very accessible to all	1	0.5%%
Moderately accessible to all	17	9.2.0%
Accessible only to the rich	78	43%
Very inaccessible to the poor	84	46.2%
No response	2	1.1%
Total	**182**	**100%**

Table 2 shows majority of the respondents (46.2%) believe that public health services are very inaccessible to the poor whereas 43% opined that such services are accessible to the rich.   The results were corroborated by FGD participants most of whom maintained that high cost of public health services has taken such services out of the reach of the poor masses.

Table 3: Distribution of Respondents by their views on features of health facilities/ services in Southeast Nigeria which could affect access of residents to such services.

Responses	Frequency	Percentage
There are adequate quality of public health services at lower charges at door step of households	64	35.2%
Health services for public use are limited in supply and still very costly and out of reach for most citizens	93	51.1%
Health facilities are far from homes at difficult terrain	18	9.9%
Rural areas lack health facilities and health manpower	2	1.1%
No response	5	2.7%
Total	**182**	**100%**

Table 3 shows that majority of respondents (51.1%) were of the opinion that health services for public use are in short supply, very costly and out of reach to most residents.

Research Question 2: What is the perception of residents of Southeast Nigeria about the major forms of differential access to health service experienced in their areas and the role of government in creating same?

Table 4: Distribution of Respondents by their views on major form of differential access applicable to use of public health services in Southeast Nigeria.

Responses	Frequency	Percentage
The rich has greater access to health service	9	4.95%
Males enjoy greater access than females	8	4.40%
Urban residents have greater access than rural residents	9	4.95%

All of the above	156	85.71%
Total	**182**	**100%**

Table 4 shows that differentials in access to healthcare cut across class, gender and rural-urban residence as most respondents chose the aggregate of the options (ie all of the above)

Table 5: Distribution of Respondents by their views on role of government in creating differential access to public health services in Southeast Nigeria.

Responses	Frequency	Percentage
Has poorly functioning economic empowerment package	11	6.04%
Skewed distribution of health facilities in favour of urban areas	8	4.39%
Government budgets very low for health	7	3.85%
All of the above	154	84.62%
Total	**182**	**100%**

Table 5 shows that majority of respondents were of the opinion that government contributes to differential access to health services of citizens through poor distribution of health facilities, poor economic empowerment packages and low budget for health services.

Research Question 3: What is the major socio-economic and cultural factor that affects or determines access to public health facilities/in Southeast area of Nigeria?

Table 6: Distribution of Respondents by their opinion on major socio-economic and cultural factor that affects or determines access to public health facilities/services in their area

Responses	Frequency	Percentage
Low level of income (poverty)	94	51.6%
Low level of education	38	21.0%
Distance and difficult terrain of health facilities	23	12.6%
Lack of awareness about existing health facility	13	7.1%
Delay in getting permission for clinic attendance from male head (effect of patriarchy)	2	1.1%
Poor quality of service provided at public health institutions	12	6.6%
Total	**182**	**100%**

Table 6 above shows that majority of the respondent 94(51.6%) were of the view that use of health facilities is mostly affected by low level of income; 38(21.0%) saw level of education as the major factor while 23(12.6%)of the respondents felt that distance and difficult terrain were the major factors affecting access to public heath institutions. However, a female focus group participant at Awka, capital of Anambra state observed that "\one problem public health facilities have is poor attitude to work among staff particularly lateness of doctors to work. There is also short supply of adequately trained and skilled health personnel. These situations often scare me and other citizens from patronizing such public health institutions"(female FGD participant, urban resident,42 years old). Meanwhile, a male health worker interviewed in the same town (Awka) stressed that level of income is not actually the main factor but resident's attitude to public health facilities occasioned by prevailing belief system and orientation. In his words, "lower charges and free treatment administered to patients in public health facilities generate doubts about quality and efficacy of those treatments. This is because the people believe that good things don't come too cheap. The

situation is compounded by generally low level of education among residents but could be reversed with intensive public enlightenment campaign" (male interviewee, urban resident, 36 years old).

Test of Hypotheses: Three hypotheses postulated for this study were tested as shown below;

Hypothesis 1

There is a significant relationship between level of educational attainment and use of health facilities among residents of Southeast Nigeria. Test was based on data in table 7.

Table 7: Relationship between level of educational attainment and use of health facilities among residents of Southeast Nigeria.

Level of use of health facilities					Total
Level of Education	Very often	Often	Rarely	Never	
No formal education	1(0.46)	-(1.12)	3(1.67)	-(0.74)	4
Primary	-(2.08)	3(5.04)	12(7.52)	3(3.36)	18
Secondary	4(5.65)	17(13.73)	20(20.46)	8(9.15)	49
Tertiary	10(9.81)	24(23.82)	32(35.49)	19(15.88)	85
Above first degree	6(3)	7(7.39)	9(10.86)	4(94.86)	26
	21	51	76	34	182

X^2=32.47, df=12, P, 0.05

The computed value of Chi-square is 32.47 while the table value of Chi-square at 0.05 level of significance with a degree of freedom (df) of 12 is 21.026. Since the computed Chi-square is greater than the table value, the alternative hypothesis was accepted: It implies that there is a significant relationship between level of education and use of health facilities among residents in Southeast Nigeria. This implies that more educated residents are more likely to use the health facilities than poorly educated residents. This is because a higher level of education enables a person to recognize early symptoms of illness resulting in willingness to seek early treatment.

Hypothesis 2:

The female gender is more likely to use public health facilities more than the male gender among residents of Southeast Nigeria. Test was based on data in table 8 below.

Table 8: Relationship between gender and use of health facilities.

Level of use of health facilities					Total	
Gender	Very often	Often	Rarely	Never		
Male	9 (9)	20(21.86)	36 (32.56)	18 (14.57)	78	
Female	12 (12)	31 (29.14)	40 (43.42)	16 (19.43)	104	
Total	21	51	76	34	182	

X^2 =55.99, df=3, P=0.05

The computed value of Chi-square is 55.99 while table value of Chi-square at 0.05 level of significance with a degree of freedom of (df) of 3 is 7.815. Since the computed Chi-square is greater than the critical value, the alternative hypothesis was accepted. This implies that, the female gender uses health facilities more than the male gender in Southeast Nigeria. This may be because females undergo more physiological, biological and reproductive changes than the male gender. Such requires regular visits to health facilities such as for antenatal services, deliveries, immunization of their children, health counseling and family planning etc.

Hypothesis 3

There is a significant relationship between level of income and use of health facilities in Southeast Nigeria. Test results showed that computed value of Chi-square is 58.12 while table value of Chi-square at 0.05 level of significance and degree of freedom (df) of 9 is 16.919 Thus, since the computed Chi-square value is greater than the critical value; the alternative hypothesis was accepted. This implies that there is a significant relationship between level of income and use of health facilities among residents of Southeast Nigeria. This suggests that higher income earners use health facilities more than low income earners.

Discussion of Findings

In this study, it was found that available public health facilities in Southeast area of Nigeria are lowly utilised. It was also found that social factors determine or impede access/use of those services. Such factors include low income, low level of education, negative attitudes towards health facilities, gender, beliefs, distance of facility away from neighborhoods, difficult terrains of health facilities, patriarchal social structure and perception of quality of treatment available etc. These factors contribute to differential access whereby persons with high socio-economic status (i.e. greater income and higher educational attainment) tend to use health facilities more than those with poor income and low educational background. However, the study revealed that low income (poverty) ranks higher among other factors that influence use of health facilities in Southeast Nigeria.

The above findings agree with some earlier studies among other social groups in Nigeria (see Nigeria Demographic and Health Survey, 2006). Also, Vietnam National Health Survey 2001-2002 similarly reported that income is strongly positively related to probability of seeking professional health care when ill. The poorest group has less opportunity to obtain health care; while the richest has highest opportunity to seek health care. Furthermore, there is a greater tendency among the poor to postpone seeking care.

Similarly, the study observed positive effect of education on access to health services in consonance with literature. Schooling is an important correlate of good health. Maternal schooling, for example, was found to be the most important determinant of infant survival in a study in Pakistan (Agha, 2000). Similarly, Moore, Hart and George (2011) in their study of utilization of health care services by pregnant mothers during delivery in Gokana Local Government Area of River State, Nigeria observed that although the rate of utilization of health facilities for delivery by pregnant women in the area stood at 57.1%., mother's education contributed significantly to increased health facility utilization.

Furthermore, the study revealed that the female gender utilizes health facilities more than the male gender either as a result of the female's biological, physiological and reproductive nature. Other forms of disparity in access to health services in Southeast Nigeria are related to rural-urban residence, as well as class. Above all, 41.8% of respondents stated that they rarely use public health facilities. To further compound the issues, respondents were of the view that government contribute to the problem of differential level of access to health services through poorly functioning economic empowerment programmes, low health budgets and skewed or inequitable distribution of health facilities to the disadvantage of rural areas and difficult terrains.

Consequences of low use of health facilities on the health status of the residents of Southeast Nigeria include high morbidity and mortality and inability to function at full capacity. The finding is in line with earlier findings Deneulin and Shakam (2009). Inability to function to full capacity (due to poor health) is a major consequence of low use of health facilities in the area. This explains frequency of diseases and deaths due to what Nigerians now call brief illness.

Respondents suggested reduction in the cost of health services; creation of awareness on existing facilities; training and re-training of health personnel and increment in their salaries; need for closer location of health facilities; improvements in education, adoption of positive attitude by residents; and improvements in transportation system as measures to improve access to services

Conclusion

Health is a basic human need. The extent of development of society could be rightly judged by the quality of her population's health and how fairly health facilities are distributed across social spectrum. Questions are also asked about people's access to available services. The influence of socio-economic and cultural factors on use of health facilities is not only a threat to health status of individuals but also a threat to national development. This is because it constitutes a set back to the actualization of Millennium Development Goals and other important aspirations of both individuals and the state. Hence it requires utmost attention. Accordingly, advances in both public and private health and breakthroughs in medical sciences will amount to nothingness if obstacles to use of health facilities as identified in this study are not dismantled.

Recommendations

Government should make essential drugs and health services free of charge at public health institutions with a monitoring team to ensure effective implementation.
Health facilities should be located nearer to the people especially in the rural areas with minimal class and political considerations that may disadvantage the poor masses.
Improved health workers salary and transportation systems should be put in place to facilitate happy workforce and easy access to services particularly during emergencies.
Public awareness programmes should be strengthened by the government and should involve all agents of socialization. They should address importance of use of health facilities and dangers of delays in health response on health status of individuals.
Universal basic education programme should be strengthened in Southeast Nigeria to ease low male enrolment and boost mothers' educational level and quality of care.
Government should provide job opportunities to enable people earn income with which to take care of their health through adequate use of health facilities in their area.

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COMPREHENSIVE ASSESSMENT OF ESTROGENIC CONTAMINATION OF SURFACE WATERS OF THE RIVER BASIN SUQUIA

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Abstract

Estrogenic compounds are a class of pharmaceutical products harmful to the animals and a cause of environmental damage. The biological activity of these compounds is high, which are designed to operate at low concentrations. Therefore, even in low concentrations in the environment can have harmful effects on aquatic organisms and in humans, who might be consuming water or food contaminated with estrogen.

The generic term (estrogen) applies to any substance, natural or synthetic exert biological effects characteristic of ovarian estrogenic hormones, many anabolic and growth promoters in animals, which has led to its misuse in the commercial animal. Estrogen produced in the laboratory can be used as a type of birth control and the treatment of menopausal symptoms, menstrual disorders, osteoporosis and other health treatment.

There are three main forms of estrogen found in the human body, Estrone (E1), 17 beta-estradiol (E2) and estriol (E3). Estrone (E1) is the most common estrogen in greater quantities in postmenopausal women.

Over the last decades, residues of hormones E1, E2 and E3, have been reported mainly in river water and sediments due to the inevitable link to WWTP effluents discharging into the receiving waters In this brief review, we provide an overview of sources, environmental concentrations in surface and ground water, and summarize the current knowledge on fate and behavior of these steroid compounds.

And we describe the first sampling campaign (surveys and water samples of the Suquia River) and we present a brief analysis of the surveys.

Keywords: Stogenic hormones, synthetic oral contraceptives, micropollutants, toxicity, Suquia River

Introduction

Estrogenic compounds are a class of pharmaceuticals harmful to animals and one of the causes of environmental damage. The biological activity of these compounds is high, which are designed to act at low concentrations. Therefore, even at low concentrations in the environment can have harmful effects on aquatic organisms and in humans, which might be contaminated in a number of ways (through contaminated food or drinking water, for example).

The generic term (estrogen) applies to any substance, natural or synthetic exert

biological effects characteristic of ovarian estrogenic hormones, many anabolic and growth promoters in animals, which has led to its misuse in commercial animal. Estrogen produced in the laboratory can be used as a type of birth control and to treat symptoms of menopause, menstrual disorders, osteoporosis and other conditions.

Studies in surface water courses have shown a high concentration of estrogen, this is because standard water treatment often fails to eliminate estrogen and synthetic compounds chemically related to the same, or inadequate management of biowaste determines being discharged to the river basin by altering the natural system.

The natural hormone and synthetic are often used in water and subsequently treated remains concentrations that can be harmful.

There are three major forms of estrogen found in the human body, estrone (E1), 17 beta-estradiol (E2) and estriol (E3).

Estrone (E1) is the estrogen most common in larger quantities in postmenopausal women.

Estradiol (E2) is the main estrogen in mammals during the reproductive years, and is produced by the ovaries. Estradiol is prescribed in this clinic consists predominantly percentage by birth control pills, there are also other indications including symptomatic relief of hot flashes, genitourinary symptoms, osteoporosis prophylaxis, psychological wellbeing and reducing coronary artery disease. High concentrations of E2 in source waters can have adverse health effects (renal failure, necrosis, and liver damage) in fish, even in very low concentrations. The main sources of high concentrations of E2 to the aquatic environment are sewage and animal waste. Estradiol is not soluble in water.

Estriol is the weakest of the three main estrogens. Estriol (E3) is the estrogen that is produced in large amounts during pregnancy and have a potential barrier properties against cancer cell production. Estriol is soluble in water. It is logical that estrogenic hormones excreted by women can find their way into the water supply plants through wastewater treatment.

In this research we study the presence, origin and concentration of the three main estrogen hormones in Suquia River Basin. Their objectives are:

Determine the presence, concentration and origin of estrone (E1), 17 beta-estradiol (E2) and estriol (E3) in Suquia River Basin.

- Gather information on the presence and origin of estrogens in watersheds and their effects on the ecosystem.
- Analyze the presence of estrogen in Suquia River basin and its seasonal variation.
- Determine the possible source of estrogens are present in the Rio Suquía

Main Text

To carry out this project, we started with a collection of studies conducted in other parts of the world such as USA, Canada, England, Sweden, Holland, Spain and other countries. In these countries that are most advanced research and studied the effects of these hormones in water courses, produce on the aquatic ecosystem and humans.

The project encompasses the study of environmental estrogens (EA), they include not only natural but also estrogens including synthetics are birth control pills, patches, hormonal and a large number of compounds of different chemical structure and which only share their ability to affect the endocrine system of different organisms to mimificar whole or in part the action of physiological estrogen hormones. These compounds are known as xenoestrogens.

Xenoestrogens are present in a wide variety of products such as sunscreens (butylated hydroxyanisole), food preservatives, in some plastics (which contain phthalates) in pesticides (atrazine, DDT, methoxychlor ...) and all kinds of cosmetics, shampoos, gels, toothpastes,

beauty creams, deodorants, drugs and even some convenience foods, etc.. containing parabens or parabens. Parabens are ubiquitous components in the products we use in our toiletries and some medications and are of particular concern because they are cheap preservatives for industry and in many countries are free to use.

The physiological effects of estrogen are numerous: they regulate cell and tissue growth, reproduction, metabolism, immunity, maintain reproductive cycles and ensure a balance between the various systems and appliances.

The presence in the environment of estrogen and compounds with estrogenic effects can result in multiple effects. Basically we can summarize the effects of environmental estrogens (EA) on animals and man in the following:
- Abnormal levels of hormones in blood
- Reduced fertility
- Immune system disorders
- Feminization of male
- Cryptorchidism
- Decreased sperm count
- Tumors of the male and female genital tracts
- Malformations of the reproductive
- Alteration of the structure and bone density
- Development of estrogen-dependent tumors

The main consequence of all these effects is reduced reproductive capacity of the species   concerned.

Importantly estrogens present in water can not be purged entirely of effluent treatment plants and sewage plants.

Recently, a study published in the reports of the U.S. Academy of Sciences revealed that only 5 ng / L (nanograms, or billionths of a gram per liter) of estrogen, ie more or less what is on the Out of the water treatment plants, could cause the demise of the entire population of minnows from the lake, also to sterilization feminization of males, in just two years ... have multiplied population surveys "feminized" fish rivers in industrial countries, from the Seine in France until the Potomac River in the United States.

In the Canary Islands, Spain found a direct link between increased breast diseases (cancer) with the content of xenoestrogens in water, because it is the European region with the highest rate of pesticide per hectare of cultivated soil.
The project is doing by completing the following steps:

Library Research

Be collected history of worldwide research associated with the presence and origin of estrogens in surface water basins.

Sampling

Water samples Suquia River Basin were take in the month of February and will be take in the month of August in order to know the variation in the concentration of estrogen in terms of climate variability. The sampling points are (Figure 1):
Point 1: Cosquín River before entering the lake.
Point 2: San Antonio River before entering the lake.
Point 3: Lake San Roque (at different depths).
Point 4: Suquia River at the outlet of Lake San Roque.
Point 5: Rio Suquia to match the intake Cordobesas Water.
Point 6: The Calera River before entering the city of Cordoba.
Point 7: Bridge 15 Cordoba.

Point 8: Bridge San Fe, Cordoba.
Point 9: Vado Sergeant Cabral, Cordoba.
Point 10: Plant Bajo Grande, Cordoba.
Point 11: 10 Km after Plant Bajo Grande.
Point 12: La Cañada stream before entering the municipal lands.
Point 13: La Cañada stream where it flows into the river Suquia.
Point 14: Sample of treated water from the city of Cordoba, which corresponds to the water treatment plant Suquia.
Point 15: Sample of treated water from the city of Córdoba that corresponds to that obtained Dam Los Molinos.
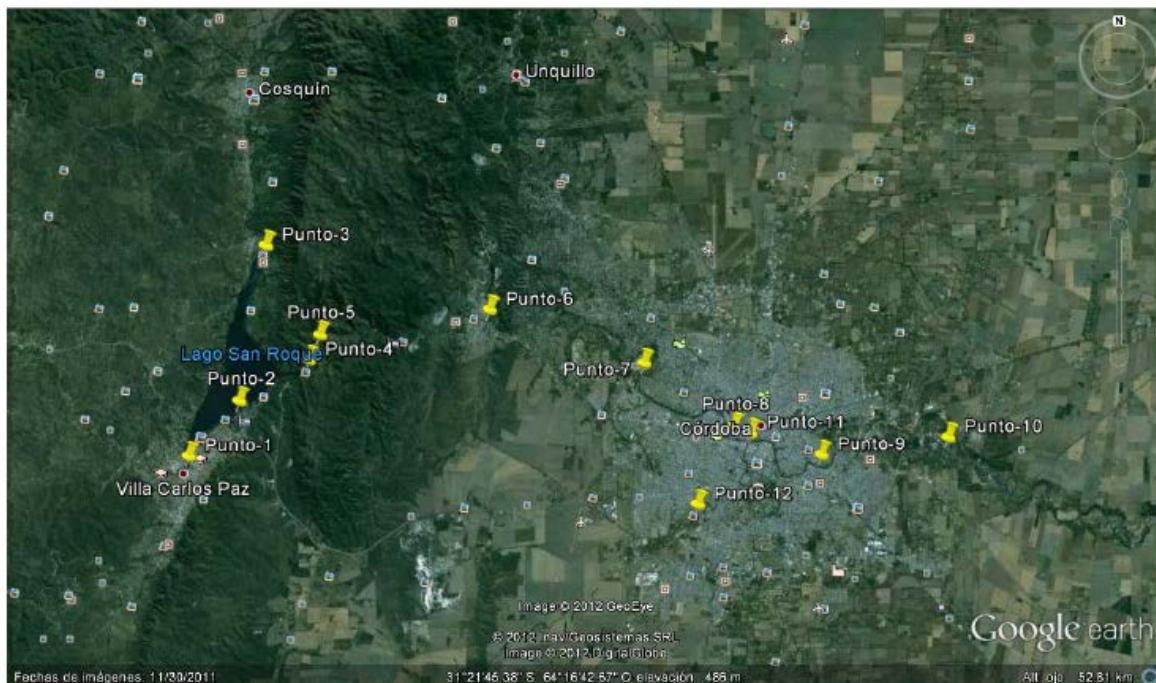
Figure 1: Sample points

Analysis Laboratory

Of the samples collected were analyzed three estrogenic hormones, estrone (E1), 17 beta-estradiol (E2) and estriol (E3).

To determine the estrogen in Estrogen laboratory was used (E1/E2/E3) ELISA Kit and an ultraviolet spectrophotometer, 450 nm.

The ELISA is highly reproducible measurement, the coefficient of variation (CV) is mostly less than 10%. The quantitative analysis is 0.1 g / L to 3 g / L (ppb).

The test requires less amount of harmful solvents instrument analyzes.

With the ease of handling, the total time for measurement is only 2.5 hours.

Making pharmacological surveys

It was survey 150 women from the city of Córdoba and other settlements Suquía River Basin to determine the consumption of birth control pills or using birth control patches.

Environmental Studies

In order to complement the results of chemical analyzes and to determine the possible source of estrogen in Suquía River Basin the following studies are been developed:

- Assessment of land use in the basin of the River Suquía.

- Determination of effluent treatment systems domestic or presence of areas with septic tanks.
- Inventory slums near the river Suquia and assessment of their impact on the resource.
- Inventory poultry and possible discharge of effluents into the river.
- Determining pastoral areas near the river basin Suquía and feedlot cattle.
- Determination of agricultural areas to assess the possible contribution of xenoestrogens from pesticides.
- Determine points clandestine domestic effluents discharged by companies weather.

Conclusions and recommendations

Conclusions that will be drawn to have a knowledge of the presence, concentration, origin and seasonal variation of estrogenic hormones, estrone (E1), 17 beta-estradiol (E2) and estriol (E3) in Suquia River Basin.

Conclusion

Collected samples were analyzed in the first instance the contents of the three estrogenic hormones, estrone (E1), 17 beta-estradiol (E2) and estriol (E3) together.

To determine the estrogen in Estrogen laboratory was used (E1/E2/E3) ELISA Kit and an ultraviolet spectrophotometer, 450 nm.

The ELISA is highly reproducible measurement; the coefficient of variation (CV) is mostly less than 10%. The quantitative analysis is 0.1 g / L to 3 g / L (ppb).

The results obtained were:

Sample	Absorvance	Concentration
M1	0.927	-0.00496 ppb (< 0.05 ppb)
M3	0.931	-0.00589 ppb (< 0.05 ppb)
M4	0.895	0.00263 ppb (< 0.05 ppb)
M7	0.933	-0.00635 ppb (< 0.05 ppb)
M10	0.142	0.47216 ppb
7070	0.9	0.00143 ppb (< 0.05 ppb)

Corresponding to Sample M10 taken downstream of the treatment plant effluent big bass showing a concentration ten times the limit of quantification of the technique. What we would indicate the presence of estrogen in the Rio Suquia, unable to be eliminated entirely by the treatment plant. Clarifying that there still scrubbing technology can eliminate them entirely when present in the water.

Because the work includes determining the origin of environmental estrogens are doing work related to:
-Assessment of land use in the basin of the River Suquía.
-Determination of effluent treatment systems domestic or presence of areas with septic tanks.
-Inventory slums near the river Suquia and assessment of their impact on the resource.
-Inventory poultry and possible discharge of effluents into the river.
-Determining pastoral areas near the river basin Suquía and feedlot cattle.

To complete the study and were surveyed about 500 women in the city of Córdoba, the survey contains a total of 103 questions divided into four main items habits, workplace characteristics, eating habits and characteristics of the place of residence. Making particular emphasis on the consumption of pills or patch anticonpetivas or use for that purpose. Surveys will be conducted to all women living in the catchment area of the river basin Suquia.

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A COMPARISON OF DIFFERENT PATTERN RECOGNITION METHODS WITH ENTROPY BASED FEATURE REDUCTION IN EARLY BREAST CANCER CLASSIFICATION

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Abstract

Breast cancer is in the most common malignant tumor in women. It accounted for 30% of new malignant tumor cases. Although the incidence of breast cancer remains high around the world, the mortality rate has been continuously reduced. Early detection by mammography is an integral part of that.In the study, we tested on three combinations of wavelet and Fourier features, including Db2, Db4, and Bior 6.8, and selected the top appropriate amounts of features which related most to the breast cancer according to the information gain. At last, three classifiers, including Back-propagation (BP) Network, Linear Discriminant Analysis (LDA), and Naïve Bayes (NB) Classifier, were tested in the original and new database, and significant figures such as sensitivity and specificity were calculated and compared.

Keywords: Breast cancer, feature reduction, classification

Introduction
Background

Breast cancer is the most commonly diagnosed form of cancer in women and the second-leading cause of cancer-related death behind lung cancer [1]. Studies show that early detection, diagnosis and therapy is particularly important to prolong lives and treat cancers. Mammography is a "specific type of imaging that uses a low-dose x-ray system to examine breasts" [2]. To date, screening mammography is the best available radiological technique for early detection of breast cancer [1].

The performance of such a mammography screening system can be measured by two parameters: sensitivity and specificity.

Sensitivity (true positive rate) is the proportion of the cases deemed abnormal when breast cancer is present. In cancer screening protocols, sensitivity is deemed more important than specificity, because failure to diagnose breast cancer may result in serious health consequences for a patient. Almost fifty percent of cases in medical malpractice relate to "false-negative mammograms" [3]. Specificity (true negative fraction) is the proportion of the cases deemed normal when breast cancer is absent. Although the consequences of a false positive, that is, diagnosing a normal patient as having breast cancer, are less severe than missing a positive diagnosis for cancer, specificity should also be as high as possible. False positive examinations can result in unnecessary follow-up examinations and procedures and may lead to significant anxiety and concern for the patient.

Data Transformation

Fourier transform is one of the most important methods in the field of signal processing, it builds up a bridge between frequency domain and time domain.

$$F(v) = \int e^{-2\pi i(x,v)} f(x)\, dx$$

$$[0.1]$$

$$f(x) = \int e^{2\pi i(x,y)} F(v) \, dv$$ [0.1]

The Fourier pair illustrates that data presented in one domain may be represented in the other domain through the process of inverse transformation.

Fourier analysis is a useful tool for extracting data from many time domain signals or determining the resolution level in spatial domain images. Similarly, frequency encoded data can be transformed to the spatial domain. Perhaps the best known example of this is MRI data, collected in a frequency encoded time domain is transformed to the frequency encoded spatial domain to provide the MRI image. It can give various frequency components in the signal. However, Fourier transform has serious disadvantages: signals transformed to the frequency domain lose time information after transformation.

In 2D wavelets we have a scaling function and three wavelets.

The scaling function $\qquad \varphi^{2D} = \varphi(x)\varphi(y)$

The three wavelets $\qquad \Psi_1^{2D} = \varphi(x)\Psi(y)$
$$\Psi_2^{2D} = \Psi(x)\varphi(y)$$
$$\Psi_3^{2D} = \Psi(x)\Psi(y)$$

where ϕ and ψ indicate the scaling function and 1-D wavelet respectively. The discrete wavelet transforms of image f(x,y) of size M and N is

$$W_\varphi(j_0, m, n) = \frac{1}{\sqrt{MN}} \sum_{x=0}^{M-1} \sum_{y=0}^{N-1} f(x,y) \varphi_{j_0,m,n}(x,y)$$

$$W_\varphi^i(j, m, n) = \frac{1}{\sqrt{MN}} \sum_{x=0}^{M-1} \sum_{y=0}^{N-1} f(x,y) \Psi_{j,m,n}^i(x,y)$$

The image is broken up into a sum of orthogonal signals corresponding to different resolution scales. From the detailed coefficients we get the horizontal, vertical and diagonal detailed of the image.
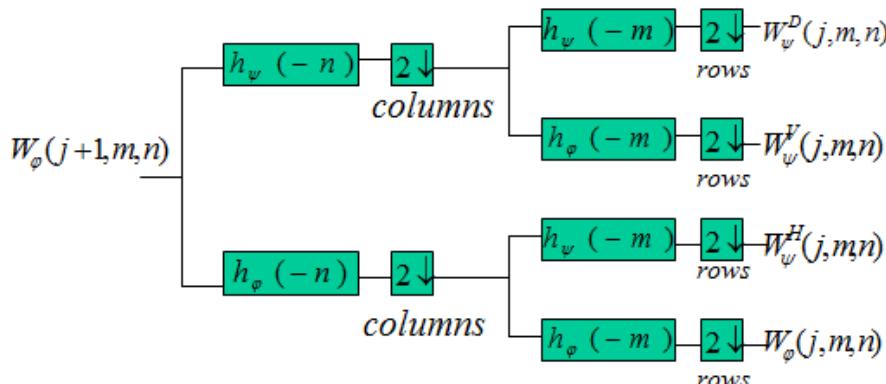
Fig. 1.1. Fast 2D wavelet transform (algorithm flow chart retrieved from the course note of Digital Image Processing in Memorial University)

Figure 1.1 illustrates the general form of 2D wavelet transform. The decompositions firstly run along the x-axis and then calculate along the y-axis, a picture then can be divided into four bands: LL (left-top), HL (right-top), LH (left-bottom) and HH (right-bottom).

The proposed research
Complete image analysis system

The entire image analysis system, from the reading of the original image to the final classification as either normal or suspicious, is represented by the block diagram of Fig. 2.1. The system consists of three distinct stages: In the image processing stage, the system inputs an original mammography image and ouputs a normalized image which could be used in

wavelet transformation. The feature selection part is mainly selecting benefit features which are extracted from Fourier and wavelet transform. The last stage is image classification, which combines different classifiers to determine whether a mammogram is normal or suspicious.
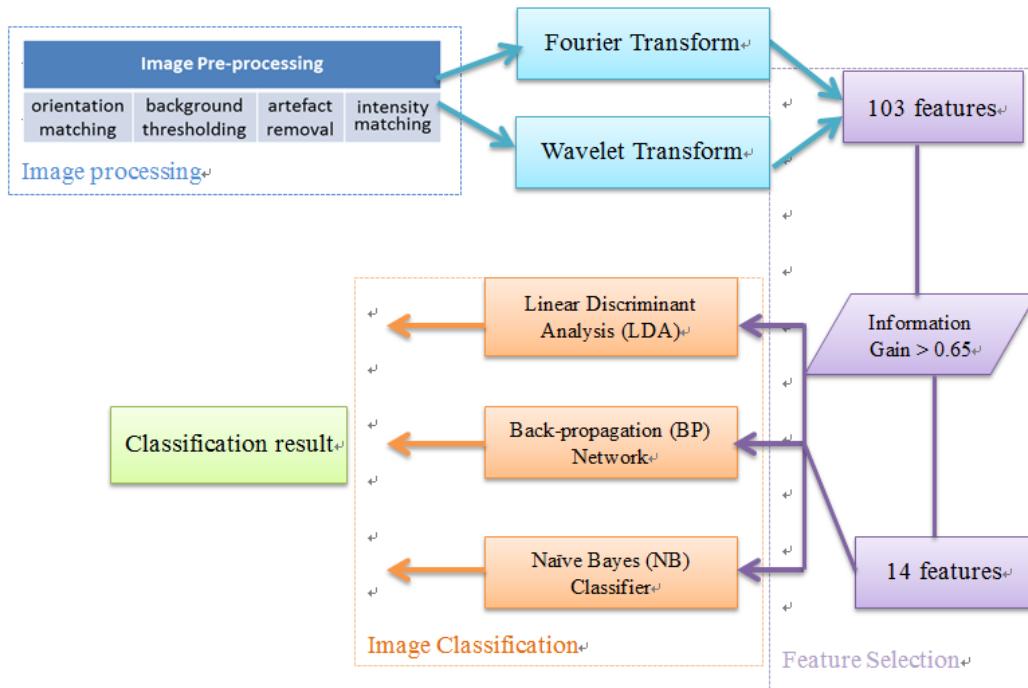
Fig. 2.1 – Block diagram of complete image classification system

Orientation matching step ensures that all images pointed to the same direction, preventing changes in the wavelet transform coefficients due only to the directionality change between right and left images.

Thresholding is the simplest method to create binary images, it normally sets all pixels below a set intensity level to zero [4]. A satisfied threshold can remove all irrelevant information in the background pixels, and leave foreground objects unaltered. A most commonly used method to choose the threshold is Otsu's Method, which assumes that the image to be thresholded contains two classes of pixels or bi-modal histogram (e.g. foreground and background) then calculates the optimum threshold separating those two classes so that their combined spread (intra-class variance) is minimal [5].

The thresholding process is usually implemented in conjunction with artefact removal. It is because that it was convenient to perform a binary thresholding, where all pixels below the threshold were set to an intensity of zero and all pixels above the threshold were set to an intensity of one. However, in this work, no artefact presents in mammograms, we can skip to the next step, intensity matching.

Intensity matching is the last pre-processing step that applied to the images before they are ready for wavelet decomposition. In this step, all mammograms are scaled to a relative intensity of 1.0 and all other image pixels are linearly scaled accordingly. The transformation is described by:

$$img\_out = \frac{img\_in}{\max(img\_in)}, \qquad\qquad (2.1)$$

where img_in is the input image following the background thresholding step and img_out is the intensity matched image whose pixel intensities range from zero to one. This step is proceeded to ensure the uniformity across all different images, because different mammograms could lead to different pixel intensities after coming through different machines.

Wavelet and Fourier Transform

After all mammograms were pre-processed from the previous steps, wavelet and Fourier transform were performed on those images. In this experiment, we will extract four statistical features: the mean intensity, the standard deviation of the pixel intensities, the skewness of the pixel intensities and the kurtosis of the pixel intensities. Further, the classification system will use some of these features to classify whole images as being normal or suspicious.

1. Mean

The mean, m of the pixel values in the defined window, estimates the value in the image in which central clustering occurs. The mean can be calculated using the formula:

$$\mu = \frac{1}{N} \sum_{i,j} I(i,j)$$

Where $I(i,j)$ is the pixel value at point (i,j) of an image of size M*N.

2. Standard Deviation

The Standard Deviation, σ is the estimate of the mean square deviation of grey pixel value $I(i,j)$ from its mean value. Standard deviation describes the dispersion within a local region. It is deter-mined using the formula:

$$\sigma = \sqrt{\frac{1}{N} \sum_{i,j} [I(i,j) - \mu]^2}$$

3. Skewness

The third statistic measured from each wavelet map image is the skewness of the pixel intensities. The skewness of a distribution of values is defined as the third central moment of the distribution, normalized by the cube of the standard deviation. Symbolically, the skewness S is calculated according to:

$$S = \frac{1}{N} \sum_{i,j} [\frac{I(i,j) - \mu}{\sigma}]^3$$

4. Kurtosis

The fourth and final statistic measured from the wavelet maps is the kurtosis of the pixel intensities. The kurtosis of a distribution of values is defined as the fourth central moment of the distribution, normalized by the fourth power of the standard deviation of the distribution. Symbolically, the kurtosis K is calculated according to:

$$K = \frac{1}{N} \sum_{i,j} [\frac{I(i,j) - \mu}{\sigma}]^4$$

Feature Selection

Feature selection is a process of reducing features according to a certain evaluation criterion, it is now normally used as a preprocessing step to machine learning. Feature selection has been researched since 1970's and it was proven to be effective in removing irrelevant and redundant features, increasing efficiency in improving learning performance like accuracy [6]. Dozens of feature selection methods have been developed during the past years and these can be divided into three categories: filter methods, wrapper methods, and hybrid methods [7]. Filter methods rely on characteristics of each individual feature using an independent test without involving any learning algorithm. Wrapper methods apply a specific machine learning algorithm and utilize its corresponding classification performance to evaluate the selected features [8]. While hybrid methods combine the advantages of filter and wrapper methods.

In this work, we evaluate the goodness of a feature according to its entropy. Entropy is a measure of the uncertainty of a random variable. The entropy of a variable X is defined as

$$H(X) = - \sum_i P(x_i) log_2(P(x_i)) \qquad (2.2)$$

and the entropy of X after observing values of another variable Y is defined as

$$H(X \mid Y) = -\sum_j P(y_j) \sum_i P(x_i|y_j) \, log_2(P(x_i \mid y_j)) \qquad (2.3)$$

Where $P(x_i)$ is the prior probabilities for all values of X, and $P(x_i|y_j)$ is the posterior probabilities of X given the values of Y. The amount by which the entropy of X decreases reflects additional information about X provided by Y and is called information gain [9], given by

$$IG(X \mid Y) = H(X) - H(X \mid Y) \qquad (2.4)$$

If we have $IG(X \mid Y) > IG(Z \mid Y)$, it means a feature Y is regarded more correlated to feature X than to feature Z.

Image Classification
Linear Discriminate Analysis

Linear Discriminant Analysis (LDA), also called Fisher Linear Discriminant (FLD), is a classic algorithm of pattern recognition. It is introduced to the field of pattern recognition and artificial intelligence by Belhumeur in 1996 [10]. The principle idea is to project high-dimensional pattern samples in the best vector space, so that to extract the classification information and the dimension of compressed feature space. After projection, pattern samples in the new subspace have the biggest between-class distance and the minimum within-class distance, which garantee the best separability in the space. Therefore, it is an effective method for feature extraction.

Given N samples in d-dimensions, $x^{(i)}\{x_1^{(i)}, x_2^{(i)}, \ldots, x_d^{(i)}\}$. Among which, there are N_1 samples belonging to class ω_1, other N_2 samples belonging to class ω_2. To make sure all classes can be clearly reflected in low dimensional data, we can imagine there is a one-dimensional vector that can determine every sample's category. This best vector is named W (d-dimension), and the projection from sample X to W can be calculated as:

$$y = w^T x \qquad (2.5)$$

The value of y is the distance from the projection of sample X to the origin. When X is two dimensions, a straight line with the direction of w is needed to make projection, and the second step is to fine a straight line that can best classify sample points.

Back-propagation Network

BP neural network is an abbreviation for error back propagation algorithm, and it is commonly used in artificial neural network [11]. It consists of information forward propagation and error backward propagation. Shown as in Fig. 2.2, BP network is a three layer network, which includes: input layer, hidden layer and output layer.
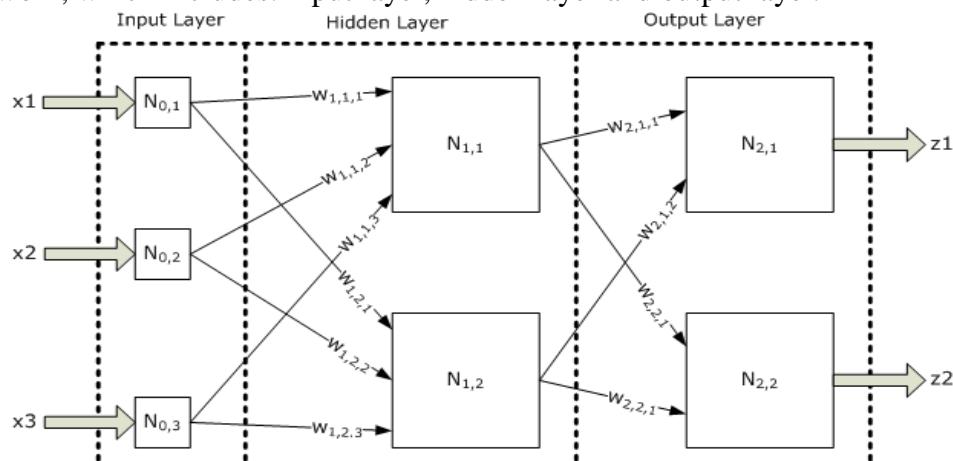

Fig. 2.2 BP neural network (retrieved from: http://www.cnblogs.com/hellope/archive/2012/07/05/2577814.html)

Neurons in the input layer are responsible for receiving outside information and transmitting to the middle layer. Hidden layer is an internal information processing layer, it can be designed as a single hidden layer or multiple hidden layer according to the demand of information transformation ability. A learning forward propagation process is completed after further processing the information of neurons from the last hidden layer to the output layer. The information processing results are obtained from the output layer.

Naive Bayes Classifier

Naive Bayes classifier is a supervised learning method. The classifier is first trained and concluded through the training set, and then it is used to classify the undefined data. Supposing that $A_1, A_2, \ldots A_n$ are the features for one data set, and there are m classes, $C = \{C_1, C_2, \ldots C_m\}$. Given an instance, its feature is $\{X_1, X_2, \ldots X_n\}$, then the posterior probability that instance belongs to a class C_i is: $P = (X \mid C_i)$. The Bayes classifier can be represented as:

$$C(X) = \frac{\arg max}{C_i \in C} P(C_i) \, P(X \mid C_i) \qquad (2.6)$$

It indicates that the prediction accuracy reaches the largest when instance X has the largest posteriori probability.

However, the posteriori probability is difficult to calculate in that formula, the following "Naive Bayesian hypothesis" is introduced to Naive Bayes classifier: under the given conditions of categories, all attributes A_i are independent from each other. That is:

$$P(A_i | C, A_j) = P(A_i | C), \quad \forall A_i, A_j, P(C) > 0 \qquad (2.7)$$

In the Naive Bayesian classification algorithm, it can independently learn either the conditional probability that each attribute A_i in the category C ($P(A_i|C)$), or the probability of each attribute A_i. Since the value is constant, it can be replaced with a normalization factor 'a'. Then, the posterior probability becomes:

$$P(C = c | A_1 = a_1 \ldots A_n = a_n) = \alpha P(C = c) \prod_{i=1}^{n} P(A_i \mid C = c) \qquad (2.8)$$

According to formula (2.8), the optimal classification ($C = C_i$) should satisfy:

$$P(C_i | < a_1 \ldots a_n >) = \frac{P(< a_1 \ldots a_n > | C_i)}{P(< a_1 \ldots a_n >)} P(C_i) \qquad (2.9)$$

$$P(C_i | < a_1 \ldots a_n >) > P(C_j | < a_1 \ldots a_n >), \ j \neq i \qquad (2.10)$$

Results and Discussions
Feature selection results and discussion

There are 102 features after preprocessing, including 6 Fourier features and 96 wavelet features. In this test, db2, db4, and bio features will be tested and compared.

After feature selecting, the program shows the information gain (IG) and entropy (E(x | y)) below.

Feature		E(x|y)	IG	Order
	Level 3 kurtosis,h	0.021276595744680847	0.6771228630838643	13.0
	Level 3 kurtosis,v	0.0	0.7008776293376933	14.0
	Level 3 kurtosis,d	0.0070921985815602835	0.6930749452746311	15.0
	Level 4 kurtosis,h	0.024822695035460987	0.6730638977527105	29.0
Db4	Level 4 kurtosis,v	0.008430651599580619	0.6917364922566107	30.0
	Level 4 kurtosis,d	0.033253346635041606	0.6635238665784421	31.0
	Level 5 kurtosis,h	0.040345545216601886	0.655212121301062	45.0
	Level 5 kurtosis,v	0.028368794326241127	0.6689769809305656	46.0
	Level 5 kurtosis,d	0.024822695035460987	0.6730638977527105	47.0

	Level 8 mean,a	0.03546099290780141	0.6607201173142287	84.0
	Level 8 kurtosis,v	0.021276595744680847	0.6771228630838643	94.0
Fourier	std	0.0035460992907801418	0.6969909224745785	98.0
	kurtosis	0.0	0.7008776293376933	99.0
	skewness	0.010638297872340425	0.6891299272077788	100.0

Table 3.1 Final results of db4 and Fourier features

Feature		E(x|y)	IG	Order
	Level 3 kurtosis,h	0.020163843290040204	0.7408423251802031	13.0
	Level 3 kurtosis,v	0.020895522388059702	0.7394641522571612	14.0
	Level 3 kurtosis,d	0.008955223880597015	0.7538821642451676	15.0
	Level 4 kurtosis,h	0.04179104477611941	0.7135477724505761	29.0
	Level 4 kurtosis,v	0.03210414179750289	0.7262091448008926	30.0
	Level 4 kurtosis,d	0.030977444033079803	0.7273358425653157	31.0
	Level 5 kurtosis,h	0.06679833955546789	0.6817697307626954	45.0
Db2	Level 5 kurtosis,v	0.047029514931831266	0.7075223729769189	46.0
	Level 5 kurtosis,d	0.06381326492860222	0.6856599703080072	47.0
	Level 7 mean,a	0.036947593286811145	0.7206482434150133	68.0
	Level 8 mean,a	0.029850746268656716	0.7284625403297388	84.0
	Level 8 std,a	0.06420828359500581	0.6861534773199935	88.0
	std	0.005970149253731343	0.7574412275035576	98.0
Fourier	kurtosis	0.0	0.764504118933247	99.0
	skewness	0.011940298507462687	0.7503048252857403	100.0

Table 3.2 Final results of db2 and Fourier features

Feature		E(x|y)	IG	Order
	Level 3 kurtosis,h	0.011940298507462687	0.7503048252857403	13.0
	Level 3 kurtosis,v	0.005970149253731343	0.7574412275035576	14.0
	Level 3 kurtosis,d	0.01791044776119403	0.7430957207090493	15.0
	Level 4 kurtosis,h	0.029850746268656716	0.7284625403297388	29.0
	Level 4 kurtosis,v	0.020895522388059702	0.7394641522571612	30.0
	Level 4 kurtosis,d	0.045902817167408176	0.708649070741342	31.0
Bior 6.8	Level 5 kurtosis,h	0.03396251865994548	0.723633318041879	45.0
	Level 5 kurtosis,v	0.03396251865994548	0.723633318041879	46.0
	Level 6 kurtosis,v	0.06122320896814013	0.6900103560916733	62.0
	Level 7 mean,a	0.04105936567809992	0.7150491456827223	68.0
	Level 8 mean,a	0.029850746268656716	0.7284625403297388	84.0
	Level 8 std,a	0.048887891794273844	0.7056639961144763	88.0
Fourier	std	0.005970149253731343	0.7574412275035576	98.0

| | kurtosis | 0.0 | 0.764504118933247 | 99.0 |
| | skewness | 0.011940298507462687 | 0.7503048252857403 | 100.0 |

Table 3.3 Final results of bior 6.8 and Fourier features

From the three features tables, it can be seen that standard diversion, kurtosis and skewness from Fourier features were selected all the time, and their information gains were among the best of candidates. In regard to three different wavelets, the average of bior features' information gain is larger than db2 features, and db4 features' information gain is the lowest among the three. As for the four statistic features, kurtosis and skewness work the best, mean and standard diversion just appear in the higher level decomposition of db2 and bior wavelet.

Image classification results and discussion

Three classifiers, including Linear Discriminant Analysis (LDA), Back-propagation Network, and Naive Bayes Classifier were tested in this program. First, they were tested in the original 670 mammograms.

There could be four outcomes for a classifier in judging a sample. We named the four results in confusion matrix as true positive (TP), true negative (TN), true positive (TP), false negative (FN). "TP" means a positive instance is classified correctly as positive; "FN" refers to the positive instance wrongly classified as negative. Similarly, "TN" implies a negative instance is correctly classified as negative; otherwise it is "FP". According to these four significant figures, sensitivity ,specificity and accuracy can be calculated as the following formula:

Classification accuracy is: $acc = \frac{TP+TN}{TP+TN+FP+FT}$

Sensitivity (SN): $SN = \frac{TP}{TP+FN}$

Specificity (SP): $SP = \frac{TN}{TN+FP}$

Then, all results were shown as table 3.4.

Db4 and Fourier Features	Classifier	TP	FP	FN	TN	Sensitivity	Specificity	Accuracy
	LDA	121	49	400	100	23.3%	67.1%	33.0%
	BP	460	48	61	101	88.3%	67.8%	83.7%
	NB	495	99	26	50	95%	33.6%	81.3%

(a)

Db2 and Fourier Features	Classifier	TP	FP	FN	TN	Sensitivity	Specificity	Accuracy
	LDA	176	23	345	126	33.8 %	84.6%	63.9 %
	BP	481	29	40	120	92.3%	80.5%	89.7%
	NB	502	79	19	70	74.9%	47.0%	85.4%

(b)

Bior and Fourier Features	Classifier	TP	FP	FN	TN	Sensitivity	Specificity	Accuracy
	LDA	301	19	220	130	57.8%	87.2%	64.3%
	BP	500	21	21	128	95.9%	85.9%	93.7%
	NB	510	68	11	81	97.8%	54.4%	88.2%

(c)

Table 3.4 Sensitivity and specificity results for three classifiers

Three classifiers were further tested in 817 true positive mammograms which were achieved from the clinic. When using db4 and Fourier features, LDA classifier gave the result that 282 normals out of all true positive mammograms, BP classified 470 normal mammograms, and NB showed 495 normals. The sensitivity for these three classifiers in regard to the new true positive database is 34.5%, 57.5%, 60.6%, respectively. The sensitivity for three different features was listed in table 3.5:

sensitivity	Db4	Db2	bior
LDA	34.5%	37.8%	45.2%
BP	57.5%	62.4%	70.4%
NB	60.6%	65.6%	70.5%

Table 3.5 Sensitivity for different classifiers regarding to different features

From the results shown as above, it can be seen that LDA classifier is more sensitivity to classify cancer, and NB gives better classification in normal mammograms. BP neural network works well in both categories. In testing the new false positive database, NB classifier has better performance, LDA works the worst. Bior features gain the highest rate, followed by db2 features. The reasons may be: 1) The false positive database contains normal mammograms actually, and NB classifier is more sensitive to classify normal ones; 2) According to the information gain after feature selection part, it can be seen bior has the highest information gain, db2 is in the second place.

Conclusions and Future directions
Conclusions

In this classification regime, we will experiment on three different classifiers using three different combinations of features. The primary objective of this research is to design a tool that combine two kinds of wavelet transform together in selecting optimal features and improve the final specificity rate. Specific research objectives are basic reached:
1. Develop a set of pre-processing steps to isolate the tissue in the images and regularize the appearance of the images to make direct comparisons possible.
This objective is successfully achieved, all mammograms are regularized and contain no artefacts after a set of propocessing steps.
2. Apply the wavelet transform and Fourier transform to parse an image and generate a set of scalar features based on the output of the transform to characterize each image.
This objective is done with some novel findings. 103 features go through a feature selection system and then around 15 features are left depending on different wavelets. After testing, their information gains are all beyond 0.65, and the highest reaches 0.76.
3. Classify the images as normal or suspicious and give the sensitivity, specificity, and accuracy of the result.
All mammograms, normal and malignant, are tested in LDA, BP, and NB classifiers. According to the results, the sensitivity and specificity can be easily calculated. It is found that LDA classifier works better to classify malignant mammogram, NB classifier achieves better performance in normal mammograms, while BP works the same in both categories.

Future direction

1. Fourier features can always give high information gain, but wavelet features are as appropriate. In the future work, more different wavelet features can be tested to see if they have better performance.
 2. For unknown database, only true positive ones have been tested. In latter work, the being tested database can contain false negative or other mammograms.
 3. The ability of classification for each classifier needs to be tested and confirmed further. If they are confirmed that some classifiers have better classification performance in specific mammogram category than all others, they can be installed in a classification system to classify that category.

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PHARMACEUTICAL CARE IN COMMUNITY PHARMACY IN THE REPUBLIC OF MACEDONIA. A COMPARED STUDY WITH EU COUNTRIES

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Abstract

In recent years in the Republic of Macedonia, the pharmaceutical legislation has undergone permanent modifications in terms of the unification with the European legislation. In essence, the establishment of certain new criteria and the amendment of the whole set of standards uniform in the EU, will undoubtedly help in increasing the quality of pharmaceutical services and will guarantee the patients' health. The Republic of Macedonia has a social healthcare system. Pharmacies are in private ownership but healthcare authorities regulate the prices of medications and the number of pharmacies across the whole territory. Many of these pharmacies have concluded regular collaboration contracts with the Health Insurance Fund of the Republic of Macedonia. The services provided by these pharmacies consist mainly in the distribution of prescribed medications and OTC preparations, nutrition products, medication usage recommendations, effects and anti-effects, etc. This paper aims at reviewing the existing legislation, the reforms carried out in time, the existing status of the pharmaceutical community in Macedonia, while comparing it with some of the countries of the EU. Special emphasis will be put on reviewing the possibilities for better inclusion of pharmacists in the healthcare system so that they can become participants in the healthcare provision teams as well as get included in the activities for the prevention of different diseases. In this respect, lots of research in international literature, including scientific articles, presentations, technical reports, and other studies has been carried out in order to present the experiences from the EU member states.

Keywords: Legislation, pharmaceutical, pharmaceutical care, pharmaceutical services

Introduction

Changes in the nation's health care system, especially the growth of managed care and integrated health systems, are stimulating adoption of primary care as a way of meeting basic health care needs and managing access to specially services. Integrated health systems are organized to deliver acute, intermediate, long-term, home, and ambulatory care. They are intended to seamlessly provide care across practice settings through appropriate use of individual health professionals and team (Am.J.Health-Syst Pharm. 1996).

Pharmacy has matured as a clinical profession and is presently well positioned to transform itself from product and ask oriented (dispensing) to a patient oriented profession (provision of care, advice and counseling) (Adepu R. et al, 2006). One of the key factors of the improvement of healthcare services are the pharmacists. Their role is crucial since the profession of a pharmacist in itself means having to deal with patients with different needs on

daily basis, who quite often require more qualitative healthcare services and treatment.

Pharmaceutical care is a practice philosophy for pharmacy. It is the way of pharmacists to coach the individual patients with their medication. The concept deals with the way a patient should receive and use medication and should receive education on the use of medicines. The concept also deals with responsibilities, medication surveillance, counseling and the evaluation of all the outcomes of care (Foppe van Mil JW et al.2004). In many developed countries of the EU such as Germany, Austria, Denmark, Portugal, and United Kingdom, community pharmacists are involved in many dimensions in healthcare. Pharmacists in these countries also participate in disease management. On the contrary, in the

Republic of Macedonia, even though the concept on the pharmaceutical care is one of the most important items within the framework of great changes that have been made in the pharmaceutical sector, the services provided by community pharmacists usually consist of medicine dispensing and limited medication advice.

Materials and Methods

There has been a lot of research carried out based on international literature such as scientific articles, abstracts, presentations, technical reports and other studies that deal with the issue of inclusion of pharmacists in the healthcare systems. The guidelines of Good Pharmacy Practice (GPP) have also been used. At the center of attention there have been articles which deal with pharmaceutical services provided by the pharmaceutical community in some of the EU countries, which were selected as points of reference. The comparison was made based on the existing situation of the pharmaceutical community in Macedonia. Based on the analyzed data, recent changes within the framework of numerous reforms in the pharmaceutical sector I particular and the healthcare system in general, were selected. The data related to the number of pharmacies per capita and the services provided by pharmacies have been given in charts using MS Excel 2007. Comparative data from some EU countries have also been presented in graphs.

Results
Historical reforms in the pharmaceutical sector in Macedonia

Since 1991 the pharmaceutical sector in Macedonia has undergone drastic and permanent changes due to the fact that all healthcare institutions including pharmacies experienced a transition from the public to the private system. The pharmaceutical community increased permanently. With the establishment of private pharmacies, there was a need for change in the legislation. In the coming years, within the numerous reforms the establishment of a National Drug Information Centre in 1998 happened. In addition, a National Centre for Pharmacovigilance was established in 1991. In 1997, it was networked with the WHO Center Drug Adverse Effects as accompany member, while full membership was obtained in 2000 (Petrushevska-Tozi L. et al, 2012). The reforms at a broader level in the healthcare system would include the implementation of new norms of Good Pharmacy Practice (GPP) in 2009.

The GPP guidelines define four core activities of pharmacists: 1) public health function related to health promotion and disease prevention 2) supply of medicines and medical products of good quality as well as provision of relevant patient instructions and advice on medicine use 3) self-medication activities and related patient advice and 4) pharmacist contribution to rational prescribing and appropriate use of medicines (Official Gazette of RoM, No.44, 2009). This would create the possibility for improving quality of pharmaceutical services and the inclusion of pharmacists in many roles in terms of healthcare and it would also ensure them the deserved place in the overall community of healthcare providers and workers. The great enthusiasm that emerged within the pharmaceutical community was soon put out since other problems started to appear and they were most often

related to the economic aspect as well as the lack of coordination with the existing legislation, which does not support the concepts of pharmaceutical practice and care .

The current status of the pharmaceutical community and future challenges

There are 740 pharmacies that are currently active in Macedonia, along with another 44 installed within the secondary and tertiary level healthcare institutions (Official Gazette of RoM, No. 81, 2012). In total, the proportion of pharmaceutical communities and the population is 1:2500. In the presented graphs below, we can see the great differences when compared to some EU countries such as Germany, Austria, Denmark, United Kingdom, Portugal, Finland, Netherlands, etc. This is because in these countries there is another mode of organization of the pharmaceutical community. In some countries pharmacies are large and they offer services for a great community and in some other countries there are more small pharmacies that provide services to a certain number of inhabitants. The Scandinavian type of pharmacy has relatively large pharmacies, serving 10.000-18.000 people. Southern Europe, France and Belgium have very small pharmacies that serve approximately 2000-2500 clients.

In the UK and Ireland are Anglo-Saxon type pharmacies which sell many non-medical items in addition to medicines and which serve approximately 3500 people. Lastly, there are pharmacies in Central and Eastern Europe (Germany, Switzerland, Austria), which focus on all kinds of healthcare amenities and serve 3000-5000 people (J.W.Foppe et al. 2006)

Fig. 1 Number of population pharmacy and community pharmacy in some EU countries
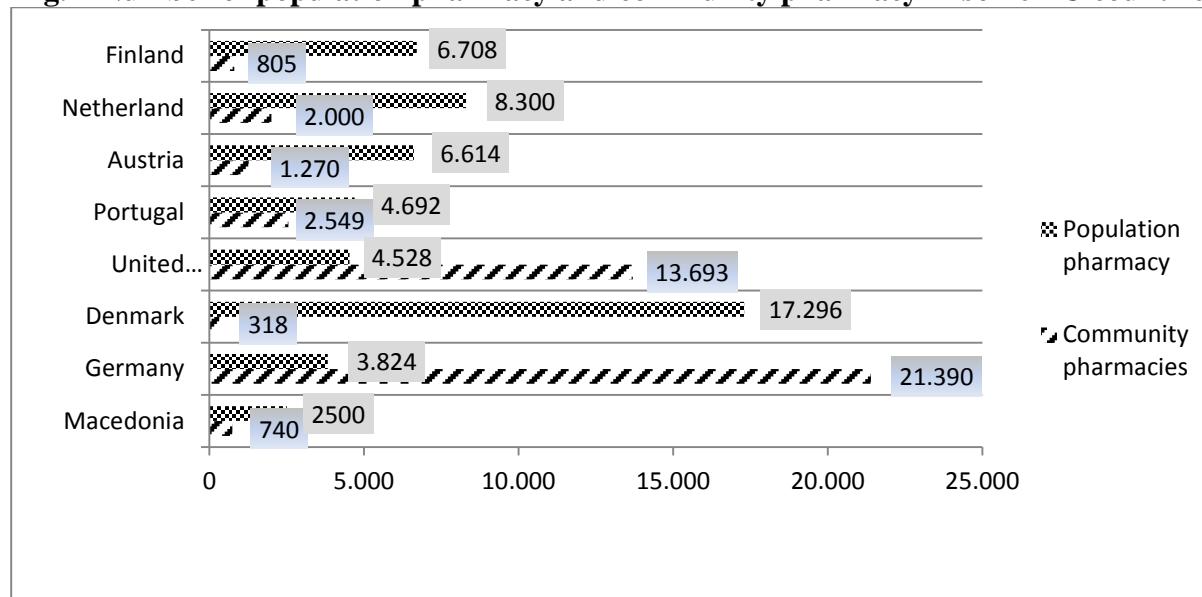
Source: Atkinson J, Rombaut B. The 2011 PHARMINE report on pharmacy and pharmacy education in the European Union. Pharmacy Practice (Internet) 2011 Oct-Dec;9(4):169-187.

What should be pointed out is the fact that these pharmacies have been distributed irrationally. A greater concentration of pharmacies can be noticed in main centers and towns, whereupon in some cases their number exceeds the maximal necessary amount. On the other hand, in some rural areas there may be cases where there are no pharmacies at all, which is a big hassle to the population residing in these areas. Since all pharmacies are private in terms of primary healthcare, there are no mechanisms to facilitate the establishment of new pharmacies in these areas, since the owners are led by their economic interests (Farmac. Informator, 2010).

Tab 1. Network of community pharmacies per regions in Republic of Macedonia

Region location of community pharmacy	Actual number*	Maximum number**	Citizens (total)
Macedonia	740	617	1850190
Pelagonia	107	77	234137
Vardar	54	43	133106
North-East	57	58	175045
South-West	70	74	221855
Skopje	233	207	619718
South-East	76	59	172858
Polog	76	106	314804
East	67	67	200522
Source: Regulation for Network of Health Institutions (Official Gazette of RM, No. 81/12)			

In general they are small pharmacies in which higher school graduate pharmacists work (at least one pharmacist per shift who as to be on site all the time) and a technician who have usually graduated from professional medical/pharmaceutical high schools (Official Gazette of RoM, No.11, 2012). Services offered by pharmacists in these pharmacies are still limited to medication delivery, information of patients about the effects of drugs, etc. This situation changes a lot in developed countries of the EU where the role of pharmacists is multidimensional and the services offered by the pharmaceutical community encompass a broader array.

Based on the experience form some of the developed countries, the role of pharmacists according to the Standards for Quality Pharmacy Services (GPP) is as follows: "Pharmacists should engage in preventive care activities that promote public health and prevent disease, i.e. in areas such as smoking cessation, infectious and sexually transmitted diseases; pharmacists should also provide point-of-care testing, where applicable, and other health screening activities for patients at higher risk of disease" (WHO Technical Report Series, 2011). There have been many attempts by the Macedonian Pharmacist Association for better inclusion of pharmacists in the healthcare sector but they have all resulted in failure. Such attempts have never been supported by the Ministry of Health and as such they remain a challenge for the future.

A review of pharmaceutical care in some European countries

In different European countries, one can notice a difference between the modes of organization of the pharmaceutical community since in line with their regulations and legislation, as well as the healthcare system, these countries have guided and developed the pharmaceutical practice in different directions.

In the UK, National Health Service (NHS) pharmaceutical services are delivered under contract by privately owned community pharmacies. Community pharmacies in UK have a crucial role in primary care and public health; there are also several examples of community pharmacy involvement in chronic disease management. In the North-East Primary Care Trust Hospital, patient hospital discharge information concerning high-risk patients is faxed to community pharmacists. The pharmacist visits the person at home for medication review, liaises with the GP practice, produces a care plan and continues to monitor progress/control (Noyce PR, 2007).

In Germany, cognitive pharmaceutical services are being implemented and the role of pharmacists only supplying medicines is changing. In 2003 the way towards cognitive

pharmaceutical services started with family pharmacy contracts between community pharmacists representatives and the largest sickness fund that include remuneration of pharmacists when providing pharmaceutical care. These contracts were extended in 2004 and since then general practitioners have been integrated. Most of the community pharmacies in Germany are part of this initiative (Eickoff C.et al, 2006).

In Portugal, there are 2,549 pharmacies, a coverage ratio of 4,692 inhabitants per pharmacy. The community pharmacist in Portugal makes an active contribution to the adoption of healthy habits and the prevention of illness, making the pharmacy a place of health care that plays an increasingly active role in the rational use of medicines and in promoting the well-being of the population. Indeed, the pharmacist plays a most active role in promoting the rational use of medicines, in pharmaco-surveillance, in health education, in detecting certain disease, in fight against AIDS, and in providing information both to doctors and to patients

Given the degree of confidence and credibility which the pharmacists inspires among the population, and the ease of dialogue between pharmacist and patient, several education campaigns have been successfully promoted, aimed at health care and at the prevention and detection of disease (Ilvana .S, 2001).

Denmark has 322 pharmacies, corresponding to one pharmacy per 16,700 inhabitants. All pharmacies provide prescription and over-the-counter products, advice about medicine use, dose dispensing, generic substitutions, and administration of individual reimbursement registers. Except for very simple processes, compounding is centralized at three pharmacies. Many pharmacies offer measurement of blood glucose, blood pressure, and cholesterol, and 60% offer inhalation counseling, a reimbursed service (Hanne H. et al, 2007).

In the Netherlands, where pharmacies are relatively big and 95% of patients always visit the same pharmacy, medication surveillance (automated drug use review or DUR) developed as early as the 1980s, and pharmacists and general practitioners (GPs) in the region discuss pharmacotherapy almost monthly (de Smet PAGM, 1992). Pharmaceutical care standards were first established in 1996, and the scientific institute of the professional pharmacist organization (WINAP) chose pharmaceutical care as its focus for further professional development around 1997 (Boysen M, 2004). In general, the comprehensive pharmaceutical care model is followed, although a number of disease-oriented projects addressing asthma and diabetes have also been implemented (Blom LTG et al. 1999)

Finland had 799 community pharmacies as of 2005. Medication counseling has been mandated by law since 1983 and only pharmacists are permitted to provide therapeutic advice in pharmacies. Since the late 1990s, Finish pharmacies have actively participated in national public health programs, initially in the areas of asthma and diabetes, and more recently in the treatment and prevention of heart disease (Bell JS et al. 2007).

Conclusion

Numerous studies that have been carried out in recent years in almost all European countries speak about different forms of inclusion of pharmacists in the healthcare system. In many of these countries, the implementation of GPP norms and the inclusion of pharmacists with a multidimensional role is giving promising results both in the treatment and prevention of many illnesses. Pharmacists represent a very important part in the healthcare system since they are the ones to detect, prevent or correct the problems that their patients face. In Macedonia there is sufficient potential and workforce and readiness by pharmacists to undertake new roles in the healthcare system as a whole. The experiences from the countries included in this study should serve as a motivation for the Ministry of Health to start thinking about including pharmacists in the adopted health care programs. In addition, the correctness in relations between physicians and pharmacists remains as one of the challenges to be dealt

with in the future, since its final resolution would actually mean better healthcare services for the patients.

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ANALYSIS OF SURGICAL TREATMENT OF VENTRAL HERNIA FOR PATIENTS WITH OBESITY

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Abstract

The 65 patients with ventral hernia suffering obesity were examined. As a result of research the used methods of hernioplasty and complications in the early postoperative period were determined. The further results of surgical treatment were observed. The obtained data prove that application of non-tension methods of hernioplasty reduces the percent of complications and recurrences of hernia.

Keywords: Ventral hernia, alloplastica

Relevance

In our time the obesity is widespread problem and it has a tendency to increase. [1, 2]. Obesity is not only primary cause of such serious therapeutic diseases, as arterial hypertension, ischemic heart disease, diabetes mellitus of II type, hormonal disorders, which considerably increase the risk of premature death [3,4,5,6], but also it contributes to the appearance of ventral hernia, both as primary as after different interventions on the organs of abdominal cavity[7,8,9]. As a rule, such contingent of patients presents certain complication for surgeons due to serious concomitant diseases, probable forthcoming technical difficulties during the operation, and high risk of development of complications in postoperative period.The problem of choice of rational method in surgical treatment of hernia of anterior abdominal wall is always actual, because development and application of more than 400 operative methods do not exclude the recurrence of hernia and postoperative complications [10,11,12,13]. In spite of introduction of new surgical technologies in clinical practice frequency of recurrences at use of autoplastic methods in treatment of postoperative ventral hernia exceeds 25% [14,15]. The quantity of recurrences is more considerable at extensive and giant hernia of anterior abdominal wall [16,17,18]. It is equal to64%. The most effective methods are with use of non-tension technologies of closure of hernia' gate that decrease the recurrence of disease considerably. The introduction of polypropylene reticular endoprosthesis to the clinical practice promotes wide application of these operations. Last years the modern chemical industry produces synthetic prosthesis that possess large durability and biological inertness.

The present existing variety of surgical schools, methodologies of hernioplasty and increase of quantity of patients with obesity demand the necessity of systematization and correct assessment of available knowledge on this issue. It is necessary to reveal the features of surgical treatment of hernia for these patients, to develop optimal non-relapsed surgical method, to determine possible complications in a postoperative period, to work out preventive measures for them, providing success of operation, and strengthening the belief of patient in recovery and in possibility to improve quality of life. So, we conducted the analysis of operative treatment of patients with ventral hernia suffering from obesity.

Material and methods

In the surgical department of Regional Hospital the name of G.Sultanov Pavlodar during one year there was 65 patients with postoperative ventral hernia suffering obesity of different degree. For making a diagnosis we used the classification of ventral hernia (VH) of Chevrel - Rath (SWR - classification) (Chevrel J. and Rath A., 1999). It is based on determination of three basic parameters of hernia : anatomic localization on abdominal wall – middle (M) : M1 – supra umbilical, M2 - paraumbilical, M3 -sub umbilical, M4 - in the area of xiphoid process or bosom; lateral (L) : L1 - subcostal, L2 - transversal, L3 - iliac, L4 - lumbar; width of hernia gate (W) : W1 is till 5 cm (hernia of small sizes), W2 is 5-10 cm (hernia of middle sizes), W3 is 10-15 cm (hernia of large sizes), W4 is more than 15 cm (giant hernia); presence and quantity of hernia relapses after repair (R) : R0, R1, R2, R3 etc. Dimensions of hernia gate (HG) in patients with reducible hernia were defined clinically, with irreducible hernia - on ultrasound investigation, the final size of GW was installed in surgery. All the patients were determined on the presence of obesity due to body mass index (BMI), according to the WHO recommendations (Adolphe Quetelet, 1869) The International Classification of adult underweight, overweight and obesity according to BMI) and other comorbidities .

Method of treatment

The patients were performed herniotomy on traditional way, and closure of hernia gate was conducted by one of two methods: autoplasty or alloplasty with reticular endoprosthesis. Depending on the state of hernia gate there is an alloplasty with reticular endoprosthesis by one of three variants: "Onlay" method, when the hernia gate is closed the edge to the edge, and the net is sew above it on 2-3 cm for the line of sutures on aponeurosis. The "Inlay" plasty (method of patch), at that joining of edges of hernia gate was not conducted, and the last was closed from above by the net going on 2-3 cm from the edges of defect. The net was also fixated to aponeurosis by interrupted suture. The "Sublay" method includes subgaleal location of explant with the subsequent joining of hernial gate by edge to edge on it. Subgaleal plasty prevents contact between the net and intestinal loops. In the basis of autoplastic closure of hernia gate there is a formation of longitudinal or transversal musculo-aponeurotic dublication. After discharge, the survey was conducted after 1, 6, 12 months.

Research methods

We used clinical methods, hardware and tool methods, sociological methods and statistical methods.

Results of the study

Among 65 patients with postoperative ventral hernias suffering obesity were hospitalized - 39 (60 %) patients routinely, by urgency - 26 (40 %) patients. Age of patients ranged from 29 to 79 years, the average age was $56,06 \pm 3,4$ years . There were operated: 11 men(17 %) patients, 54 women (83%). Duration of illness at patients ranged from 3 months to 10 years. 41 (63%) patients had concomitant diseases: of cardiovascular system - in 28 (43 %) patients, chronic obstructive pulmonary disease in 5 (7,6%) patients, a disease of the gastrointestinal tract in 3 (4,6 %) patients , diabetes mellitus was in 5 (7,6 %) patients.

According to the classification, the median hernias (M) were observed in 51 (78,4 %) patients: M1 - in 8 (15,6 %) patients , M2 - in 30 (58,8 %) patients , M3 – in 14 (27,4) patients, M4 - in 8 (15,6 %) patients , lateral (L) - 14 (21,5%) patients. The width of hernial gate was in borders at W1- 8 (12,3%) patients, W2 - in 36 (55,3 %) patients , W3- 13 (20 %) patients , W4 - in 7 (10,7%) patients. Recurrent hernias were observed: R0 - 56 (86,1 %) patients , R1 - 4 (6,1%) patients, R2 - 3 (4,6 %) patients , R3 in 2 (3,07 %) patients.

According to the BMI indexes the patients were divided on the degree of obesity into 4 groups: I degree of obesity found in 14 (21,5%) patients, II degree of obesity in 34 (52,3 %) patients, III degree of obesity in 14 (21,5 %) patients, IV degree of obesity 3 (4,6%).

In 52% (34 persons) of cases the alloplasty of hernial gate using polypropylene reticular prosthesis was performed, and in 48% (31 persons) cases the autoplasty was made. In alloplasty 18 (27,7 %) patients were operated by the «Onlay» method, 6 (9,2%) patients by «Inlay» way,10 (15,4%) patients were used «Sublay». Distribution of the performed operations is represented in Table 1.

Table 1. Distribution of conducted operations in groups

№	Obesity n=65	Types of plasty							
		Autoplasty n=31		Alloplasty n=34					
				«Onlay»		«Inlay»		«Sublay»	
		n	%	n	%	n	%	n	%
1	I degree n=14	12	18,5	2	3,1	-	-	-	-
2	II degree n=34	12	18,5	14	21,5	-	-	8	12,3
3	III degree n=14	7	10,8	-	-	3	4,6	4	6,2
4	IV degree n=3	-	-	-	-	3	4,6	-	-
	Total:	31	48	16	24,6	6	9,2	12	18,5

The data presented in Table 1 shows, that patients with ventral hernias and obesity I degree were mainly performed autoplasty of hernial gate (85,7% cases from I degree obese patients), obese patients II degree - alloplasty with net endoprosthesis (64,7% cases from II degree obese patients), in patients with III degree of obesity- 50% of cases (from obese patients of III degree.) was carried out as autoplasty as alloplasty, and to patients with obesity of IV degree in 100% of cases the alloplasty of hernial gate was made.

After surgery, complications were observed in 16,9% of cases, of which 8 (12,3%) patients after hernial autoplasty (suppuration of surgical wounds in 3 patients, postoperative scar infiltrate - 5 patients) and in 3 (4,6%) patients after alloplasty net endoprosthesis (development of seroma). Data are presented in Table 2.

Table 2. Distribution of early postoperative complications after operations

№	Obesity n=65	Types of plasty							
		Autoplasty n=31		Alloplasty n=34					
				«Onlay»		«Inlay»		«Sublay»	
		n	%	n	%	n	%	n	%
1	I degree n=14	2	3,08	-	-	-	-	-	-
2	II degree n=34	2	3,08	-	-	-	-	-	-
3	III degree n=14	4	6,15	-	-	-	-	-	-
4	IV degree n=3	-	-	-	-	3	4,6	-	-
	Total:	8	12,3	-	-	3	4,6	-	-

From Table 2, we can see, that the largest number of complications observed in patients with third and fourth degree of obesity.

In the study of long-term results after conducted operations a recurrence was observed in 3,1% (2 persons) cases after autoplasty and 1,5% (1 person) after alloplasty cases (Table 3).

Table 3. Frequency of relapse after autoplasty and usage of net for hernia of anterior abdominal wall

| Period | Types of plastics | | | |
| | Autoplasty n=31 | | Alloplasty n=34 | |
	n	%	n	%
1 month	-	-	-	-
6 months	-	-	1	1,5
12 months	2	3,1	-	-

In assigning the groups found that recurrent hernias were observed in patients with obesity-second (1 person) and third degree (1 person) after autoplastic operations. After alloplasty by «Inlay» method one case of recurrence in patients with fourth degree obesity was observed (Table 4).

Table 4. Distribution of hernia recurrences after surgery

№	Obesity n=65	Types of plastics							
		Autoplasty n=31		Alloplasty n=34					
				«Onlay»		«Inlay»		«Sublay»	
		n	%	n	%	n	%	n	%
1	I degree n=14			-	-	-	-	-	-
2	II degree n=34	1	1,5	-	-	-	-	-	-
3	III degree n=14	1	1,5	-	-	-	-	-	-
4	IV degree n=3			-	-	1	1,5	-	-
	Total:	2	3	-	-	1	1,5	-	-

Discussion of results

The study found that most complications were observed in postoperative period in the patients with ventral hernias after autoplasty. Development of purulent wound complications at the use of tension technology we associate with impaired microcirculation, and the presence of obesity exacerbate these disorders in the tissues. The use of polypropylene nets at patients with ventral hernias suffering obesity defined that the application of explants allows tj sew tissues without significant tension, that prevents the violations in microcirculation, providing optimal conditions for the wound healing. The only disadvantage of implants usage is slowly liquidating seroma. At the present time the alloplasty should be regarded as an operation of choice in the treatment of postoperative ventral hernias. In patients with large and giant hernias closure of hernial defect is possible only when you commit explant «Onlay» or «Inlay» + «Onlay», whereby additional pockets are formed , which leads to the formation of hematomas, lymphorrhagia[14 20].

Conclusion

Thus, the introduction in practice of new technologies and materials significantly reduced the number of relapses and complications of abdominal wall plastics in patients with ventral hernias, obese. Decision of this problem is especially important for general surgical hospital district hospitals, which are the main element in the provision of surgical care to patients with hernias of the abdominal wall, and allow making a differential selection of hernioplasty method.

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MID-TERM RESULTS OF THE ON-PUMP VS OFF-PUMP CORONARY ARTERY BYPASS GRAFTING SURGERY

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Abstract

Objective. To evaluate the fate of ON-pump vs. OP-CABG surgery at mid-term follow-up.

Methods. Data from 166 consecutive OP-CABG patients compared with those of 203 ON-pump CABG patients operated on the same time of OP-CABG operations were retrospectively analyzed.

Results. As compared to OP-CABG, in the ON-pump CABG patients mean value of Logistic EuroSCORE (8.1%±7.8% vs. 6.2%±5.9%; P<0.05), more extended coronary disease (2.7±0.5 vs. 2.5±0.7 diseased vessels/patient; P<0.001) consequently requiring a greater number of grafts/patient (2.9±0.9 vs. 2.3±0.9; P<0.0001), and emergency surgery (12% vs. 6%; P<0.05) were more frequently observed. Operative mortality was 1.9% in ON-pump CABG vs. 1.2% in OP-CABG (P=NS), incidence of stroke 2.4% vs. 1.8% (P=NS). Incidence of stroke by using OP-CABG PAS-Port system technique was reduced at 1.2%.

Intraoperatively, costs per patient were higher for OP-CABG vs. ON-pump CABG (1.930,00 €+ 1.050,00 €, if PAS-Port system was included, vs. 1.060,00 € for ON-pump surgery). ICU stay (1.9±1.0 vs. 1.4±0.7 days) and total postoperative in-hospital stay (5.3±3.3 vs. 5.5±3.5 days) were similar in both groups (P≥0.1, for both comparisons).

At 4 years, survival (91%±13% in the ON-pump CABG vs. 84%±19% in the OP-CABG) and freedom from MACE (composite end-point of all-cause death, myocardial infarction, repeat coronary revascularization of the target lesion) (82%±9% vs. 76%±14%) were not significantly different (P≥0.1, for both comparisons). Freedom from late cardiac death was slightly significant higher after ON-pump CABG (98%±4% vs. 90%±10%; P=0.05).

Conclusions. Mid-term freedom from composite end-points are substantially similar after ON-pump CABG and OP-CABG. OP-CABG techniques required higher intra-operative costs. Freedom from cardiac death appears to be better after ON-pump CABG.

Keywords: CABG, coronary revascularization, OPCAB

Introduction

Coronary artery bypass surgery (CABG) improves ischemic symptoms and prognosis in patients with coronary artery disease. For more then three decades, surgical coronary revascularization has been primarily performed with the use of cardiopulmonary bypass (ON-pump CABG) with cardioplegic arrest, and is considered the standard for surgical coronary revascularization in patients affected by multivessel coronary artery disease, providing a motionless, bloodless field for an optimal construction of the distal coronary anastomoses.

However in the last years, off-pump (OP-CABG) coronary artery bypass grafting has gained increased interest of cardiac surgeons, in order to reduce post-operative complications associated with the use of CPB and to avoid any potential detrimental effects of cardiopulmonary bypass, especially the inflammation response, adverse neurological outcome, and the multi-system organ failure that may occur.[1,2] Advances in surgical techniques, myocardial protection, perioperative anaesthesiology management have led to improved outcomes of ON-pump CABG, as well as the development of modern stabilizers has made the OP-CABG more technically feasible and safe. Therefore, a greater number of patients affected by several co-morbid diseases undergo CABG with low in-hospital mortality rate.[3,4] Several studies have compared ON-pump CABG with OP-CABG with respect to short-term mortality, complications, costs, and short-term follow-up. Generally, majority of the studies found no substantial differences for both types of revascularization .[5-7] However, other studies evidenced lower graft patency rates for OP-CABG, higher rates of cardiac events and need of revascularization following OP-CABG. [8-9]

In fact, OP-CABG, is a difficult surgical procedure, and operating with a beating heart would lead to a less complete and a less effective revascularization and, consequently, to a worse follow-up outcome.[10-11] These are the reasons, that the enthusiasm for off-pump surgery decreased rapidly, and the proportion of OP-CABG procedures remains at 20-25% of the total CABG surgery performed in Europe and USA.

Aim of our study was to retrospectively analyzed a single-center experience obtained by two strategies of revascularization in terms of clinical results, efficacy, impact on intraoperative costs, and in particular in terms of early neurological outcome. Survival, freedom from cardiac death, MACE were also investigated up to 4 years of follow-up.

Main Text
Methods
From January 2008 to December 2010, 369 patients affected by multivessel coronary artery disease underwent surgical myocardial revascularization in our Division, 166 using OP-CABG techniques and 203 with the aid of cardiopulmonary bypass.
The study was approved by our local Institutional Review Board, which waived the need for patient consent.

Chronic renal dysfunction, was present in 67 (18%); chronic obstructive pulmonary disease was present in 82 (22%). Emergency CABG, namely, ought to be performed before the beginning of the next working day after coronary angiography, was needed in 34 patients (9%). Patients requiring coronary surgery reoperation or concomitant procedures (valvular or ablation surgery, replacement of ascending aorta, ventricular resection) were excluded from the study.
Criteria to choose OP-CABG
Most of OP-CABG procedures (90%) were performed by one expert surgeon (CB) in beating heart surgery. Exclusion criteria to perform OP-CABG were: left ventricular ejection fraction less than 0.30, left ventricular end-diastolic diameter greater than 60 mm, distal diffuse narrowing of coronary arteries, intra-myocardial course of the left descending coronary artery, emergency or urgency surgery in presence of perioperative hemodynamic instability.
Surgical strategy and safety measures
Access to the heart was obtained through a complete median longitudinal sternotomy in all patients.
ON-pump CABG was performed by means of normothermic cardiopulmonary bypass and intermittent antegrade blood cardioplegia (600 ml the first dose, 400 ml the others administered every 20-25 minutes). Cardiopulmonary bypass was performed by means of a

Sorin Monolyth-Pro (Sorin Biomedica; Turin, Italy) or Capiox (Terumo Cardiovascular System; Borken, Germany) membrane oxygenator and a Stockert roller pump (Stockert Instrumente; Munich, Germany).

In OP-CABG patients, left anterior descending artery and its diagonal branches were bypassed as first vessel, followed by the right coronary artery and finally the left circumflex artery system. Proximal anastomoses of the saphenous grafts were always performed before distal ones, either handsewn or with the aid of an automated device that avoided aortic clamping (PAS-Port; Cardica; PAS-Port® Proximal Anastomosis System, USA) (n=84, 51% of OP-CABG procedures).

Stabilization was obtained with the aid of suction stabilizers (Octopus and Starfish; Medtronic Inc; Minneapolis, MN; USA in the early phase, and Acrobat and X-pose; Guidant Co; Boston Scientific, Boston, MS, USA later on). Distal perfusion was maintained after arteriotomy by means of intravascular shunts (Clearview, Medtronic Inc; Minneapolis, MN; USA).

Monitoring of cardiac function was obtained with transesophageal echocardiography and insertion of a Swan-Ganz pulmonary artery catheter. Other safety measures included perfusionist's stand-by on a ready-dry state (mounted, non-primed cardiopulmonary bypass circuit).

Internal thoracic artery as in situ graft, was the conduit of choice for the left anterior descending artery revascularization in all cases. In the last 2 years of the reported study (2009-2010), OP-CABG was routinely performed using PAS-port system.

Data collection

Perioperative myocardial infarction was defined as an increase of post-operative troponine I higher than 5 ng/ml associated with a CK-MB above normal values and more than 10% of total CK, and the onset of ECG new anomalies. Major non-cardiac complications were also analyzed: a pulmonary complication was defined as an episode of primary lung failure requiring mechanical ventilation for more than 48 hours, re-intubation, or intermittent application of positive end-expiratory pressure by mask; a neurological complication was defined as an episode of stroke due to a focal or general cerebral lesion; renal insufficiency was defined as a two-fold increase of preoperative serum creatinine level or oliguria necessitating continuous veno-venous hemodiafiltration. Operative mortality included death in hospital after operation at anytime or within 30 days after discharge. MACE (Major Adverse Cardiac Events) was defined as composite of all-cause death, documented myocardial infarction, or repeat coronary revascularization of the target lesion).

The mean duration of follow-up was similar in the ON-pump CABG vs. OP-CABG (35±13 vs. 34±15 months, p=NS). Four patients were lost (n=3 in ON-pump CABG group, n=1 in OP-CABG group), and follow-up was 99% complete.
All causes of operative and at follow-up death, data of pre- and postoperative echocardiography exams were analyzed. Need for in-hospital readmission for cardiovascular causes and functional status of the patients were also recorded, at the outpatient clinic visit or by telephone interview. Collected data of functional tests and echocardiographic exams during the follow-up were also analysed.

Statistical analysis

Analysis was performed with Stat View 4.5 (SAS Institute Inc, Abacus Concepts, Berkeley, CA). Student's t test for continuous data and the χ^2 or Fisher's exact test for categorical data were used. Twenty-six preoperative and perioperative variables were analyzed including age, gender, Logistic EuroScore I Risk Stratification System [12] expressed and percent risk of death plus or minus 1 standard deviation, previous myocardial infarction,

smoking habit, co-morbidity (arterial hypertension, diabetes mellitus, chronic renal dysfunction, chronic obstructive pulmonary disease, hyperlipidemia, peripheral vascular disease, obesity), previous percutaneous coronary revascularization, previous cerebrovascular accidents (stroke or TIA), Canadian Cardiovascular Society (CCS) grade of angina, New York Heart Association (NYHA) functional class, preoperative left ventricular ejection fraction (LVEF), severely depressed LVEF (equal to or less than 0.35), number of diseased coronary artery vessels, need of emergency or urgent CABG, number of grafts per patient, cardiopulmonary bypass and aortic cross-clamp times, calcification of the aorta (so defined when intra-operatively detected at the inspection and/or palpation, or by transesophageal echocardiography), and "aortic clamp-less" technique. Risk factors analysis to detect independent predictor/s for postoperative stroke was performed using the Logistic Regression analysis. Overall survival (not including operative mortality), freedom from late cardiac death and from MACE were expressed as mean values plus or minus 1 standard deviation, and computed by using the Kaplan-Meier method; the log-rank test was used to compare survival estimates among subgroups, and the Cox proportional hazards methods was used to evaluate the influence of variables on time to death in the entire population of CABG patients. All other continuous values were expressed as mean plus or minus 1 standard deviation of the mean. All p values less than 0.05 were considered statistical significant.

Results

     Preoperative, angiographic, intra-operative and postoperative variables of the ON-pump CABG and OP-CABG patients are reported in Tables 1-4. Due to the exclusion criteria to perform OP-CABG, the retrospective analysis showed that in the ON-pump CABG group Logistic EuroSCORE, incidence of diabetes mellitus, hyperlipidemia, peripheral vascular disease, and the number of patients with a LVEF =/<0.35 were higher in comparison with OP-CABG group (Table 1). As well as, emergency and urgent CABG were more frequently performed in the ON-pump CABG group (Table 1) (P<0.05, for all comparisons). Number of diseased coronary vessel per patients was higher in the ON-pump CABG as compared with OP-CABG (Table 2), consequently requiring a greater number of grafts per patient (2.9±0.92 vs. 2.3±0.96) (Table 3).

     Operative mortality was 1.9% (n=4/203) for ON-pump CABG and 1.2% (n=2/166) for OP-CABG (P=NS). Postoperative complications and outcomes are reported in Table 4. In particular, incidence of postoperative stroke was 2.5% in ON-pump CABG group vs. 1.8% in OP-CABG group (Table 4). Independent predictors for postoperative stroke were the advanced age of patients (76 vs. 67 years) (P=0.005), preoperative peripheral vascular disease (P=0.01), and obesity (P<0.05). At the univariate analysis also the association of carotid artery disease and diabetes was recognized as risk factor for stroke (P<0.05). Using the aortic "clamp-less" technique (i.e. achieved either with total arterial revascularization or using PAS-port system avoiding completely aortic manipulation) the incidence of stroke was reduced from 1.8% in the entire group of patients undergone OP-CABG at 1.2% in this subgroup of OP-CABG (P=0.06, marginally significant vs. ON-pump CABG).

     Intra-operative costs per patient of OP-CABG techniques with or without use of PAS-Port System were higher in comparison with those of ON-pump CABG.

Follow-up Results

     At 4 years, survival rate was 91%±13% for ON-pump CABG vs. 84%±19% for the OP-CABG (P=NS) (Figure 1); freedom from late cardiac death was 98%±4% vs. 90%±10% (P=0.05) (Figure 2), from MACE 82%±9% vs. 76%±14% (P=NS) (Figure 3). Thirty-four out of 358 patients (9.4%) surviving at operation with completed follow-up (not including 4 patients lost) died. Causes of late death were cardiac events in 16 patients (sudden death=13, acute myocardial infarction=2, congestive heart failure=1), malignancy in 6, gastric

hemorrhage in 2, stroke in 2, renal failure in 4, septicemia in 1, and unknown in 3.
On multivariate Cox Regression analysis, independent predictors of overall late mortality were advanced age at operation ($P<0.01$), a lower mean value of preoperative LVEF ($P<0.01$), peripheral vascular disease ($P<0.01$), chronic obstructive pulmonary disease ($P=0.05$) and patients affected by postoperative major complications ($P<0.05$).
Independent predictors of late cardiac mortality remained advanced age at operation ($P<0.05$), a lower mean value of preoperative LVEF ($P<0.05$), peripheral vascular disease ($P<0.05$), and patients who experienced postoperative major complications ($P=0.05$).
Clinical and Functional Status

At 4 years, freedom from reintervention either for coronary revascularization than for graft occlusion documented by means of coronary angiography or coronary angiography 64-slice CT-scan, were 90%±7% and 90%±7% in the ON-pump CABG and 95%±2% and 93%±3% in the OP-CABG patients ($P=NS$, for both comparisons). Follow-up echocardiography obtained on 250 patients showed a preserved value of LVEF either in the ON-pump than in the OP-CABG patients 0.53±0.08 vs. 0.56±0.7 ($P=NS$). Stress tests were examined in 243 patients. CCS anginal class markedly improved from 2.9±1.2 preoperatively to 1.2±0.6 in the ON-pump CABG and from 2.9±1.1 preoperatively to 1.4±0.5 in the OP-CABG group ($P<0.0001$).

Discussion

Off-pump CABG have been increasingly used in Western world since the 1990s, when Benetti and Buffolo and their colleagues[1,2] demonstrated potential benefit associated with the avoidance of cardiopulmonary bypass.[13,14] However, the preferable technique remains unclear: the supposed superiority of OP-CABG in terms of short term results can be counterbalanced by more frequent lack of completeness revascularization and low graft patency rate, both conditioning a worse follow-up outcome.

In-hospital Results

Randomized controlled trials, observational studies and most of the meta-analyses recently published generally found no significant difference in peri-operative mortality, but did find a reduced need for blood transfusions and shorter hospital stay.[5,7] Likewise, in our study mortality and major complications rates appeared to similarly occur in ON-pump CABG and OP-CABG patients, as well as the length of intensive care unit and postoperative stay, and the incidence of postoperative atrial fibrillation, although the patients who underwent ON-pump CABG in our series had a preoperative higher EuroScore and required more frequently urgent or emergency surgery.

The incidence of re-exploration for bleeding and the need of blood transfusions were higher in the ON-pump CABG. These findings can be likely related on the one hand to a greater inflammatory response caused to the cardiopulmonary bypass, but on the other to a major rate of patients operated on emergency (12% in ON-pump patients vs. 6% in OP-CABG patients) or on urgency (48% vs. 42%). In these cases platelet anti-aggregation therapy was not always stopped and could lead to a greater peri-operative bleeding.

Relatively to the costs, the use of stabilizer devices during OP-CABG increases the expenditure in comparison with ON-pump CABG surgery (1.930,00 € vs. 1.060,00 €). Costs further increase over about one third if (+ 1.050,00 €) if PAS-Port system automated systems are used, as we found from our brief cost analysis. Such costs were partly counterbalanced by the minor requirement of blood transfusions in the OP-CABG patients, as well as by the reduced ICU stay of the OP-CABG patients, although without a statistical difference (1.4 vs. 1.9 days) (Table 4).

An important aspect to focalize the attention in our study has been the reduced

incidence of postoperative stroke when the manipulation of the aorta was avoided. Afilalo and co-authors[15] in a recent meta-analysis of randomized trials observed 49 strokes among 3,605 OP-CABG procedures compared with 76 among 3,589 ON-pump CABG procedures, representing a 30% relative risk reduction. Borgermann and co-workers[16] found that by using in 395 patients PAS-Port system or total arterial revascularization the incidence of stroke was significantly reduced in comparison with conventional CABG (1.3% vs. 3.6%, P<0.05). In our study we have found that the incidence of stroke was similar in the two groups (2.5% in the ON-pump vs. 1.8% in the OP-CABG). However, we found a trend in reduction (1.2%, 1 case /84 OP-CABG procedures using with PAS-Port, P=0.06 vs. ON-pump CABG) when OP-CABG was performed without aortic manipulation, i.e. using the PAS-Port. For these reason, the higher costs of "clamp-less" OP-CABG procedures using PAS-Port can be justified, especially in patients at higher risk for stroke (i.e, in presence of peripheral and carotid vascular disease, advanced age, high preoperative serum creatinine level, extent of aortic atherosclerosis and calcification of the aorta). [3,6,17] In our study we recognized as independent predictors for early stroke the advanced age, the peripheral vascular disease, and the obesity.

Follow-Up Outcome

Mid- and long-term efficacy of the off-pump CABG remains unclear.[18] Results from the ROOBY Trial recently published by Hattler and co-workers,[19] indicated that OP-CABG in comparison with ON-pump CABG was associated with a significant lower patency rate at 1 year of follow-up either for arterial (85.8% vs. 91.4%) than for saphenous (72.7% vs. 80.4%) grafts (P<0.05). Moreover effective revascularization was significantly worse after off-pump than on-pump. Takagi and Co-workers [6] in a systematic review of randomized trials comparing off-pump and on-pump CABG surgery showed lower rates of revascularization and graft patency in the off-pump coronary surgery, with a 38% increase in repeat revascularization rate. Reduced graft patency and incomplete revascularization can affect long-term results and increase repeat interventions with adjunctive expenditure.[20] Hannan et al.[9] in 13,889 off- pump CABG and 35,941 on-pump CABG patients reported a better freedom from a subsequent revascularization following on-pump CABG (93.6% vs. 89.9%). However, more recent series evidenced that off-pump coronary surgery performed by skilled surgeons may offer the same effective results during follow-up in comparison with a conventional CABG.[21-23] In our analysis we did not find substantial differences in terms of survival and freedom from MACE. These findings can be likely related to the good experience of the surgeon who performed off-pump surgery, as also reported by other studies who have stressed the importance of a necessary experience required in the beating heart coronary surgery.[21-27] Freedom from cardiac death appeared better in the On-pump CABG patients with a discrete statistical relevance (98% vs. 90%, Figure 2). Considering that our follow-up was based on clinical records, we did not have definitive data about the cause of death, details of angiographic status of the grafts or of the native coronary tree, such that to draw a clear evidence that mortality could be related to a graft failure or to an incomplete revascularization. However, in a recent publication, Filardo and colleagues[28] showed a significantly higher risk of death at 10 years of follow-up in OP-CABG patients in comparison with ON-CABG patients.

Limitations of the study

The study was retrospective observational, not randomized; 2) the power of statistical analysis in detecting differences in the two groups of CABG patients had been affected by the selection criteria to perform OP-CABG. However, the aim of the study mainly was to analyze the results of each type of CABG, focalizing the interest on the effectiveness of CABG

techniques in the current clinical practice.

Conclusion

In conclusion, ON-pump CABG remains an effective surgical strategy for the treatment of extended multivessel coronary disease, in patients affected by co-morbid disease, with a high EuroScore. Mid-term freedom from cardiac death observed after ON-pump CABG appears to be very satisfactory. Off-pump surgery needs for more expensive technology and more demanding technique, requiring expertise surgical practice.

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SEASONAL TRENDS IN ANTIBIOTIC USAGE AMONG PAEDIATRIC OUTPATIENTS

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Abstract

The aim of this study was to analyze two aspects, the first one being the seasonal variations in antibiotic usage in different age groups and the seasonal prescription patterns of commonly used antibiotics in paediatric outpatients, the other one being the correlation of antibiotics with age and clinical diagnosis. Surveillance of antibiotic use was done during 01 January – 31 December, 2012 in the outpatient department of a paediatric hospital in Tetovo. Drug data and patient characteristics were computed using Ms. Excel 2007 and the SPSS (version 19.0) packages. Among the total number of 7956 patients analyzed during the period of one year, 3151 (39.6 %) of them were prescribed antibiotics. From the different age group, the study showed that special attention should be paid to toddlers (> 1 - ≤ 3 years)-those utilizing significant percentage of the antibiotic year's supply. Seasonal variation in antibiotic usage was strictly linked with the age of patients. Significant fluctuations of monthly use of antibiotics were observed for cephalosporins, combinations of antibiotics and macrolides. There was no significant seasonal fluctuation for penicillins. Respiratory tract infections were identified as a factor considerably elevating monthly drugs usage frequency. Usage of antibiotics was significantly correlated with group age. There was a correlation between the percentage of children given antibiotics for respiratory tract infections and the overall paediatric antibiotic prescribing rate. Results from our study have shown that a continuous surveillance of antibiotic use and resistance in the community are necessary to develop and implement guidelines for antibiotic use.

Keywords: Antibiotics, paediatric outpatients, seasonal trend

Introduction

The current worldwide increase in antimicrobial resistance (AMR) and, simultaneously, the downward trend in the development of new antibiotics have serious public health and economic implications. The increased resistance is a result of many factors, but the foremost cause is the overall volume of antibiotic consumption. About 80% of antibiotics are used in the community and the rest are used in hospitals (Wise R. et al., 1998)(Cars O. et al., 2001). The use of antimicrobial agents, especially antibiotics has become a routine practice for the treatment of paediatric illnesses. Although antibiotics are targeted to kill or inhibit the growth of bacteria and have no effect on viral agents (JETACAR 1999), it is often inappropriately used to treat viral infections. Antibiotic misuse was found to be significantly frequent in children, especially when presenting with viral upper respiratory tract infections (URTIs) (Cebotarenco N. et al., 2007). Detailed surveillance of antibiotic use in the community is one strategy to guide and control antibiotic overuse and misuse. In a number of developed countries, extensive surveillance programmes have been developed to

study patterns of antimicrobial resistance and antibiotic use (Moslstad S. et al., 2008)(Coenen S. et al., 2007)(Metz-Gereck S. et al., 2009).

Different publications provide information about the level of utilization of antibiotics, seasonal variations and long term trend in antibacterial pharmacotherapy. Available studies have been based on a few basic types of data of varying reliability: including survey data, data provided by companies analyzing the pharmaceutical market, insurance companies wholesale reports, as well as hospitals' and pharmacies' records (Ronning M., et al. 2003). Using the outpatient paediatric hospital records we achieved to analyze two aspects, the first one being the seasonal variations in antibiotic usage in different age groups and the seasonal prescription patterns of commonly used antibiotics in paediatric outpatients, the other one being the correlation of antibiotics with age and clinical diagnosis.

Materials and Methods

Surveillance of antibiotic usage was done by collecting data during 01 January – 31 December of 2012 from the outpatient department of a paediatric hospital in Tetovo, Republic of Macedonia. All patients' data at age group between 0 months and 14 years who were prescribed antibiotics were included in the study. A specially designed data entry form was used to collect data regarding demographics such as age, sex, diagnosis, drug details which included name of the drug, generic/brand name, dosage form, dose frequency and duration.   The results were computed using Ms Excel 2007 and the SPSS (version 19.0) packages. Chi-square test was used for comparison between groups. Relationship between different parameters was measured using Pearson's correlation coefficient. $P<0.05$ was accepted as significant. The results were expressed as percentage/proportion either as pictorial representation in the form of line and bar diagram or in the tabular form.

Results

Socio-Demographic data

During the study period from 01 January – 31 December of 2012, the total number of prescriptions surveyed was 7956; where antibiotics constitute 3151 (39.6%) out of prescriptions assessed. Demographic data of the patients are illustrated in (Table 1); where 3151 children who received antibiotics, were aged from 0 months to 14 years.

Table 1: Pediatric out patients socio-demographic data

Parameters	Number of patients	Percentage
Total prescriptions	7956	100
Antibiotics prescription	3151	39.6
Age		
Neonates (up to 4 weeks)	39	1.2
Infants (> 4weeks - ≤ 1 year)	652	20.7
Toddler (> 1 - ≤ 3 years)	1674	53.1
Pre-school (>4 - ≤ 6 years)	495	15.7
School age (>6 - ≤ 14 years)	291	9.2
Sex		
Female	1414	44.9
Male	1737	55.1

Seasonal variations of antibiotic usage in different age groups

The patient population was not homogenous in terms of the seasonal changes concerned. In age groups, the months of the largest usage were January and March, whilst the lowest level was recorded in June (Figure 1). There was tendency for two usage peaks for neonates and school age children in the months of January and March. It was 0.3% and 1.4%, respectively, higher than in the lowest usage months. Infants showed a significant peak in March (2.3% higher than in June and July). There was a significant peak of usage of antibiotics for toddlers in January, when the percentage of antibiotics usage was 4.5 % higher than in June, which was the month of the lowest usage of antibiotics. Pre-school age children had a single peak incidence in January, when the level of usage was 2.1% higher than in May and June (the lowest usage months during the year).

Figure 1: Comparison of seasonal variations in usage of antibiotics in different age groups
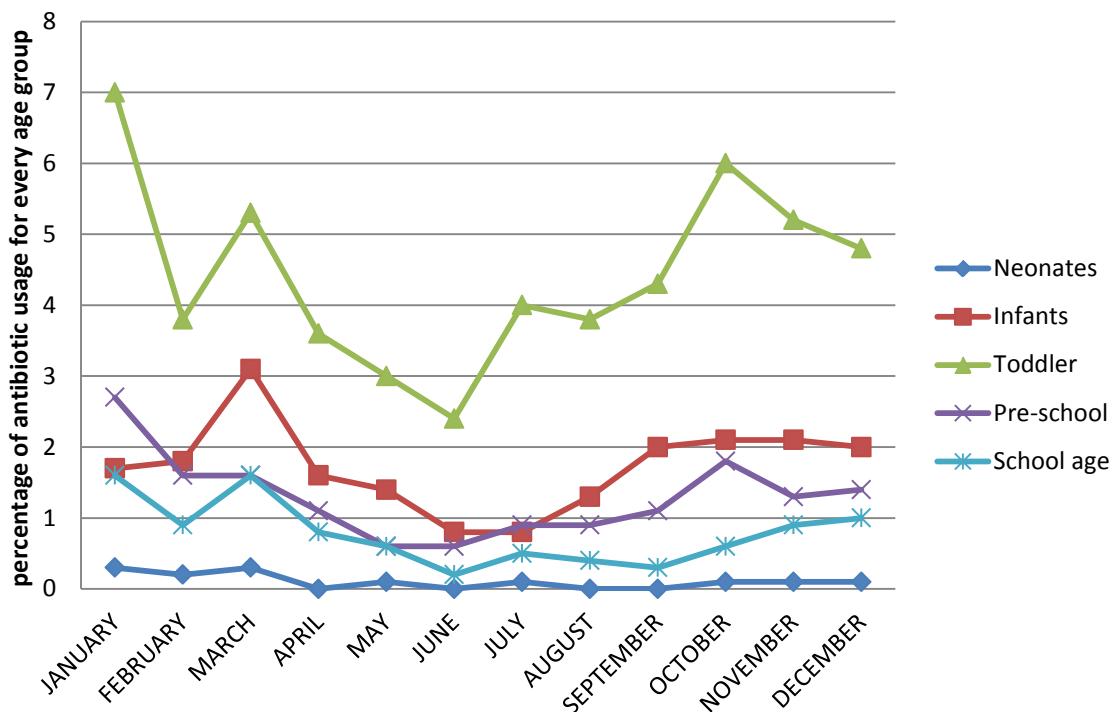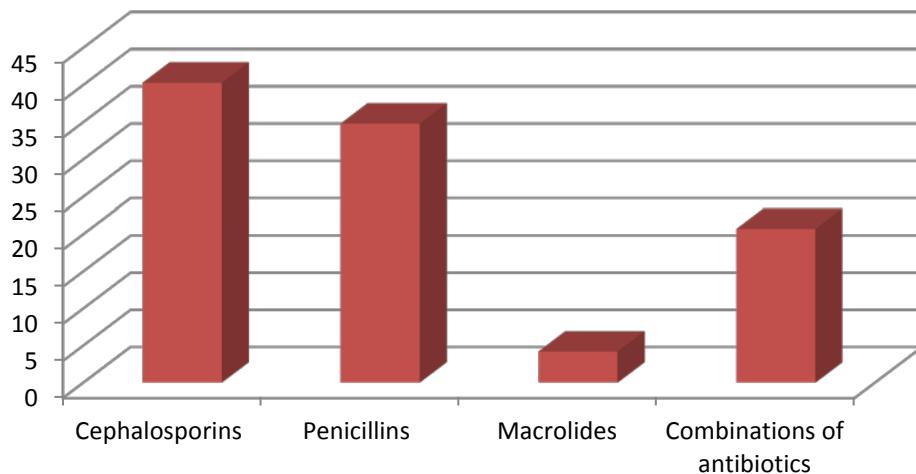

Monthly trends in the use of antibiotics

The frequency of prescriptions of antibiotics regarded as 'single' or in 'group' is shown in

Figure 2, where 40.3% out of the antibiotics prescribed belong to the cephalosporin class.

Penicillins constitute 34.8% of the antibiotics prescriptions; combinations of antibiotics presents 20.7%; macrolides, the least used antibiotics were prescribed in 4.2% out of the total antibiotics prescribed.

Figure 2: Percentage share of different classes of antibiotics

Figures 3, 4, 5 and 6 show the monthly trends in the percent of prescriptions containing various classes of antibiotics. There did appear to be an overall increased use of all classes of antibiotics (commonly used for respiratory tract infections) during the winter months January-March. For cephalosporins the highest prescription rates in winter (January-March) were around 4% greater than the minimum usage observed during summer (June as the lowest usage month during the year). Some seasonality was also observed for combinations of antibiotics with tendency for two peaks in January-November. It was 2.3% higher than in June the lowest usage month. Macrolides show a significant peak in January with 1.4% higher rate than the usage in June. There was no significant seasonal fluctuation for penicillins.
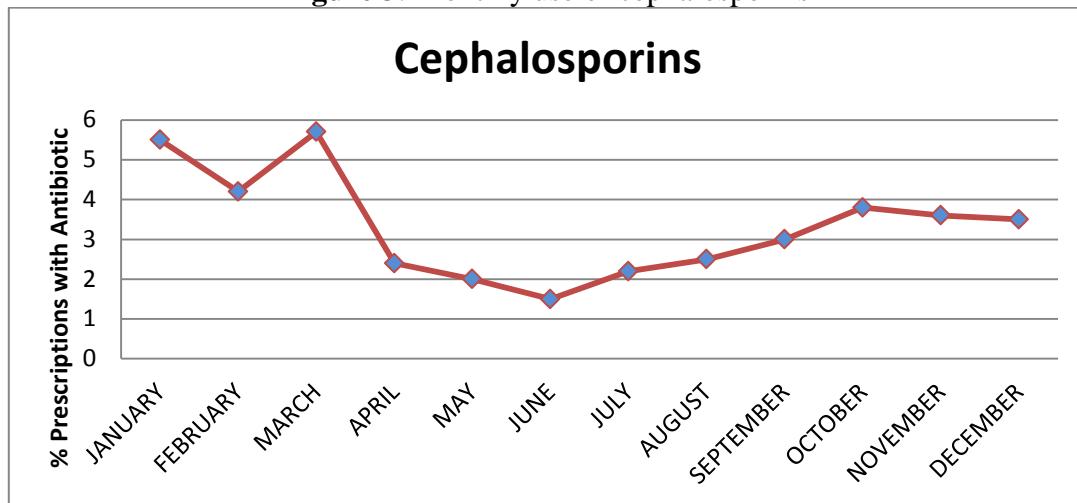
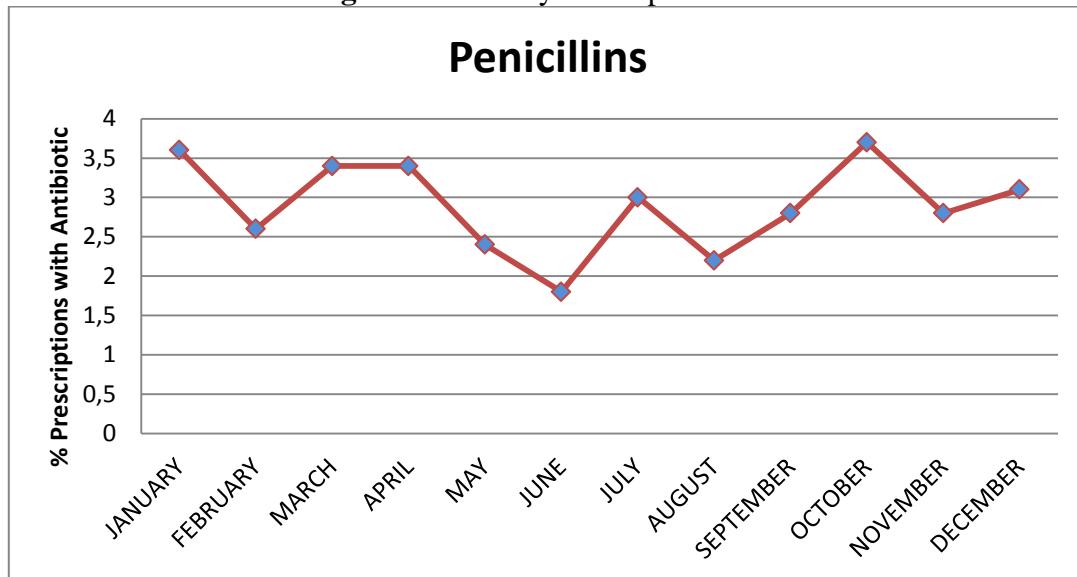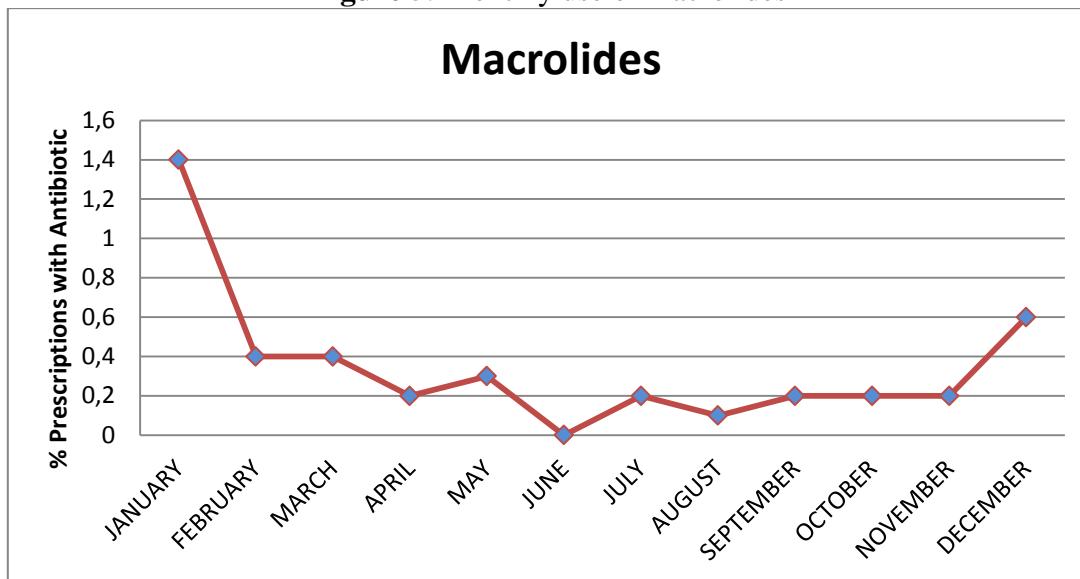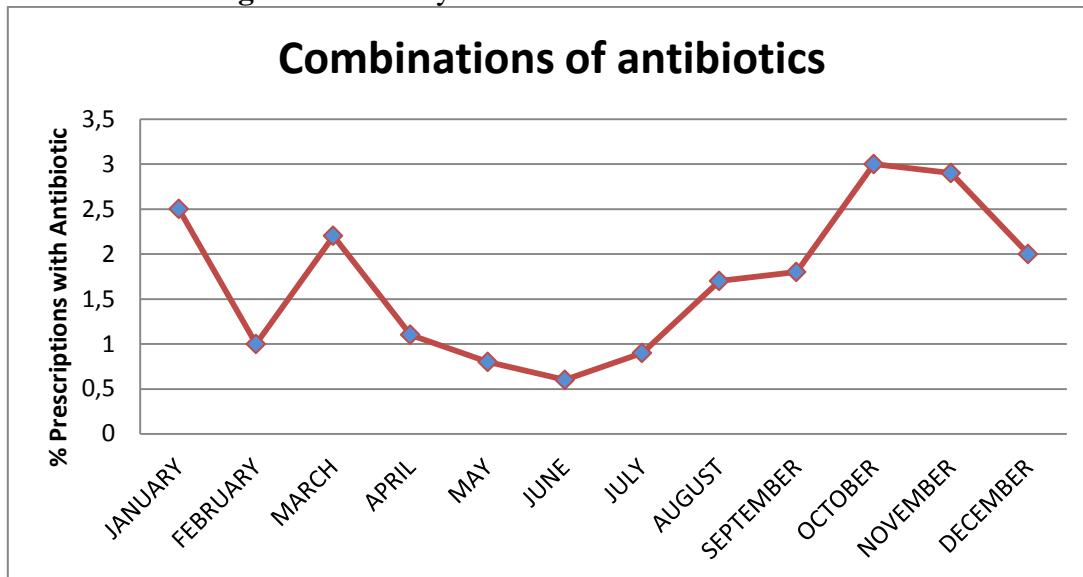**Figure 3**: Monthly use of cephalosporins

Figure 4: Monthly use of penicillins

Figure 5: Monthly use of macrolides

Figure 6: Monthly use of combinations of antibiotics

Seasonal variations of clinical diagnosis

Concerning the clinical diagnosis; out of 3151 patients for whom antibiotics were prescribed, 73.3% had an upper respiratory tract infections. Lower tract infection was present in 13.7% patients, gastroenterocolitis and fever in 2.1 %, skin infections in 1.5%, urinary tract infections in 1.7%. 2.5% had other diagnosis and in certain cases 3.5% prescriptions covered multiple diagnoses.

Upper respiratory tract infections had the highest frequency during all months with a significant percentage rate in January.

Figure 7: Frequency of clinical diagnosis
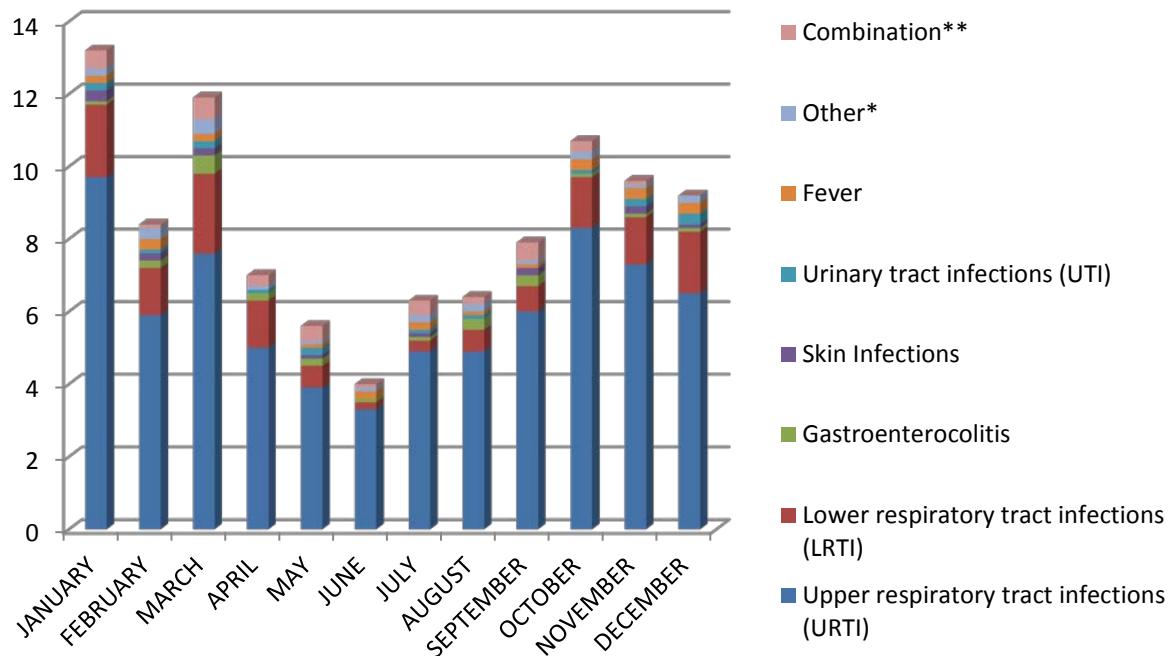
**Correlation of antibiotics with age and clinical diagnosis**

The treatment with antibiotics had a high significant relationship with upper and lower respiratory tract infections in all age groups as illustrated in Table 2.

Table 2: Correlation of antibiotics with age and clinical diagnosis

		Diagnosis	Antibiotic	Age
Diagnosis	Pearson Correlation	1	r=0.069*	r=0.050*
	Sig. (2-tailed)		P=1.114E-4 S	P=0.005 S
	N	3150	3150	3150
Antibiotic	Pearson Correlation	r =0.069*	1	r=0.180*
	Sig. (2-tailed)	P=1.114E-4		P=3.130E-24
	N	3150	3151	3151

**. Correlation is significant at the 0.01 level (2-tailed).

53.1 % of the total antibiotics prescribed to paediatric outpatients were used by toddlers (Figure 8). 73.1 % of the overall paediatric antibiotics were prescribed for upper respiratory tract infections and 13.8% were prescribed for lower respiratory tract infections (Figure 9).

Figure 8: Types of antibiotic prescriptions written in all age groups
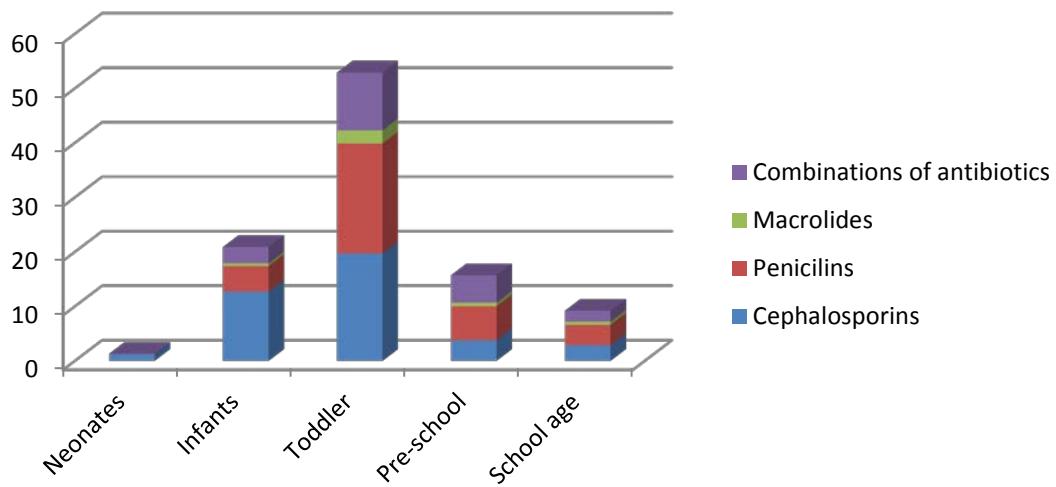
Figure 9: Antibiotic diagnosis relationship
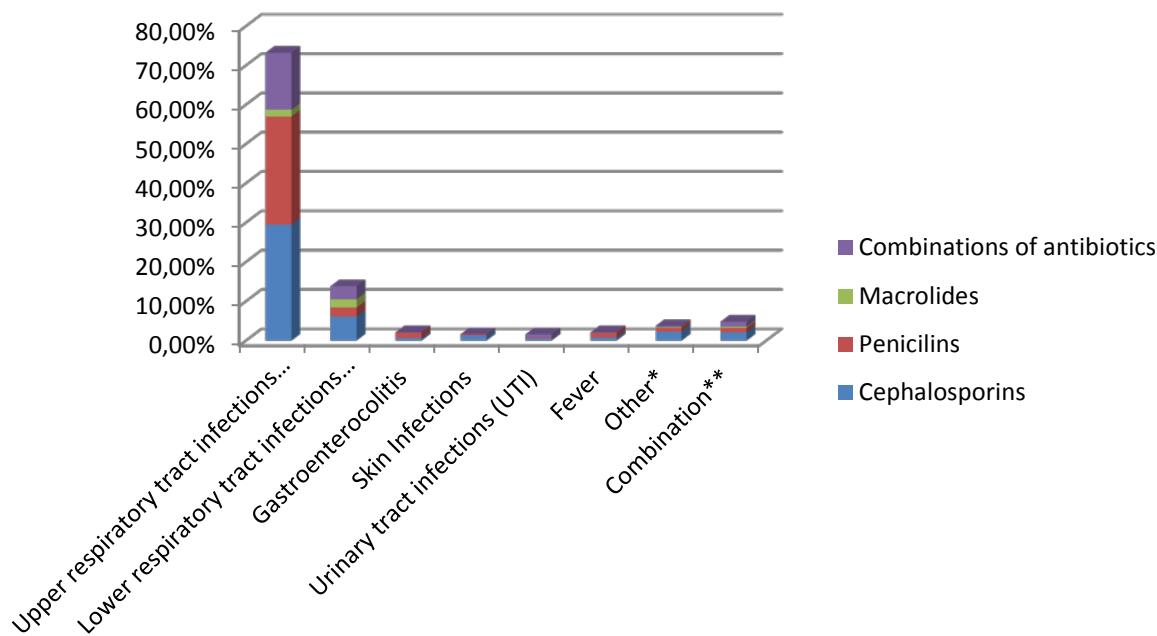
Conclusion

Seasonality in antibiotic prescription rates is common and is more accentuated in countries with high antibiotic use (Goossens H. et al., 2005). The observations in the study were corroborated by the analysis of the monthly variations of antibiotic usage in different age groups. There was a significant correlation between the group age and seasonal usage of antibiotics. In all age groups, the months of the largest usage of antibiotics were January and March, whilst the lowest level was recorded in June. In our study, significant fluctuations of monthly use of antibiotics were observed for cephalosporins, combinations of antibiotics and macrolides. There was no significant seasonal fluctuation for penicillins. The antibiotics with high seasonality are mainly prescribed for respiratory tract infections during winter months. The European Surveillance of Antimicrobial Consumption (ESAC) study has shown a higher outpatient antibiotic use in the winter season in all countries. The authors explained that this seasonal variation could be related to an increased incidence of respiratory tract infections during the winter months in European countries, resulting in higher prescription rates during this period (Ferech M. et al., 2006). Respiratory infections are more likely in the winter months in Tetovo also, as showed in the results, and it is likely that the higher usage of antibiotics during the winter months in our study was due to this and could include inappropriate prescribing for coughs and colds. Our results revealed a positive correlation between the usage of antibiotics and age. 53.1 % of antibiotics were used by toddlers. There was a correlation between the percentage of children given antibiotics for respiratory tract infections (upper and lower) and the overall paediatric antibiotic prescribing rate. Results from our study have shown that a continuous surveillance of antibiotic use and resistance plus detailed knowledge of antibiotic use in the community are necessary to develop and implement guidelines for antibiotic use in a particular region. Efforts from the policy makers of R. of Macedonia to educate providers, mainly paediatric providers and patients to decrease the rate of irrational antibiotic use especially for viral infections are urgently needed to avoid development of resistance and to preserve the effectiveness of antibiotics.

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FORMATIVE ASSESSMENT OF QUALITY ASSURANCE AND SAFETY IN PHARMACEUTICAL EDUCATION IN SOUTH AFRICA

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Abstract

Initial quality assurance instruction is described in this article for Rhodes University in South Africa for the 2012 and 2013 academic years. Comprehension of the Standard Operating procedure was limited among the 2012 class as only 12 % of the student properly correctly adapted the template for the practical exam. In the same year, 75 % percent of the students struggled with the basic laboratory operations as source of impurities. Thus a specific weighing practical was implemented at the beginning of the 2013 course. The impurity problem was partially resolved, but the students continue to struggle with the subject. Analogical observations were made for statistical dimension of quality assurance. A tutorial session was run using the YouTube videos as tools to address the issue and the problem was resolved. Up to 40 % of the 2012 and 2013 classes did not understand the intellectual property concepts of quality assurance. Comparison of the module content indicated that the practical subject matter was relevant to tertiary pharmaceutical education in the areas of pharmacy practice, social and administrative sciences; and the ability to work with informational resources. Based on the above, the 2014 course will start with detailed explanation of quality assurance and its significance in pharmacy. Tutorials will be run on the sources of impurities and the link between basic laboratory operations, as well as in the nature and legal ramifications of intellectual property. Focus will be placed on the formative assessment of the students' performance until the practical exam to facilitate development of the students' understanding of the Standard Operating Procedures and their practical significance. Use of the student-friendly communication avenues will be strengthened through the increased application of the YouTube videos and discussion of the SOP-related subject matter through the Rhodes University moodle-type platform.

Keywords: Pharmacy curriculum, titration, laboratory practicals

Introduction

Standard operating procedures (SOPs) are protocols that describe the correct way to perform routine activities in an industrial process (Pharminfo.net, 2013). These protocols form part of quality assurance systems and their implementation with subsequent adherence help guarantee production consistency (Pharminfo.net, 2013). This in turn assists the particular company in meeting the relevant regulatory requirements for its final products (Herrman et al., 2007). Consistency throughout pharmaceutical production and healthcare delivery is particularly important as any quality problems can lead to detrimental effects on

the patient's health (Hughes, 2013). In pharmaceutical industry, SOPs are designed for each step in the production process, which includes all relevant laboratory analyses (SJSU, 2013). These are performed at critical steps in the production cycle to ensure that key intermediates and the final products contain the correct concentrations the active ingredient and meet standards for the content of impurities (WHO, 2013a).

At Rhodes University in South Africa, the Bachelor of Pharmacy degree (designated a B. Pharm. in further text) is taught over four years in the Faculty of Pharmacy (Tandlich, 2011). An integral part of the B. Pharm. students' education is the coverage of the quality assurance concepts in the subjects such as Pharmaceutical Chemistry and Pharmaceutics (Rhodes University Calendar, 2012). The quality assurance instruction starts in Pharmaceutical Chemistry 2 which is taught in the second year of the B. Pharm. (Tandlich, 2011). The first module in this course is the Quality of Drugs module (designated as the module in further text; Tandlich, 2011). The subject matter includes the following topics (Tandlich, 2011): volumetric analysis, electroanalytical techniques, gravimetric analysis, types and essential properties of pharmaceutical packaging materials, antioxidants and preservatives, differentiation of active pharmaceutical ingredients (designated as APIs in further text) based on spectral properties, aqueous solubility and physical appearance. The six-week module consists of 28 formal lectures and 6 laboratory practicals (Tandlich, 2011).

During practical sessions, the students are taught how to understand, compile and correctly follow an SOP. Baseline observations and problems observed for instruction at Rhodes University are outlined here for 2012 and 2013.

Development of the SOP comprehension in the Quality-of-Drugs module

The B. Pharm. students enter the module with basic understanding of the laboratory safety concepts, such as wearing of protective personal gear (Rhodes University Calendar, 2012). During the practical part of the module, these basic concepts are developed further by linking (pharmaceutical) safety to precision and accuracy of quantitative analysis, traceability of pharmaceutical product contamination and safety in laboratory analyses. Understanding of SOP and its structure/formal requirements are developed with the students through step-by-step instruction and preparation of practical reports. Topics of these reports are examples of volumetric and potentiometric analyses from pharmaceutical industry, as well as statistical data analysis. Consecutive practicals increase in difficulty from week 1 to week 6. Practicals take place on Monday and Tuesday of every week, immediately following the completion of the first five lectures in the module. Each practical is preceded with a pre-practical session on Friday just prior to the given practical.

In the pre-practical session, theoretical concepts behind the particular practical are outlined through limited lecture-based instruction and references to the module lecture notes.

For the weekend before the practical, the B. Pharm. students are assigned self-study readings from internet sources and pharmacopeias (Tandlich, 2011; BP, 2013a; WHO, 2013b) to go through before the practical in question. Using the information from the pre-practical session and the readings, the students must prepare an SOP type report on the given practical topic (designated as practical report in further text) before the start of that practical.

Formatting and content guidelines for practical reports and all other module documents are available to students on the Rhodes University moodle-type platform. A check list for the practical report content is uploaded onto the moodle-type platform before the first module practical session. This checklist then stays through this platform for the students to go back to upon need throughout the duration of the module. All relevant information about the check list is also communicated to the students in the first pre-practical session. At the beginning of the given practical, each student's practical report is evaluated for consistency and formative assessment is provided to all students.

Structure of the practical report

Each practical report has to begin with the Introduction section which provides a short description of the sample the students will work with, its pharmaceutical significance and chemical composition. The students are also encouraged to outline the purpose of analysis, i.e. what would be the purpose of writing an SOP for the particular analysis and what would its role in pharmaceutical practice. The Introduction section should continue with theoretical principles behind measurement and all information must be properly referenced (e.g., BP, 2013a; WHO, 2013b). Impact of the referencing on traceability of the data and information in pharmacy is being taught through this approach. The overall significance of the Introduction section is to teach the students how to write a background chapter on a topic of pharmaceutical importance with the target audience being the regulatory community and users of the SOPs, e.g. operators in pharmaceutical production and the quality assurance analysts.   Every time such operations or analyses are performed, this must be done in a way that meets all criteria for precision, accuracy and pharmaceutical safety requirements.

After Introduction, the Materials and Methods section should follow. Here the students should first tabulate chemical structure/formulas and physical constants of all sample components and reagents they will use in the practical. Knowledge of chemical structure and formulas will facilitate students' understanding of chemical properties of the compounds they work with (Bivall et al., 2011). Such properties namely melting and boiling point have safety implications as they will influence volatility and flammability of the chemical compounds in question. Chemical properties of sample components are in turn important in the product quality assurance as they dictate packaging and storage/transport requirements. Familiarity with all the relevant properties is likely to stimulate students' awareness of the necessary safety precautions to be followed in the laboratory during the given practical, e.g. based on the links between chemical compounds' properties and the routes of human exposure. As a part of preparing a practical report, the students must therefore research and identify the major routes and symptoms of human exposure, along with the relevant first aid procedures. These are then to be summarised in the table at the beginning of the Materials and Methods section right next to the chemical structure, formula and properties.

All information in the practical report must be clearly referenced and students must be able to answer questions in the practical to demonstrate their knowledge of the subject and traceability of any piece of information to a particular literature source. If a problem with a pharmaceutical product occurs, or a counterfeit medication is detected in the pharmaceutical supply chain, then the ability to trace the source of the problem is important for the preservation of human health and production integrity (Bellman, 2003). The students must also indicate in their practical report which protective personal gear is to be worn when carrying out each step of the practical work. Wearing of such a gear is then mandatory in the particular practical. The pieces of safety equipment available to every student throughout the module include goggles, non-latex plastic gloves and a lab coat. On certain occasions, face masks are also provided (see below for practical four). The protective gear and awareness of its correct use is important for compliance with occupational health and safety legislation (OSHA, 1993). It thus stimulates regulatory compliance and prevents occupational health problems in pharmaceutical industry (see below).

The Results and Discussion section is next in the practical report where the students formulate another table for capturing results, doing calculations and reporting the final result(s). Space must be left for results evaluation and conclusions. Capturing the data and its evaluation should facilitate the students' SOP writing skills and it also likely to contribute to the development of critical thinking (Tandlich, 2011). Development of critical thinking will simulate troubleshooting in pharmaceutical industry (Ben Youssef et al., 2012). This in turn should contribute to the development of the students' ability to perform the following tasks in

quality assurance: to maintain adherence to safety protocols and SOPs in pharmaceutical industry; to address any quality assurance problems with product integrity during the pharmaceutical production and shipment of the final product to the customer. Once a practical has been performed, the students have one week to hand-in their practical reports. These are then put through formative assessment by the lecturer and the demonstrators and given back to students a week after handing-in.

Practical topics

In the first Practical, the students measure pH and electrical conductivity of honey samples according to the method of Tandlich et al. (2011). Honey is viscous mixture of multiple chemical components (Tandlich et al., 2011). Preparation for this practical requires the students to research a complex chemical mixture/product and integrate the gained knowledge with the significance of elementary laboratory operations, such as weighing and dissolution in quality assurance. On the day of the Practical, the students are required to properly level an analytical balance, accurately weigh out and completely dissolve a particular honey sample. They subsequently perform potentiometric measurements of pH and electrical conductivity (Tandlich et al., 2011). Given the nature of honey, the students are introduced to the use of the personal protective gear in prevention of the adverse health reactions, e.g. allergic reactions, from working with a complex mixture. Therefore this Practical is designed to demonstrate to the students that maintaining a clean working surface area is critical in quality assurance and pharmaceutical safety. Simultaneously, the B. Pharm. students are introduced to the concept of impurities in pharmaceutical production through visually identifiable sources, e.g. spillage of honey on the top-loading balance.

In the second Practical, the active pharmaceutical ingredient (API) concentration in a suspension pharmaceutical formulation, namely magnesium hydroxide in a magnesium hydroxide suspension, is determined using an acido-basic back titration (BP, 2013b). First and second step of the practical are standardisations of solutions of sulphuric acid and sodium hydroxide. The third step is the assay of the magnesium hydroxide suspension using the stepwise back titration of excess sulphuric acid with sodium hydroxide as the titrant (BP, 2013b). The titrant neutralises the excess of sulphuric acid in the presence of magnesium ions (BP, 2013b). After each addition of sodium hydroxide, the students must re-dissolve a precipitate of the magnesium hydroxide which forms due to a temporary rise of pH to alkaline values (BP, 2013b). The practical teaches the students to carefully follow an SOP as a means to guarantee precision and accuracy of pharmaceutical analysis. The second Practical also integrates the knowledge of basic laboratory operations and their influence on quality assurance with the actual analytical determination of API concentrations in a pharmaceutical formulation.

At the conclusion of the second Practical the students calculate the molarities of sodium hydroxide and sulphuric acid and use this information to determine the weight fraction of magnesium hydroxide in its suspension (BP, 2013b). The calculated results are compared with the pharmacopeial regulations which specify that the weight fraction of magnesium hydroxide in its suspension must range from 7.45 to 8.35 % (w/w; BP, 2013b).

The magnesium hydroxide suspension has been reported to provide relief from constipation (e.g., Donowitz and Rood, 1992). Results of some human trials indicate that this takes place through a dose-proportional increase of the water content of the patient's stool (Donowitz and Rood, 1992). If the content of magnesium hydroxide in its suspension is measured precisely and accurately, then the students perform the second Practical as outlined in the British Pharmacopeia. If this is the case, the students should arrive at a correct result of the calculated weight fraction of magnesium hydroxide in its suspension. Obtaining correct results will facilitate the administration of the correct dose to the patient. Thus the second

Practical gives the students the chance to develop understanding about the prevention of the API side-effects, e.g. dehydration in the case of magnesium hydroxide.

If the students engage with the magnesium hydroxide practical as specified in the module syllabus, then performing the practical along with writing the practical report should stimulate the students' comprehension of the link between quality assurance and the pharmacological action of an API (Miller and Crowther, 2000). This in turn should stimulate the students' understanding of the issues surrounding pharmaceutical product safety. Similar logic applies to the third and fourth Practicals on redox volumetric analysis of a disinfectant, namely hydrogen peroxide (practical three), and the assay of the iron content in a nutritional supplement, i.e. ferrous sulphate (practical four). Statistical analysis of analytical chemistry data is then the final practical topic in Practical five. Practical reports for practicals three and four have the same structure as those for practicals one and two. Respective methods are again based on British Pharmacopeia (BP, 2013c) and the International Pharmacopeia (WHO, 2013b - Monographs: Pharmaceutical substances: Ferrosi sulfas - Ferrous sulfate).

It is in Practical three is that the B. Pharm. students encounter a highly toxic reagent, namely oxalic acid for the first time, as it is used to standardise the titrant (BP, 2013c). Oxalic acid has the following toxic side-effects in humans (Gosselin et al., 1984): "vomiting; burns of the skin, oesophagus, throat and stomach; along with neuromotoric side-effects and convulsions". Routes of human exposure include ingestion, skin contact and inhalation (Gosselin et al., 1984). Therefore students are required to wear face masks and the above-mentioned personal protective gear during the entire practical. Analytical balances used in this practical are often concurrently needed by other B. Pharm. student groups in other subjects. Thus the second-year module students must immediately clean up any spillages of oxalic acid.   Containment of chemical contamination is an important concept in pharmaceutical quality assurance, as it helps companies achieve compliance with the occupational health and safety legislation (Sessink et al., 1994). The use of the redox/corrosive titrant, i.e. potassium permanganate, also introduces the students to the importance of packaging in isolation and prevention of any chemical changes in the chemical composition of stored (pharmaceutical) products. Thus Practical three forms a fundamental part of the B. Pharm. students' professional education.

The fourth Practical is an assay of the iron content in the ferrous sulphate nutritional supplement (WHO, 2013b - Monographs: Pharmaceutical substances: Ferrosi sulfas - Ferrous sulfate). Samples are the polymer-coated tablets of a nutritional supplement. Before analysis, the tablets must be crushed and the coating broken up by grinding before the students use deionised water to extract the API, namely iron. Then the suspension is filtered and the filtrate is made up to a known volume with deionised water. The resulting solution is then assayed by the direct redox titration with a standardised solution of ammonium ceric sulphate (WHO, 2013b - Monographs: Pharmaceutical substances: Ferrosi sulfas - Ferrous sulfate).

Ammonium ferrous sulphate is used to standardise the titrant (WHO, 2013b - Monographs: Pharmaceutical substances: Ferrosi sulfas - Ferrous sulfate). The Practical is designed to strengthen the concepts already taught to the students in the module. At the same time, the quality assurance and pharmaceutical product safety are taught in relation to the extraction of an API from a sustained-release dosage.

In Practical five, the students get three readings about statistical analysis of chemical data for self-study. Topics include identification of outliers in analytical results using the Dixon test (Efstathiou, 2013) and Grubbs test (Grubbs, 1969); and revision of the t-test for statistical significant differences among averages (see Results and Discussion section in Tandlich et al., 2013a). The readings build on the students' fundamental knowledge of basic statistics which is acquired in the first year of their B. Pharm. degrees in a specialised course entitled "Introduction to Statistics" (Rhodes University, 2012). Comprehension of the

principles of statistical data analysis and identification of outliers is a critical skill in the quality assurance of pharmaceutical products as it prevents the damage to patient's health due administration of the wrong API dose (Miller and Cromworth, 2000). Thus this exercise introduces students to the data analysis as part of quality assurance.

Assessment of student performance

In 2012, the module practical section was examined in part in an SOP assignment where the students were given a template SOP file (designated as the template in further text). It described the protocol for the enumeration of coliform bacteria in water entering a hypothetical pharmaceutical factory. One month before the date of the actual practical exam, the template file was posted on the Rhodes University moodle-type platform. Two days later, the students were given the topic of the practical exam assignment which was the determination of the acid value of oils in 2012. An information session about the details of the practical exam was then scheduled for three days later. In this session, details of the template were explained, as was the purpose of the practical exam assignment. Afterwards, all students were instructed to modify the template to the determination of the acid value of oils. On the day of the practical exam, each student handed-in the resulting SOP individually.

The template contained sections that are suggested by the standard World Health Organization (WHO) format for health related SOPs. The first section contained the definition of all relevant terms in document. The membrane filtration technique is used to determine low concentrations of microorganisms (Tandlich et al., 2012). Its sensitivity is to quantify one bacterial cell in one hundred millilitres of drinking water (Tandlich et al., 2012). It is used in working with microbial species which indicate the presence of fecal contamination or the presence of pathogens (Tandlich et al., 2012). Thus the SOP in question will provide the worst case scenario in terms of personal safety and in context of measures needed to prevent contamination in pharmaceutical production. It was therefore deemed by the authors an ideal teaching tool for demonstrating quality assurance concepts to second year pharmacy students.

Safety procedures were described at the beginning of the document with a detailed list of the personal protective gear to be worn by the analysts. Preparation of the necessary reagents was described next, together with maintaining a clean work space and accuracy/precision during the quantitative analysis. Guidelines for the correct way to perform calculations constituted the last section. Students had access to all the up-to-date reference pharmacy texts, pharmacopeias and other online literature resources (see Tandlich, 2011 for further details). The students had an option to prepare for the acid value procedure from the International Pharmacopeia where the arachis oil and linseed oil are dissolved in ethanol (WHO, 2013b). The students were required to maintain the same level of detail as in the practical reports (see above). In 2013, the quality assurance examination had to be changed due to the low comprehension levels among the second-year students (see Results and Discussion for details).

Results and Discussion

In 2012, three percent of all students submitted an unchanged SOP template for marking with no mention of the determination of the acid value of oil measurement. Up to 40 % of the students copied and pasted information from the module lecture slides verbatim into their Materials and Methods section in the modified template. This indicates that a significant part of the 2012 B. Pharm. class struggled with at least some of the intellectual property principles in quality assurance. Similar observations have been observed among the B. Pharm. and science students at Rhodes University in the past (Tandlich et al., 2013b). In previous academic years, such issues were solved through running a dedicated short course

on the nature and legal ramifications of intellectual property before the instruction of specific scientific topics (Tandlich et al., 2013b). A similar strategy will have to be implemented in the module practical sessions in 2014. Given the time constraints, this is likely to take the form of a single pre-practical session. Such a session should be conducted before the first Practical with follow-up reminders to the students throughout the module practicals. Inclusion of such a session into the module content is discussed below.

Only 12 % of the students demonstrated good understanding of the experimental procedure for the acid value of oils, i.e. presented a detailed and clear titration procedure, in their modified templates in 2012. Up to 90 % of all the 2012 B. Pharm. class included all the necessary details about first aid, transport and disposal of waste reagents in the handed-in template files. The majority of the class thus demonstrated sufficient level of general safety awareness in the laboratory and in relation to quality assurance. However, some elements of the safety awareness were likely only superficial in nature because 30 % of all safety data was not detailed enough (see practical report structure above for details). Correct interpretation of results and conclusion, along with a complete theory section, were found in 98 % of the submitted SOPs. Thus the majority of the B. Pharm. students likely understood the theory behind the practical and evaluation of results in quality assurance (Young and Sullivan, 1984; Prieto et al., 2006). Three percent of the students handed in an incompletely modified template in 2012, as not all the necessary information on the acid value of oil measurement was listed in the SOPs.

The data from the previous paragraph indicate that Materials and Method section caused the biggest problems for the students. During the six practicals in 2012, it was observe that 75 % percent of the students struggled with the basic laboratory operations, such as weighing as source of impurities. Incorrectly leveled top-loading and analytical balances were often observed in practical sessions. Repeated instructions were given to the students in pre-practical session and during the actual practicals on the importance of maintaining a clean working environment in prevention of contamination of pharmaceutical products. To address this problem, a specific weighing practical was implemented into the 2013 course and it was run before the honey practicals (see above). The students were given two solid culture media for the enumeration of bacteria and fungi; and asked to weigh out three replicates of each. The link between weighing and the introduction of impurities into the pharmaceutical products was only partially resolved and the students also struggled with the statistical dimension of quality assurance. A remedial tutorial session was run where the students were shown the importance of the concepts using YouTube videos. As a result of this activity the problem was resolved.

The quality assurance and safety education contributes to the achievement of the following professional outcomes of the American Association of the Colleges of Pharmacy (AACP) for Pharmacy Practice (CAPE, 2007a). The particular outcomes that are being facilitated by the module practical content include the following (CAPE, 2007a): IA by teaching the students to organize pharmaceutical information in a systematic manner, e.g. in the form of an SOP, IB by teaching the students how to judge the validity of information sources, identify adverse drugs reactions such as allergies and how to correctly interpret laboratory based data, ID by the instruction on conducting literature research and retrieving of pharmaceutically relevant information, IIB and IIC by developing the required calculation skills among students; and outcome IIE by introduction to the regulatory background and requirements for the pharmaceutical product safety and quality assurance compliance.

Components of the course which deal with storage of the oxidative agents, e.g., potassium permanganate, contribute to the accomplishment of the AACP outcome 2.5. for Social and Administrative Sciences in Pharmacy (CAPE, 2007b). This is due to the students gaining familiarity with proper "records keeping and performing drugs control, storage and

security" (CAPE, 2007b). From the same batch of professional education outcomes, the ability to conduct analytical activities in the laboratory and the research ones in the literature domain will facilitate achievement of the Social and Administrative Sciences outcomes 6C and 6D (CAPE, 2007b). Introduction to laboratory safety in the module Practicals contributes to the achievement of the professional outcome IE for Pharmacology, namely "Address and prevent side effects and toxicities from therapeutic agents and xenobiotics by applying knowledge of mechanisms of toxicity" (CAPE, 2007c). Development of writing skills and drafting of the practical reports and the SPO template adaptation help achieve the professional outcome III for Pharmacology in the field of professional pharmacy communication (CAPE, 2007c).

Pharmaceutical education should develop the pharmacist's ability to "retrieve, analyze, and interpret the professional, lay, and scientific literature to provide drug information to patients, their families, and other involved health care providers" (Outcome 1.iii for Library and Educational Resources; CAPE, 2007d). This is accomplished in part by the module's practicals through preparation and writing of the practical reports. The B. Pharm. degree should make a practising pharmacist capable to "carry out duties in accordance with legal, ethical, social, economic, and professional guidelines" (Outcome 1.iv for Library and Educational Resources; CAPE, 2007d). The degree's subject matter has to contribute to the pharmacist's ability to "understand issues of privacy, copyright, plagiarism and other issues involved in the legal and ethical uses of information" (Outcome 1.iv for Library and Educational Resources; CAPE, 2007d). The module facilitates by requiring the students to maintain complete traceability of any information used; and through their familiarization with pharmacopeias. Research using databases and internet resources during preparation for Practicals provide a foundation for attainment of the professional Outcome 1.iv for Library and Educational Resources (CAPE, 2007d). Analogical contribution is made in the module towards the achievement of the second batch of Library and Educational Resources outcomes (CAPE, 2007d).

The CAPE outcomes for professional pharmaceutical education were updated in 2013 (CAPE, 2013). The altered nature of the Doctor of Pharmacy degree in the United States was reflected by merging the previously disciplinary outcomes, e.g. for Social and Administrative Sciences, were shrunk into four wide areas of competencies (CAPE, 2013). Domain 2 in these outcomes is entitled "Essentials of Practice and Care" (page 4; CAPE, 2013). In this domain, one of the of expected pharmaceutical education objectives is 2.1.1, namely that a practising pharmacist should be able to "collect subjective and objective evidence related to patient, medications, allergies/adverse reactions, and disease, by performing patient assessment (including physical assessment) from chart/electronic health records, pharmacist records and patient/family interviews" (CAPE, 2013). The module practical part contributes to the achievement of this professional outcome by requiring the students to collect the relevant safety information about the reagents and analysed samples. At the same time, the fist aid procedures must also be outlined, i.e. the students becomes familiarized with the prevention and treatment of human exposure to pharmaceutically relevant chemicals. Knowledge of the quality assurance procedures and SOPs contributes to the achievement of the expected learning objectives 2.2.6 (page 4; CAPE, 2013).

The 2013 CAPE professional outcomes further contain domain 3 which is entitled "Approach to Practice and Care" (page 5; CAPE, 2013). The module practical part constitutes an introduction into the systems of pharmacy production and quality assurance (Tandlich, 2011). Knowledge of the systems in which pharmaceutical formulations are produced and tested should help the students develop the ability to trace problems occurring back to their sources. This will thus facilitate the achievement of the expected learning objective 3.1, namely for the students to become problem solvers (page 5; CAPE, 2013). At

the same time, the practical part of the module provides one of the first glimpses of the B. Pharm. students to the application of analytical chemistry in pharmaceutical education. It thus contributes to the anchoring of the pharmacy profession in science as outlined in the 2013 CAPE professional education outcomes (page 2; CAPE, 2013). Thus the module remains practically relevant to current pharmacy education.

Thus the content is relevant to the pharmacy education and a change in the delivery of the subject matter is necessary. Based on the above mentioned observations, the following teaching paradigm will be in 2014. The module will start with tutorials of the significance of quality assurance and its principles in pharmacy, on the sources of impurities and links between basic laboratory operations; and on the nature and legal ramifications of intellectual property. A specialised tutorial will also be run statistics before the practical part of the course will begin. After these activities the actual practicals will be performed by the students.   Formative assessment will be maintained as the sole form of evaluation of the students' performance until just before the practical exam. The aim of this strategy will be to get the student to understand the main components of the SOP and their practical significance. It is believed by the authors that if this fundamental goal is achieved than the students' performance in the course will improve. Use of the student-friendly communication avenues will be strengthened through the increased application of the YouTube videos and discussion of the SOP-related subject matter through the Rhodes University moodle-type platform.

Conclusion

Thus the content is relevant to the pharmacy education and a change in the delivery of the subject matter is necessary. In the coming academic years, more focus will have to be placed on the instruction of the links between basic laboratory operations and quality assurance/safety in pharmaceutical production, the nature and principles of intellectual property and statistics in pharmaceutical quality assurance. Focus on formative assessment will be maintained, but effort will be made to make the course more interactive for the students through the use of online media.

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CONDITION OF DONATION IN BLOOD SERVICE

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Abstract

There has been a monitoring of donation in Pavlodar region. It has been established that over the years of observation there was a significant change both in the number and structure of the donors in Pavlodar region: number of donors seems to increase, similar to the growth of the total number of donors, the number of donors per thousand people has increased. The number of primary donors has decreased and there are unsteady requests for blood donation. Growth of free donations is conditioned upon donating relatives of recipients. There is a tendency to a decrease in the share of male donors and increase in the share of female donors. There is a steady increase in the share of donors from 30 to 39 years old, workers and employees with a predominance of urban residents.

Keywords: Donor, blood service, blood donation

Relevance

Issues of blood and its components donation are one of the most important for the state and key ones for public health. That is why this issue can be rated as an issue of national security [1].

According to WHO estimates, share of blood donors is less than 1 % of total population in Central Asian countries, and in the last 3 - 5 years this figure sharply decreased while, according to international standards, to satisfy potential needs, share of blood donors shall include 2.5 % of the population. As a result, blood services in Central Asian countries have no necessary and safe blood resources that poses risks to health and life of patients who need blood transfusion[2].

Despite a certain progress, too many Central Asian countries depend on paid or substituting donation. By estimate, in Central Asia, share of paid donors accounts for 80 % of all blood donors used by blood services for their needs. Pool of voluntary donors from lower risk group constantly decreases while prevalence of infectious diseases increases in those places where resources are limited[3].

In the Republic of Kazakhstan, from 1990s, donation has reduced more than twice. In 2009, 271,000 donations of blood and its components were recorded which is 18 donations per thousand people a year and only by 45 % corresponds to minimal level recommended by WHO. Average republican rate per thousand people according to the results of 2009 is 18 donors[4] . Taking into account the above stated we have conducted research to find out how donation is developing in blood service in one of the regions of Kazakhstan.

Research material and methods

The object of the research is donors who applied to Pavlodar Region Blood Center (PRBC) from 2008 to 2012. Epidemiologic information about donors was collected with the help of a standard questionnaire approved by the order of the Ministry of Public Health of the Republic of Kazakhstan No. 332 of 08/07/2009. Material for study also was annual reports

on PRBC operation. Sociological, analytical and statistical research methods were used in the work.

Results of the research

There are 168,339 people (according to RK census of 2009) from 18 to 50 years old in Pavlodar region who could become potential donors, but in average only 6% apply to blood centers (BC) of Pavlodar region. See the illustration of change in the total number of donors in Pavlodar region over the period of five years in Figure 1.
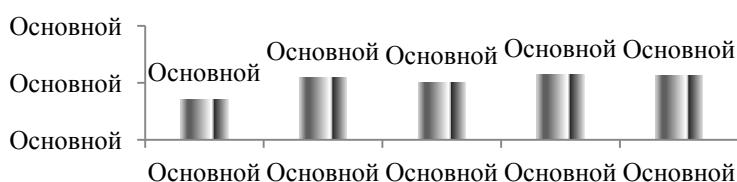

Figure 1- Number of PRBC donors over 2008-2012

As it can be seen from the chart in Figure 1, number of donors in Pavlodar region over the period under review seems to increase. Decline in donation is observed in 2008 (7148 donors). Stabilization in the number of donors is observed from 2011.

It is known that the number of donors per thousand people is considered to be a rate which precisely enough shows both attitude to donation and its condition in the country. Change in the number of donors per thousand people in Pavlodar region is shown in Figure 2.
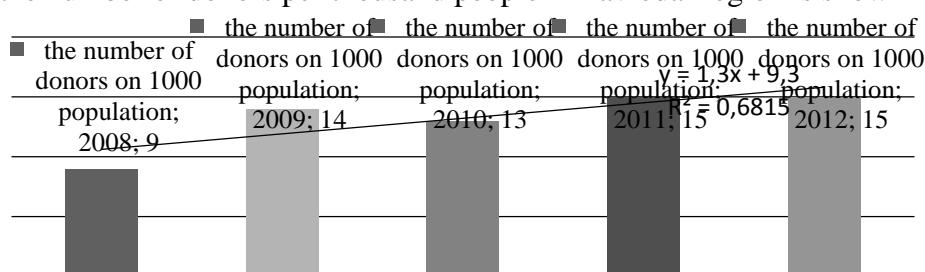

Figure 2- Number of donors per thousand people in Pavlodar region over 2008-2012

The chart in Figure 2 allows noting that similarly to the growth of total number of donors there is also an increase of number of donors per thousand people: if in 2008 it was 9, in 2009 it increased to 14 per thousand people, and in 2011 there is a stabilization and a certain increase of donors, to 15 donors per thousand people.

From 2008 to 2009 number of primary donors decreased from 44% to 41% of the total number of donors correspondingly. Then, in 2010 there is a significant growth of primary donors up to 51% of the total number of donors. In the following years a tendency towards decrease is seen in 2012 to 33% (Figure 3).
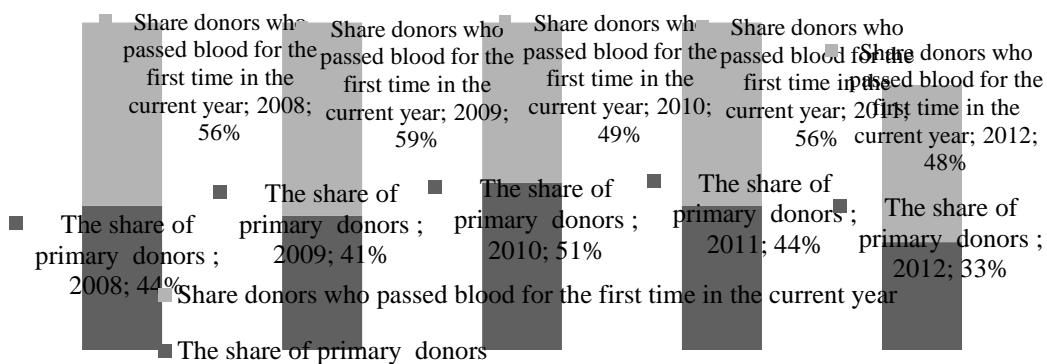
Figure 3- Composition of donors in Pavlodar region over 2008-2012

The above chart also shows that there is a decline of first applying donors from 56% of the total number of donors in 2008 to 49% in 2010, then there is a growth of donors to 56% in 2011, and in 2012 – maximal fall to 47,9%. Such unsteady requests of people for blood donation indicates inadequate agitation educative activities among population while improved facilities of PRBC allows for safe and more comfortable blood donation.

Over five years, PRBC observed 50,836 donors, where men were 68,7% (34,918 people), and women – 31,2% (15,854 people). Data according to years are illustrated in Figure 4.
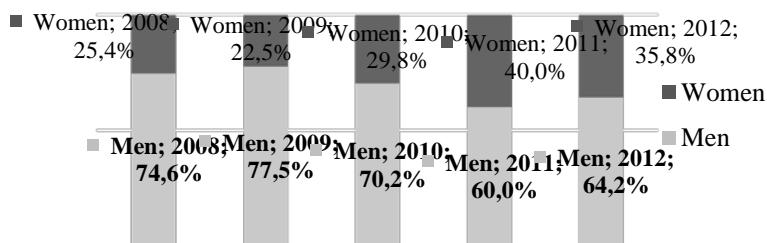

Figure 4 – Ratio of men and women over 2008-2012

Data illustrated in the chart above (Figure 4) show that there is a tendency to reduction in the share of male donors and growth of female donors, especially in 2011 (40%).

As for age of donors, maximum percent – 69, 3% - is the age between 18 and 39. Donors from 40 to 59 years old account for 30,7%. See ratio of age groups in Table 1.

Table 1. Ratio of different age groups among donors over 2008-2012

Age	Year									
	2008		2009		2010		2011		2012	
	n	%	N	%	n	%	n	%	n	%
18-29	3324	46,5	4781	44	4214	41,6	4352	38,2	3311	29,3
30-39	1794	25,1	2934	27	2735	27	3737	32,8	3955	35
40-49	1380	19,3	2162	19,9	2056	20,3	2518	22,1	2938	26
50-59	650	9,1	989	9,1	1124	11,1	786	6,9	1096	9,7
Total:	**7148**		**10866**		**10129**		**11392**		**11301**	

Data in Table 1 show that if in initial for our research 2008 young donors from 18 to 39 accounted for 71,6%, donors of senior age group – from 40 to 60 years – 28,6%, and the biggest part – 46,5% - accounted for people between 18 and 29, then by 2012 share of donors from 18 to 29 years decreased to 29.3%, senior age group increased to 35,7% of the total number of donors. There is no doubt that positive factor is steady growth of donors' share from 30 to 39 years old, which in recent years reached 35%.

It is interesting to note change in characteristics of social structure of donors. Distribution of donors by social sign is represented in Table 2.

Table 2. Distribution of donors in Pavlodar region by social sign over 2008-2012

Social group	Year									
	2008		2009		2010		2011		2012	
	n	%	N	%	n	%	n	%	n	%
Worker	4003	56	5498	51	5510	54,4	5252	46,1	5707	50,5
Employee	1272	18	1282	12	1935	19,1	2028	17,8	2712	24
Student	829	12	2195	20	1165	11,5	1857	16,3	1367	12,1
Retiree	43	0,6	33	0,3	20	0,2	11	0,1	45	0,4
Unemployed	643	8,7	1021	9,4	891	8,8	2119	18,6	870	7,7
Serviceman	172	2,4	348	3,2	324	3,2	57	0,5	203	1,8
Other	186	2,6	489	4,5	284	2,8	68	0,4	396	3,5
Total:	**7148**		**10866**		**10129**		**11392**		**11301**	

As it is seen from Table 2, the biggest percent of donors are workers (51,6%) and employees (18,18%), the smallest percent falls to the retired (0,32%). Socially disadvantaged group of donors – the unemployed – were observed in 10,6% of cases. Number of rural dwellers among donors in average over five years is 18,7%, and urban dwellers – 81,30% (Figure 5).

Increase in the number of donors certainly increases the total number of blood donations in Pavlodar region. Thus, from 2008 to 2012, number of donations increased from 9,790 to 12,053, that is, by 1,2 times. See the monitoring of donations over five years in Figure 5.
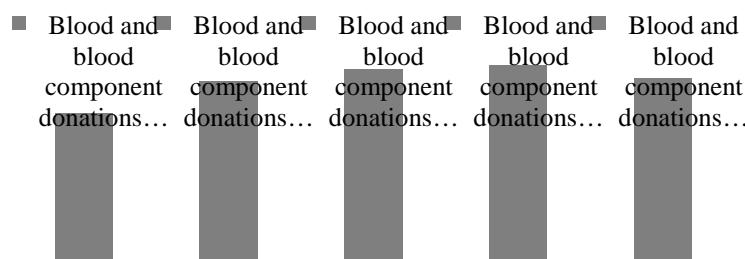

Figure 5 – Monitoring of donations in PRBC over five years

The number of donations per thousand people increased from 13, 2 per thousand people to 16 per thousand people and in average accounted for 15, 9 per thousand people (Figure 6).
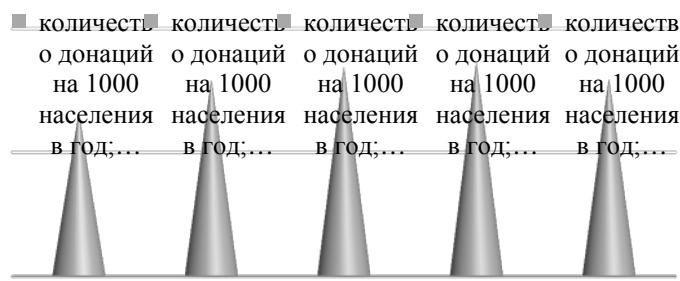
Figure 6- Number of donations per thousand people a year

The number of free donations increases annually while percentage of paid donations by 2012 decreased from 28, 6% in 2008 to 17,3% (Figure 7).
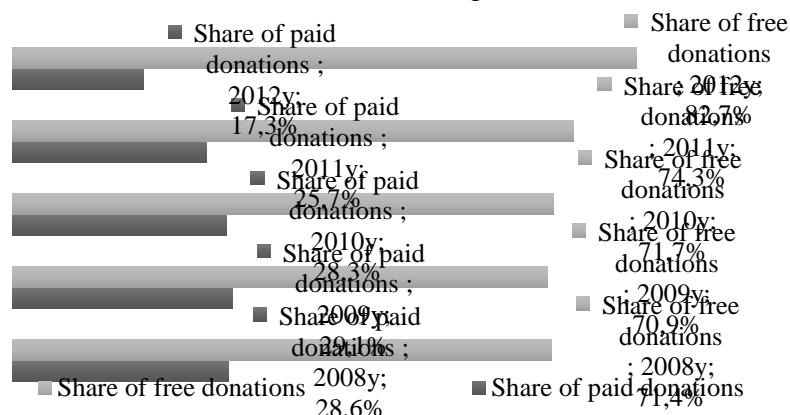

Figure 7- Ratio of paid and voluntary donors

The growth of free donations is conditioned upon donating relatives. In average, share of free donations accounts for 74,3% of all blood donations, where share of free donations from relatives of recipients is 55,9% and voluntary free donations only accounts for 18,4%, which is by 7,3% less than paid donations.

Discussion of results

Over the years of observation there was a significant change both in the number and structure of donors in Pavlodar region: number of donors seems to increase, similar to the growth of the total number of donors, the number of donors per thousand people has increased. In spite of the fact that the number of donors increases and, correspondingly, the number of blood donations per thousand people increases, in average accounts for 15,9 per thousand people, which is a low indicator in comparison to WHO data. The level of donation recommended by World Health Organization for self-sufficiency of a country requires for 40-60 donations per thousand people[5] . In Kazakhstan, this rate is 18 per thousand people. For comparison: in the USA, this rate is 109 per thousand people, Denmark – 67 per thousand people, Germany – 52 per thousand people, Russia – 25 per thousand people[1].

The positive fact shall be a steady growth of share of donors from 30 to 39 years old, reaching 35% in the recent years. This increase directly correlates to similar steady growth of donors from among workers (51, 6%) and employees (18, 18%) with predominance of urban dwellers (81,30%). Socially disadvantaged group of donors – the unemployed - were observed in average in 10, 6% of cases without upward trend.

According to WHO recommendations, voluntary free donor is "the gold standard", and donors having financial or other interest are in theory potentially dangerous category[6]. According to results of the research, the number of free donations annually increases and

accounts for 74,3% of all blood donations while percentage of paid donations by 2012 decreased from 28,6% in 2008 to 17,3%. The growth of free donations is provided due to donating relatives of recipients and equals 55, 9%. Free voluntary donations account for 18, 4%, which is by 7, 3% less than paid donations.   According to global WHO data base, 94% of blood collected in countries with high level of income is donated on free basis, and 43% of blood in countries with low and medium level of income is paid or donated from relatives[7].

Conclusion

Thus, despite the increasing number of donors and, correspondingly, increasing number of blood donations per thousand people, in average, the number of donations equals 15,9 per thousand people which is a low rate compared to WHO data. The growth of free donations is provided by donating relatives of recipients and equals 55, 9%.

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AJWA DATES AS A PROTECTIVE AGENT AGAINST LIVER TOXICITY IN RAT

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Abstract

Background: Liver toxicity is a worldwide clinical problem caused by a variety of causes. It mostly ends by hepatic fibrosis and or cirrhosis.
Materials and methods: Ajwa date extract was prepared from Almadinah AlNawiah ajwa and was given to the animals by gastric gavage at a dose of 1gm/kg/day. CCl4 was dissolved oil at 1: 1 percent and was injected intraperitonealy at a dose of 1.2 ml/ kg of body weight 3 times a week. Fourty adult male rats were divided into five groups. G1 - control group. G2 received CCL4 for 4 weeks. G3 received CCL4 for 12 weeks. G4 received CCL4 and ADE for 4 weeks. G5 received CCL4 and ADE for 12 weeks. Animals were sacrificed and blood samples were collected for SGPT, SGOT and albumin measurements. Liver samples were stained and subjected to image analysis to assess the area percentage of fibrosis.
Results: Biochemical analysis showed that ADE treated groups showed a significant lower level of SGPT and SGOT compared to CCL4 treated groups. Light microscopic examination showed that the ADE treated groups showed a decrease in the histological alterations induced by CCL4. The area occupied by collagen fibers was significantly decreased in ADE treated groups. These effects may be due to the rich vitamins and antioxidants in the extract.
Conclusion: This study highlights the interest to change toward the use of natural medicinal plants with antioxidant activity for protection against diseases. This may provide a scientific base for the conventional use of ADE as a nutritional protocol of management.

Keywords: Ajwa, dates, liver toxicity, prophetic medicine, complementary, alternative, fibrosis, cirrhosis, area percentage

Introduction

Liver toxicity is a worldwide clinical problem that may presents with acute or chronic hepatitis, cirrhosis, or fulminant liver failure. The onset is usually insidious with long latent period between disease occurrence and detection; and most patients remain asymptomatic until they develop hepatic decompensation (Brewer et al. ,1999). Chronic liver injury of any cause eventually ends in healing by scarring healing response that results in hepatic fibrosis.

Underlying etiology include biliary obstruction, helminthic infection, chronic ethanol

consumption, autoimmune disorders, drug-induced, iron or copper overload (Friedman, 2003). Hepatic fibrosis affects millions of patients worldwide and if left untreated, fibrosis can progress to cirrhosis, ultimately leading to liver failure and possible death (Tsukada et al., 2006). To avoid liver fibrosis, eradication of continuing liver injury is required. This process depends on reduction of activated myofibroblasts (reversion of activation and/or apoptosis) and degradation of pathologic extracellular matrix (Murphy et al., 2002). Carbon tetrachloride (CCl4) is one of the most used hepatic toxins for laboratory experimental induction of liver fibrosis and cirrhosis (Zasshi, Y. 2006; Tsuchiya et al., 2007). It is mostly used to study liver injury induced by free radicals in animal models. Liver toxicity caused by it is closely analogue to hepatotoxicity in human (Ko and Lim 2006).

Ajwa date is a special luxury type of dates with black color, soft and delightfully fine taste. It is only cultivated at Almadina AlNabawiah in Saudi Arabia. It is the fruits of the female tree date palm (Phoenix dactylifera L.). Its characteristic contents of high percentage of carbohydrates, dietary fibers, fats, proteins, vitamins and minerals gave it the superiority over other types of dates (Al-Shahib and Marshall, 2003; Abdu, 2011). Experimental studies proofed that Ajwa date extract (ADE) have strong antioxidants (Al-Farsi et al., 2005; Chaira et al., 2009; Ragab et al., 2013), anticancer (Ishurd et al., 2004) and antiviral (Vayalil, 2002) activities. These activities were attributed to the high contents of polyphenols, flavonoids, and flavones present in the ADE which helps in free radical scavenging. However, studies on its protective effect on liver toxicity are scarcely presented (Abdu, 2011).

Main Text

Aim: This study aims to investigate the protective effect of ADE against hepatotoxicity induced by CCl4.

Materials and methods

Chemicals: CCL4 dissolved in corn oil at 1: 1 percent was injected intraperitonealy at a dose of 1.2 ml/ kg of body weight 3 times a week.

Dates: Ajwa date (Phoenix dactylifera L.) fruits were obtained from Almadina AlNabawiah, Saudi Arabia. Flesh of the fruits was left in distilled water (1:3) for 48 hours in 4°C (Al-Qarawi et al., 2005). The whole solution was grinded, then centrifuged at 4°C for 20 min at 4000 rpm. The supernatant was collected and stored at -80°C till use (Vayalil, 2002). Animals were given the extract at a dose of 1g/kg/day by gastric gavages, which is equivalent to 7 dates per person per day (Abdu, 2011). The starting point for administration of both CCL4 and ADE was the same.

Animals: Fourty adult male Wistar rats (Rattus norvegicus) (240 gm to 306 gm body weight) were obtained from the Experimental Animal House Center, King Abdul-Aziz University, Jeddah, Saudi Arabia. Rats were housed in polyethylene cages (5 rats/cage) with stainless steel wire tops and were allowed commercial standard diet and water ad-libitum. Rats were housed under standard laboratory conditions (room temperature 22 ± 2 0C°, humidity 55 ± 5L, 12 hours light/dark cycle). Standard care methods were used to maintain the animals healthy and free of infections.

Experimental groups: Animals were divided randomly into five groups (eight rats each) orally treated by gastric gavage for four weeks (5 days/week) as follows: Rats of the control group (G1) received ordinary diet; rats of the second group (G2) received CCl4 intraperitoneally for four weeks, the third group (G3) received CCl4 for twelve weeks. The fourth group (G4) received CCl4 and ADE for four weeks and the fifth group (G5) received CCl4 and ADE for twelve weeks. Animals were anaesthetized by diethyl ether inhalation and sacrificed and samples were collected at the 4th and 12th weeks of treatment (four animals each time).

Biochemical analysis. Blood samples were collected from the orbital sinus using a fine-walled Pasteur tubes. Serum SGPT, SGOT and albumin were measured using the commercially available kits. Image analysis of the area occupied by collagen fibers. Quantitative assessment of liver fibrosis was performed with morphometry on sections processed with Masson's trichrome stain, which specifically stains collagen fibers (James et al. 1986). The data were obtained using Leica Qwin 500 image analyser computer system (England). The image analyzer was first calibrated automatically to convert the measurement unites (Pixels) produced by the image analyser program into actual micrometer units. Using the measurement menu (the area, area %) and standard measuring frame of a standard area equal to 763882 µm2 were chosen from the parameters. In the chosen field the Masson's trichrome stained areas enclosed inside the standard measuring frame were measured. These measurements were done using an objective lens of magnification 4. The % of the fibrosis area over the whole observed field was assessed to represent the degree of hepatic fibrosis. Several readings were obtained in each specimen (6 sides per animal and at least ten random fields was measured in each slide) (Muller et al. 1988).

Statistical analysis: The data were analyzed by using the SAS software package (SAS, 1999). ANOVA analyses were used to compare the mean of the studied variables (SGPT, SGOT and albumin) among the studied five groups. The level of statistical significance was defined as ($P \leq 0.05$) highly significant at ($p < 0.01$) and very highly significant at ($p < 0.001$). Scheffe grouping was used to detect the individual significant difference among the studied groups. Box plot was also depicted to show and compare the central tendency and dispersion measures among all the studied groups.

Light Microscopy:The abdominal wall was dissected. Liver samples were removed from each rat and fixed in 10% neutral buffered formalin solution then processed up to paraffin blocks. Tissue sections were cut at 3-5µm and stained with haematoxylin and eosin (H & E) and Mallory stain (Bancroft, 2007).

Results:

Biochemical analysis: The relations between SGPT, SGOT and Albumin mean values are shown in Table (1) and Figs. 1a,b and c.

Studied factor	G1	G2	G3	G4	G5	P value
SGPT	39.5 ± 3.4	84.2 ± 6.7	166.4 ± 7.3	73.2 ± 5.3	56.7 ± 7.1	<.0001*
SGOT	68.7 ± 2.7	133.2 ± 13.3	235.6 ± 22.0	112.8 ± 13.9	84.4 ± 6.5	<.0001**
Albumin	3.7 ± 0.3	3.5 ± 0.4	2.4 ± 0.2	3.02 ± 0.2	2.5 ± 0.4	<.0001***

Table (1): Comparison of the mean of SGPT, SGOT and albumin among the studied group of rats

*Highly significant difference between group 1 and other studied groups, but no significant difference between groups 2 and 4.

**Highly significant difference between group 1 and groups 2, 3 and 4, but no significant difference between group 2 and 4, groups 4 and 5, and groups 5 and 1.

***Highly significant difference between group 1 and groups 3, 4 and 5, but no significant difference between groups 1 and 2, groups 4 and 5, groups 5 and 3 and groups 2 and 4.

Table 1 shows the comparison of the mean of the studied variables (SGPT, SGOT and albumin) among the studied five groups of rats. There have been highly significant differences of the mean of all studied variables in the studied groups with p <.0001. For SGPT, the highest mean level was among group 3 (166.4 ± 7.3) and the lowest level was among group 1 (39.5 ± 3.4). No statistically difference, however, was observed for SGPT between groups 2 and 4. The mean SGOT level was also the highest in group 3(235.6 ± 22.0) and lowest in group 1 (68.7 ± 2.7). It showed significant difference with groups 2, 3 and 4, but no significant difference between group 2 and 4, groups 4 and 5; and groups 5 and 1. For

albumin, its highest level was in group 1 (3.7 ± 0.3) and lowest level in group 3 (2.4 ± 0.2).
There has been significant difference between group 1 and groups 3 and 4 and 5. No significant differences, however, were observed between groups 1 and 2, groups 4 and 5, groups 5 and 3 and groups 2 and 4. The control group showed the lowest level of both SGPT and SGOT and highest level of albumin. CCl4 treated group for 12 week group (G3) showed the highest level of SGPT and SGOT. It also showed the lowest level of albumin. This changes indicted severe liver affection. ADE received groups (G4 and G5) showed lower changes in the level of both enzymes (SGPT and SGOT) compared to the CCl4 only treated groups (G2 and G3).

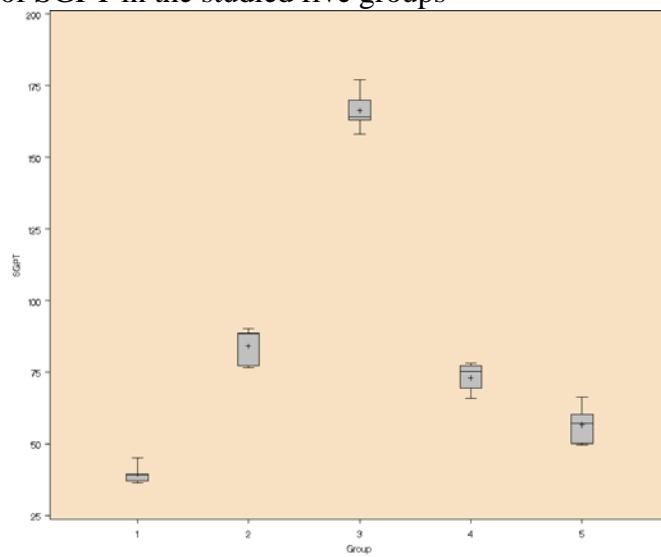Figure 1a: Box plot of SGPT in the studied five groups

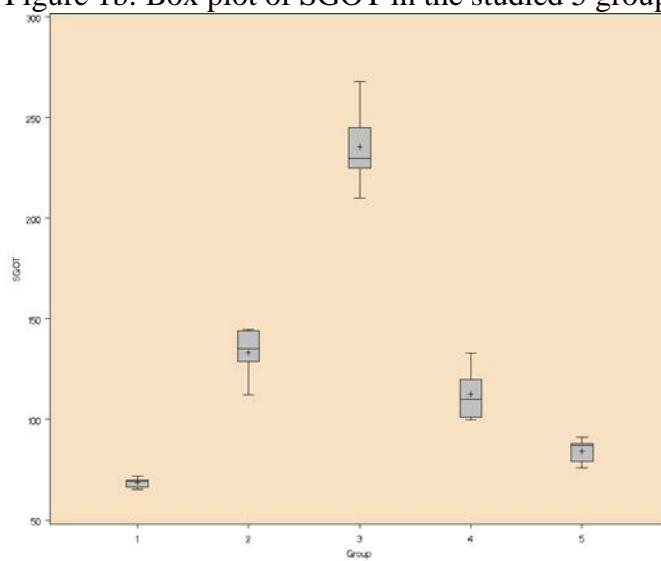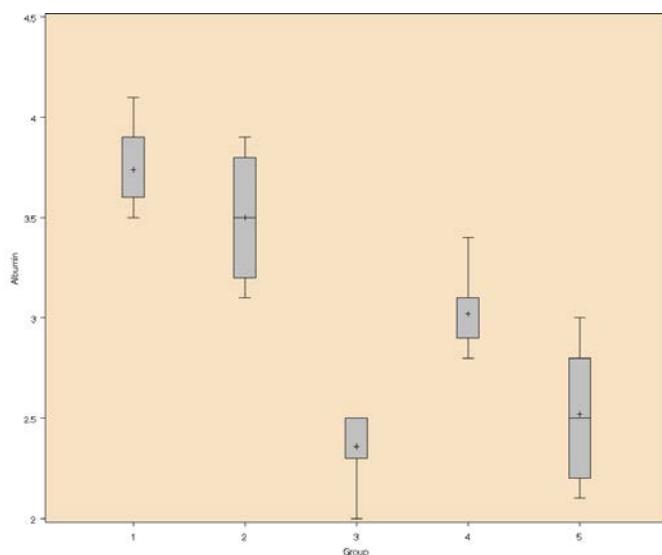Figure 1b: Box plot of SGOT in the studied 5 groups

Figure 1c: Box plot of albumin in the studied 5 groups

Light microscopy

Examination of liver sections from the control group at low magnification revealed normal histological appearance of hepatic tissues with normal hepatocytes arrangement in relation to the central veins and sinusoids (Figs. 2 and 7).

Liver sections from CCL4-alone treated rats (Groups 2 and 3) at four weeks after treatment showed loss of general architecture structure of the hepatic pattern and dilatation of the sinusoids. The cells showed pale cytoplasm and intracellular vacuolations (Ballooning degeneration) (Fig. 3). At the end of the 12th weeks, the liver sections showed increased hepatic cellular swelling as well as cytoplasmic vacuolization and degeneration (ballooning degeneration). Moreover, loss of the general architecture structure of the hepatic pattern was also noticed compared to the controls (Figs.4). Many necrotic cells manifested by the deep eosinophilic staining quality of the cytoplasm and the smaller, condensed and intensely basophilic stained nuclei. Pyknotic nuclei and well as disappearance of the nuclei of other cells were also common.

On the other hand, the groups treated with CCL4 and ADE (Groups 4 and 5) at the end of the 4th week showed almost normal architectural structure of the hepatic tissues with distinct hepatocyte strands in many parts. Many histological alterations including dilatation of the central veins and sinusoids, ballooning degeneration and nuclear pyknosis were enormously reduced when compared to group 2. Meanwhile, some vacuolated hepatocytes and limited degenerative cells were also observed (Fig 5). At the end of the 12th week many parts of the liver sections showed normal architecture structure of the hepatic tissues with distinct hepatocyte strands. Many histological alterations including tissue congestion, dilatation of the central veins and sinusoids, necrosis and nuclear pyknosis were enormously reduced together with obvious decrease in the inflammatory changes and the extent of the lesions of the liver tissues compared to CCL4-only treated groups. Meanwhile, some vacuolated hepatocytes (Fig. 6) and limited degenerative cells were also recorded.

Masson trichrome stained sections showed the bluish stained fibrous tissue of variable amounts at 12 weeks of treatment in both group 3 and 5 being more obvious in group 3 indicating increased fibrosis (Figs. 8 and 9).
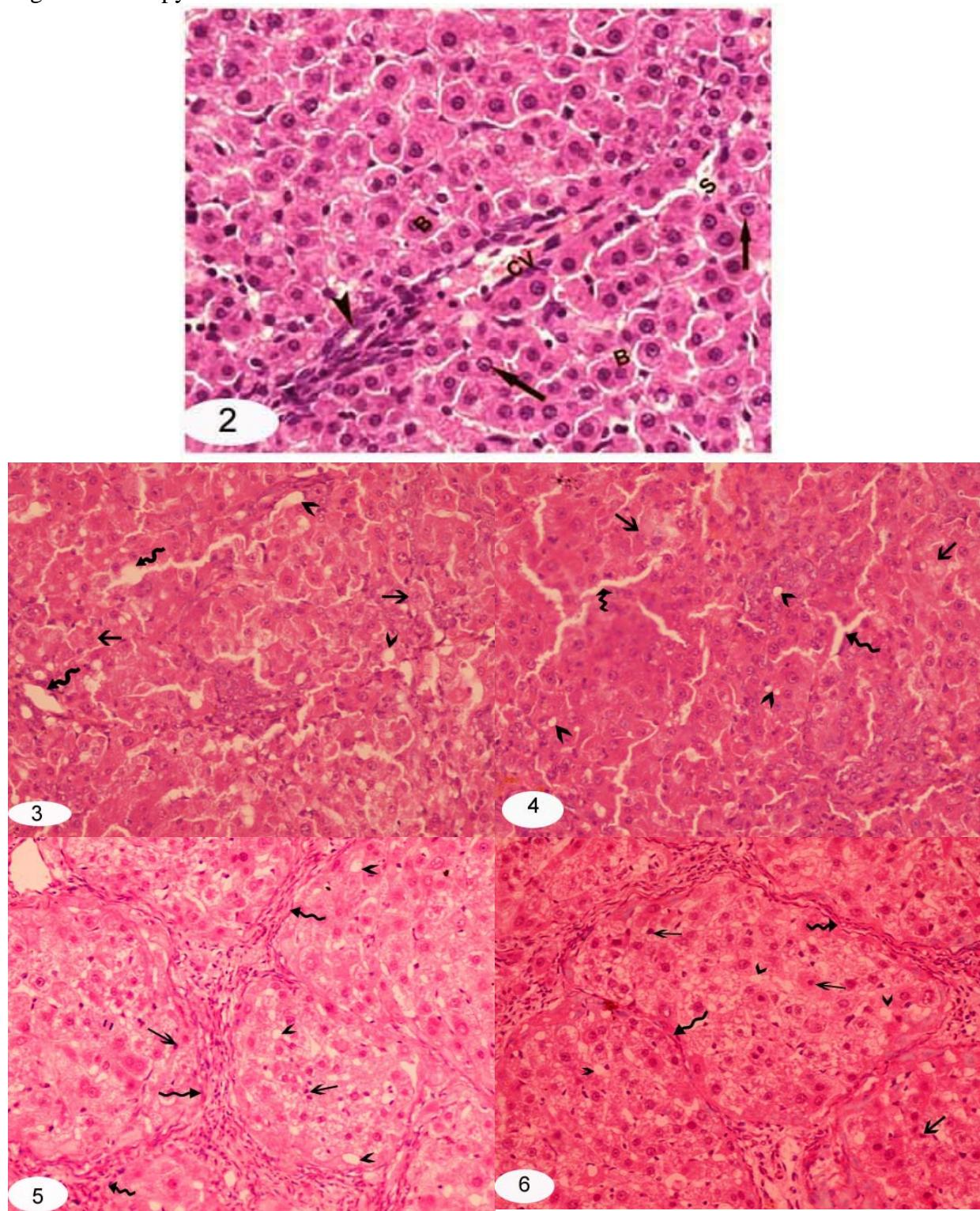
Light microscopy

Fig.2 A photomicrograph of a section in liver of G1 rat showing the apparent normal arrangement of hepatocytes with vesicular nuclei (arrows), some cells are binucleated (B). The cells forms cords around the sinusoids (S), the central vein (CV) and bile canaliculus (arrow head).

     Fig. 3 Liver section of G2 rat at 4 weeks showing loss of the normal arrangement of hepatocytes with dilated sinusoids (curved arrows). Most cells have pale cytoplasm (arrows). Some cells show intracytoplasmic vacuoles (arrow heads).

     Fig. 4 A photomicrograph of a section in liver of G3 rat at 12 weeks showing loss of the normal arrangement of hepatocytes with dilated sinusoids (curved arrows). Some cells shows deep eosinophilic cytoplasm with small condensed nuclei (arrows). Some cells show intracytoplasmic vacuoles (arrow heads).

     Fig.5 Liver of G4 rat at 12 weeks showing loss of the normal arrangement of hepatocytes with increased fibrosis (curved arrows). Some hepatocytes have pyknotic nuclei (arrows). Most cells show intracytoplasmic vacuoles (arrow heads).

     Fig.6 A photomicrograph of a section in liver of G5 rat at 12 weeks showing loss of the normal arrangement of hepatocytes with less amount of fibrosis (curved arrows). Some hepatocytes have eosinophilic cytoplasm and pyknotic nuclei (arrows). Most cells show intracytoplasmic vacuoles (arrow heads).
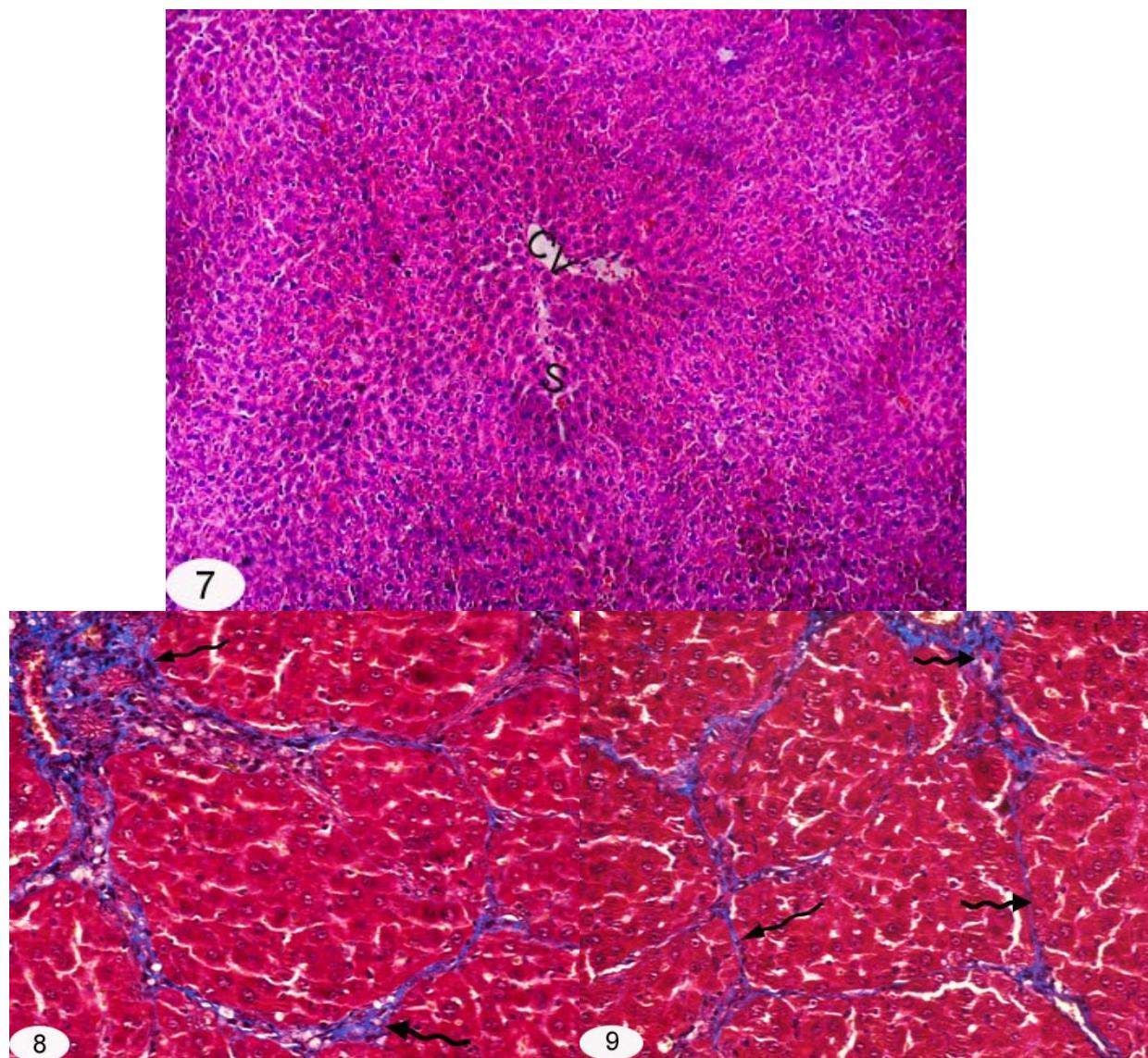

     Fig. 7 A photomicrograph of a section in liver of G1 rat showing the normal arrangement of the hepatocytes in relation to the central vein (CV) and sinusoids (S). Note

the absence of blue stained fibers.   (Masson trichrome stain x 100)

Fig. 8 A section in liver of G3 rat at 12 weeks showing the bluish stained fibrous tissue (curved arrows).

Fig.9 A photomicrograph of a section in liver of G5 rat at 12 weeks showing small amount of fibrous tissue (curved arrows). Compare to G1 & G2   (Masson trichrome stain x 400)

Image analysis of the area occupied by collagen fibers:

Image analysis of Masson's trichrome stained sections of the control rats revealed that the area occupied by collagen fibers was 3.128 ± 0.781.

The area occupied by collagen fibers was significantly increased with administration of CCL4 in group 2 (3.828 ± 0.844) compared to the control. Administration of CCl4 for 12 weeks in group 3 caused a very high significant increase in area occupied by collagen fibers (6.24 ± 0.987) as compared with the control.

ADE and CCl4 treated groups (group 4 and 5) showed high significant increase in the area occupied by collagen fibers (4.712 ± 0.797 and 4.365 ± 1.16 respectively) in comparison with the control.

Table (2):- Morphometric quantitative measurements of liver fibrosis in animal groups stained with Masson's trichrome stain.

Group	Area %			P value
	Min.	Max.	M±SD	
Group 1	2.397	4.599	3.155 ± 0.772	-
Group 2	1.181	3.666	3.944 ± 0.834	p< 0.05*
Group 3	0.977	7.214	6.344 ± 0.996	p< 0.001***
Group 4	1.488	5.465	4.801 ± 0.898	p< 0.01**
Group 5	1.045	4.541	4.065 ± 1.26	p< 0.01**

Table 2: Area %: represent the degree of hepatic fibrosis, the results are represented as mean value± SD:-

(*) significant at ($p < 0.05$), (**) highly significant at ($p < 0.01$), (***)   very highly significant at ($p < 0.001$).

Discussion

The presented study investigated the in-vivo protective effect of AlMadinah Alnabawiah Ajwa dates extract against hepatotoxicity induced by CCL4.

Carbon tetrachloride is known to cause liver damage by inducing tissue necrosis through oxidative damage in liver cells. It is widely accepted that CCL4 causes lipid peroxidation through generating the release of reactive oxygen species which damage the mitochondrial and cytoplasmic membranes causing more severe oxidative damage in the tissues and consequently, releasing lipid hydroperoxides into circulation (Domitrovićа et al., 2009).

Furthermore, protein modifications elicited by direct oxidative attack lead to the formation of protein carbonyl derivatives and protein carbonyl content (Radice, et al., 1998). This liver cell injury usual initiate activation of either resident or blood-derived phagocytes increases the steady-state concentration of fibrogenic cytokines, which recruit a large amount of fibroblasts and fibroblast-like cells for excess production of extracellular matrix.

Liver fibrosis is created not only as a consequence of the changes in the secretion of matrix, but also from changes in its degradation, which means a loss of the dynamic functional balance between fibrogensis and fibrolysis (Arthur, 2002). During the development of fibrosis, the capacity of the degradation is not eliminated, but is reduced (Batallar and Brenner, 2001). On this basis, the increase in the amount of the collagen fibers

could be the net result of two different processes formation of new fibers and degeneration of the already formed ones. With continous and repeated injury, the formation of new fibers predominated and the degradation of the already formed fibers decreased. The terminal outcome of liver fibrosis is the formation of nodules encapsulated by fibrillar scar matrix (Tsukamoto, 1999). The progression of fibrosis observed in the CCl4 control group suggests development of an irreversible fibrosis.

Ajwa date fruits are widely consumed in the Arab world. Ajwa has been mentioned in prophetic medicine. Its strong strong antioxidant activity is related mainly to its rich contents of carotenoids, phenolics, melatonin and vitamins (Hoehler and Marquardt, 1996; Grosse et al., 1997; Meki and Hussein; 2001; Al-Farsi et al., 2005; Sutken et al., 2007; Chaira et al., 2009 and Abdu, 2011). Melatonin was found to be an efficient protector of DNA (Lopez-Burillo et al., 2003), protein and lipids in cellular membranes (Cuzzocrea & Reiter, 2001). It also acts as an antagonist and supressor of a number of endogenous and exogenous free radicals generated during cellular process (Zang et al., 1998 and Guo et al., 2003).

Looking at liver function test in the present study (Table 1), the biochemical profile showed marked increase in serum SGPT and SGOT and a marked decrease in albumin in the CCL4 intoxicated group. These results are attributed to the toxic oxidative stress of CCL4 on liver cells as shown in the histopathological results. This is in agreement with the results obtained by other investigators (Domitrovića et al., 2009). The detected significant reduction in the serum enzymes' level by Ajwa extract could be attributed to a decrease in the lipid peroxidation of hepatocellular membrane induced by the CCL4. Furthermore, it may be attributed to the accelerated repairing and regeneration of damaged hepatocytes, this is in concurdance with other researchers (Zang et al., 1998; Cuzzocrea & Reiter, 2001; Abdu, 2011).

Histopathological evaluation showed that liver was target organ for CCL4 toxicity. Analysis of the liver sections stained with Masson's trichrome stain revealed a progressive increase in the amount of fibrous tissue with increasing the duration of CCL4 treatment. At the 12th week, fibrosis was most obvious. However ADE combination with CCL4 decreased the area occupied by collagenous fibers (Table 2).

Comparing the biochemical and histopathological results of the animal groups show that improvement in the ADE treated groups on the biochemical level exceeds that on the histopathological level. This may be due to the fact that biochemical parameters may not reflect the degree of tissue damage (Murayama et al., 2007).

These results are of significant clinical importance, suggesting that the classical biochemical parameters such as serum minotransferase activities are not a reliable indicators of chronic liver damage (Domitrović et al., 2009).

The overall results showed that CCL4 intoxicated group treated with ADE showed significant minimization of CCL4 induced changes in both enzyme and histopathological levels. These results could be explained by the protective role of ADE which significantly decreased the blood levels of CCL4 compared to non treated CCL4 intoxicated groups. This implies the possible chelating effect of ADE in addition to its role as a natural antioxidant, antimutagenic and immune system stimulator (Saafi et al., 2010; Rock et al., 2009 and Ragab et al., 2013).

Conclusion

The presented study has shown that ADE had significant protective effect against CCL4-induced changes in the liver. This effect may be due to the rich vitamins and antioxidants in the extract. This study highlights the interest to change toward the use of natural medicinal plants with antioxidant activity for protection against diseases. This may

provide a scientific base for the conventional use of ADE as a nutritional protocol of management.

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THERAPEUTICAL ASPECTS IN CONVENTIONAL REMOVABLE TREATMENT

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Abstract

Conventional dentures represent the most common prosthetic solution for edentulousness, therefore they should reestablish all functions of masticatory system considering the changes caused by the age and edentation.This paper aims to assess every possibility to reconstruct the edentulous arches in order to recover all functions, the study being conducted on a group of 46 patients,adopting an individualised treatment plan for each other.

Keywords: Edentuous patients, removable dentures, denture wearers

Introduction

Reconstructing the edentulous arches is a very serious issue for the elderly patient because of the difficulties that may occur during the process of making the dentures, reestablishig the vertical dimension, recovering the facial aspect modified with age, cleaning and maintaining the dentures, all problemes due to the third age.

Material and Method

The study was conducted on a group of 46 patients, 19 men and 27 women, with complete or subtotal edentation , denture weares or not, with ages over 60 years old, average age being 70,3.

AGE	MEN	%	WOMEN	%
60 – 70	6	31,57	14	51,85
71 – 80	9	47,36	8	29,62
>81	4	21,05	5	19,61

Tabel I:Distribution of patiens by age and sex

Each patient was throughly examined and everything was wrote down in a clinical paper, with information about the general and local exam, diet habits, situation of arches and denture(if case), age, adaptation, comfort, quality and quantity of saliva, etc.

Clinical local exam was completed with paraclinical exams (cast for study, orthopantomography, tomography for temporomandibular joint) which determine the final diagnosis. The treatment was conducted taking into consideration the age, sex, general

conditions. Patients with general state of health influenced were supllimetary observed in order to ensure the quality of the treatment.There were choosen simply solutions, sustainable, easy to manipulate, which does not change much the cranio mandibular existing rapports amd the masticatory type.

In patients with good general state of health the prosthetic treatment considered the geroindex, with minor cautions for profilaxy and efficacy.

There were taking into account the :

1.the reason for which the patient came in

2.state of oral and denture hygiene

3.the existing teeth and their prosthetic value

4.the patient attitude towards the previous treatments

Results

The repartition of the patients by age and sex proves a preference for feminine sex(58,69%) while the male was 41,30% as in tabel I.The patients were framed by sex, age and general state of health

SEX	State of health influenced			Total	Good state of health			Total
	60-70	71-80	>80		60-70	71-80	>80	
Male	4	6	4	14	2	3	-	5
Female	8	5	5	18	6	3	-	9
Total	12	11	9	32	8	6	-	14

TabelI I:Distribution of patiens by age, sex and general health

Age	Patients	Geroindex			Oral health			
		Subunit	Normal	Higher	Complete edentation bimaxillary		Complete/sub or extended unimaxillary	
					Treated	Not treated	Treated	Not treated

60-70	20	8	9	3	1	8	5	6
71-80	17	7	8	2	7	2	3	5
>80	9	9	-	-	6	-	3	-
Total	46	24	17	5	14	10	11	11

Tabel III:Distribution of patiens by geroindex and oral health

Statistics proves that from 46 examined patients, 24 of them had a stressed geroindex, 17 of them were near the normal limits and 5 were younger than their biological age.

The oral exam showed facial changes caused by age and edentation:lower inferior floor, facial asymmetries,stressed wrinkles and ditches, reduced lips, etc

Fig.1I.C. 76 years

Fig.2 I.P. 82 years

Fig.3 C.E.73years   Fig.4 G.F. 71 years

Intraoral evaluation of the prosthetic field allowed us to fit them using Sangiuolo classification and Kennedy –Apllegate , Koeler-Rusov and Schroder also.The existing remaining teeth caused problems in using special devices for support, maintenance and stability.

Fig.5,6-prosthetic fields

Fig.7,8-prosthetic fields

Examination of old dentured revealed many times disastrous, degraded ones, with incorrect retentoin elements, with tartar deposits, porosities that emphasises the irritating effect on the mucosa.The occlusal raports were changed and caused the instability and the lower masticatory efficiency.

Fig.9,10-old dentures

Denture age	Cases	Stability	Instability			
			Large flanges	Errors	Vertical dimension and modified occlusion	Lack of fitting
0-5	9	2	4	2	1	-
5-10	8	1	2	1	2	2
>10	8	-	-	-	5	3
TOTAL	25	3	6	3	8	5

Tabel IV:dentures evaluation

Medical education for the elderly was done by simple dialogues, with a lot of patience and tact. We presented the techniques for oral and denture hygiene, which were better understood by the patients with low geroindex, because they learn these on their natural dentition and remembered it even now and even than the conditions were changed.

We insisted on some general rules for prevention:

►well balanced life style, avoiding sedentariness with daily long walks

►gymnastics

►massages, balnear treatment

►avoid stress and overloading –factors of premature wear of organism

►good food ration, with a lot of vitamins, less salt, fats and more proteins and minerals

The type of denture was commended by the state of hygiene and the prosthetic value of remaining teeth, partial dentures being recommended when teeth were with a low value and hygiene index lower than 1.

Reduced lower face floor and malocclusion asked for a exploratory redimension of the facial floors We also used graphic method for determining central relation in some of the patients, with incorrect muscular pattern.

Fig.11-determining centric relation

We used overdentures were teeth were correct treated and covered with capes**.**

Fig.12,13-overdentures

If not we extracted the teeth and made an immmediate denture which lead to a better acceptance of the denture.
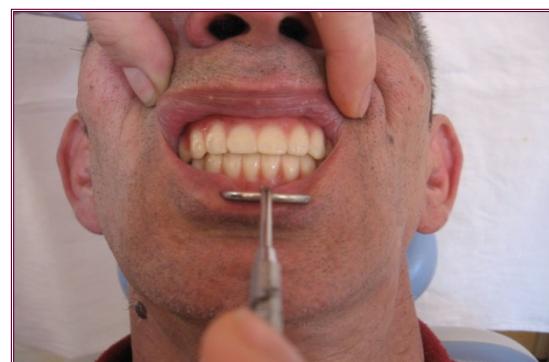

Fig.14,15-immediate denture

Conclusions

Recovering the arches is very difficult especialy for elderly because of the stability and maintenance problems , because of the reduced lower facial floor and because of the problems caused by change position of the mandible

In patients with old dentures, making them new ones wasn't always a good solution, because they were used with old ones and their flowes and couldn't accept the correct dentures. After the correct treatment is very important to also tracking down the patients and see the way they adjust to their new situation, the way that the dentures remake the functionality of the stomatognat system, state of oral health and oral mucosa.

Prosthetic treatment for the elderly must have an integrative concept and not a standard one, being necesary an individualized treatment for each patient and for every stage of the treatment being adjusted for the main reason the patient came in, adjusted to their general health, their oral hygiene and attitude towards the previous treatments.

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PERCEPTIONS OF SEXUAL BEHAVIOR AND KNOWLEDGE ABOUT SEXUALLY TRANSMITTED INFECTIONS AMONG YOUNG PEOPLE IN TIRANA, ALBANIA

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Abstract

The level of sexual activity and the incidence of sexually transmitted diseases (STDs) are high among Albanian young people, but use of reproductive health services is low. Information about their attitudes and experiences is needed for the design of youth-friendly programs.30 focus group discussions were conducted among young people aged 14-19 attending gymnasiums in Tirana City. The discussions explored the adolescents' perceptions of sexual behavior among their peers, their knowledge of STIs and their preferred means of preventing and treating STIs. The participants perceived that sexual activity is common among their peers. They noted that although physical attraction is the main reason for romantic relationships (which might include sex), the desire for material or financial gain is the primary motivation for sexual relationships. The young people had some knowledge about STIs, especially HIV and AIDS, but many believed infections were inevitable. When they had an STI, non educated young people went to traditional healers; they were unlikely to seek treatment from doctors because of high cost, slow service, negative provider attitudes toward young people and a perceived lack of confidentiality. The participants considered media campaigns as the best way to educate young people about STIs and condom use.

Keywords: Perceptions, knowledge, young people, STIs, Tirana

Introduction

The Republic of Albania is a small country located on the Balkan Peninsula in south-eastern Europe. It has a surface area of 28,748 square kilometers. It shares a 172 km border with Montenegro to the north-west, a 115 km border with Kosovo to the north-east, a 151 km border with Macedonia to the north and east, and a 282 km border with Greece to the south and south-east.

The health system in Albania is mainly public. The state is the major provider of health services, health promotion, prevention, diagnosis and treatment. The private sector, which is still developing, covers most of the pharmaceutical and dental services, as well as some clinics for highly specialized diagnosis, mostly in Tirana and one or two other major cities. The Ministry of Health (MoH) is the leader in health policy development and planning and in the implementation of health strategies.

After the fall of Communism in Albania, family planning was legalized under government order no. 226, in May 1992. Since January 1993, based on an order from the Ministry of Health, contraceptives have been distributed free in all government health centers and social marketing of contraceptives has been implemented throughout the country. In 2008-09, contraceptives were available from three sources: the government (at no cost), social marketing programmes (at subsidized prices), and the commercial for-profit sector (at market prices).

The public sector provides pills, condoms, and injectables free of charge in over 431 public health facilities—hospitals, polyclinics and health centers, and some health posts (ambulances)—and tubal ligations and intrauterine device (IUD) insertions in facilities with trained obstetricians/ gynecologists. The National Logistics Management Information System collects service statistics as well as contraceptive logistics information that enable the Ministry of Health to estimate national contraceptive requirements and to monitor the progress of the national family planning programme.

Main Text

The Ministry of Health has taken the lead in strengthening contraceptive security to ensure a lifetime supply of contraceptives for all Albanians who need them. As part of these efforts, in 2003, the Ministry of Health approved the national strategy on securing contraceptives. The Ministry of Health has regulated family planning policy and budgets to achieve contraceptive security. This was done in a step by step manner by assuming the cost of procuring public sector contraceptives. The share of contraceptives provided by UNFPA, the only contraceptive donor for the public sector, has decreased correspondingly. Today, the Ministry of Health covers 80 percent of contraceptive procurement costs for the public sector and by 2010 Albania will be completely self-sufficient and independent of outside donor support for provision of contraceptives.

Acquired immune deficiency syndrome (AIDS) is caused by a human immunodeficiency virus (HIV) that weakens the immune system, making the body susceptible to and unable to recover from other diseases. HIV/AIDS is an international pandemic, with cases reported from every country. As of the end of 2012, Albania was still considered a low HIV prevalence country. However, there is an upward trend in the number of new case diagnosed, and estimates indicate higher numbers of undiagnosed cases. As of November 2008, 291 persons were diagnosed with HIV in Albania. About 90 percent of HIV infections occurred as a result of sexual contact (Epidemiological Situation Report, IPH, 2009).

Most cases of HIV in Albania have been diagnosed among women and men age 25-44. Since 2000, however, an increasing proportion of women have contracted HIV/AIDS. Sixteen cases of mother-to-child transmission have been identified (Epidemiological Situation Report, IPH, 2009). The National Programme for Prevention and Control of HIV/AIDS (NPPC) was established at the Institute of Public Health (IPH) by the Ministry of Health (MoH) in August 1987 with direct support from the World Health Organization (WHO). The programme aimed to establish a comprehensive, organized, and scientific, evidence-based prevention and control programme for HIV/AIDS.Highlights in the development of Albania's national programme include: The recruitment of a multidisciplinary team of physicians, epidemiologists, psychologists and social workers at IPH with the responsibility for coordinating HIV/AIDS prevention activities and monitoring Albania's epidemiological situation.

The establishment in 2003 of an inter-ministerial HIV/AIDS committee which aimed to strengthen political efforts for fighting HIV/AIDS.

Establishing Albania's Country Coordinating Mechanism (CCM), this meets regularly, with participation of government, non-governmental organizations (NGOs), and people living with HIV/AIDS. The establishment of the CCM paved the way for Albania's successful application for a Global Fund grant of approximately US$5 million to be monitored by IPH and to be implemented in two phases over five years beginning in early 2007.

The strengthening of the behavioral and biological surveillance system through second generation surveillance and the establishment of a single monitoring and evaluation

system in 2005.The provision of free medical treatment for patients with AIDS since 2004 with support from foreign donors and UN agencies.

The third national conference on HIV/AIDS, which took place in March 2012, adopted the National Strategy for HIV/AIDS Prevention and Control in Albania, which was revised in 2008. There is a detailed implementation plan relating to this strategy. The key implementation structure is the NPPC, located within the Institute of Public Health.

Several studies have reported that modern methods are more widely known by women than traditional methods: 95 percent of women have heard of at least one modern method, compared with 84 percent who know of a traditional method. Among women, the most widely known modern contraceptive methods are the male condom (88 percent) and the pill (85 percent), while withdrawal (84 percent) is the most commonly known traditional method. Female sterilization (58 percent) and injectables (57 percent) are known by almost six in ten women, while the IUD is known by more than one-third (35 percent) of women. Only 28 percent of women have heard of the lactation amenorrhea method (LAM) or emergency contraception. The least known modern methods are male sterilization (16 percent), the female condom (15 percent), and implants (7 percent); the least known traditional methods are rhythm (19 percent) and folk methods (less than 1 percent).As with women, modern methods are more widely known to men than traditional methods.For example, 97 percent of all men have heard of at least one modern method, while only 92 percent know of a traditional method. Among all men, the most widely known modern method is the male condom (96 percent), while withdrawal (92 percent) is the most commonly known traditional method. Pills are known by 59 percent of men, while female sterilization and emergency contraception are known by 37 and 33 percent, respectively. Around one in four men has heard of male sterilization, injectables, and the rhythm method. The least widely known methods are LAM, IUD, and female condom (9 percent, each), and implants (5 percent).

The new national law on HIV and AIDS was proclaimed in July 2008. This law addresses prevention and control of the spread of HIV, and related social issues. The prevention programme is coordinated by the Ministry of Health but, importantly, involves key line-ministries and institutions such as the Ministry of Education and the Ministry of Social Affairs. The law also provides social and financial care and support to people living with HIV, which is based on fundamental international standards.

Knowledge of AIDS although not universal is high in Albania, with 93 percent of women and 94 percent of men reporting that they have heard of AIDS.The level of awareness of AIDS does not vary substantially by age or marital status, although never-married women and men who have had sexual intercourse (99 and 98 percent, respectively) are more likely to have heard of AIDS than never-married women and men who have never had sexual intercourse (94 and 91 percent, respectively). Respondents in urban areas are more likely to have heard of AIDS than those in rural areas (98 percent of both women and men in urban areas, compared with 90 percent of women and 91 percent of men in rural areas). Women and men in the Mountain region (88 and 85 percent, respectively) are least likely to have heard of AIDS, while those in Urban Tirana are most likely to have heard of AIDS (99 percent for both women and men). The level of awareness of AIDS increases substantially with education among both women and men. Almost all women with university or higher education (>99 percent) have heard of AIDS, compared with 76 percent of women with no education or primary 4-year education. Similar proportions are seen for men with university or higher education (>99 percent), compared to men with no education or primary 4-year education (75 percent). Knowledge of AIDS increases with household wealth status (wealth quintile).Several hypotheses have been offered to explain the high rates of sexual activity and STI infection among Albanian Young people, such as Albanian's deteriorating socioeconomic situation, the traditional values, the early onset of menarche, a widening gap between age at

menarche and age at marriage, infrequent and ineffective use of barrier contraceptives and the decreased value placed on virginity. To date, however, few studies have investigated young people's perceptions of the problem.To design appropriate interventions, it is important to know about youth' knowledge of and experience with STIs and about their health-seeking behavior related to STIs. For example, we need information about adolescents' knowledge of and attitudes toward using condoms for STI prevention, their use of various types of health providers for the treatment of STIs and their attitudes toward partner notification. It is widely recognized that Albanian youth do not use existing reproductive health services. This poor utilization of public services is probably largely attributable to the fact that such services do not specifically address the needs and concerns of adolescents.Eliciting young people' views on reproductive health in communities where sexuality is not openly discussed can be problematic. A quantitative research design yields limited information on this complex and sensitive topic because it is less likely to provide detailed explanations for observed patterns of behavior. Therefore, carefully conducted focus group discussions in which people discuss perceptions and behaviors of their peers may uncover behavior and knowledge related to reproductive health. In this study, we use focus groups to provide deeper insight into adolescents' perceptions, knowledge and experience regarding STI acquisition, symptoms, prevention and treatment.This study was carried out among youth attending gymnasiums in Tirana, the capital of Albania. In, which was part of a larger investigation of the determinants of sexual activity and treatment-seeking behavior related to STIs among youths, focus group discussions were held with male and female young people in 6 gymnasiums in the Tirana city. Before the study began, we explained it in detail to the principals and staff of the schools. In each school that agreed to take part, a teacher designated as the study coordinator described the research to students, chose the student participants and made arrangements for the focus groups. The students who were asked to participate in the group discussions were those perceived by study coordinators as likely to provide the most information.30 focus groups were conducted in 6 gymnasiums in the Tirana city. The 300 focus group participants were aged 14-19, with an average age of 16.8 years for females and 17.3 years for males. The size of the groups ranged from 8 to 12 students. The focus groups were conducted in English, the language used by teachers and students in the schools. The comments on each issue were then compared by sex. Results were also compared across grade levels; differences between lower and higher grades were minimal.The focus group discussions centered on young people perceptions and beliefs regarding sexual behavior among their peers and the reasons for the patterns of behavior they observed. In addition, we elicited information on how these young people recognized and labeled STI symptoms, how they made choices among various methods of STI prevention and treatment, and which methods and places of treatment they preferred. Specifically, we sought information on young people' knowledge of and attitudes toward the use of condoms for STI prevention. Finally, the discussions addressed young people's opinions on how to increase access to various reproductive health services and on their preferred methods of acquiring reproductive health information.Participants first discussed sexual behavior among youth in their communities. They generally agreed that sexual activity was common among their peers. Males were more likely to state that levels of sexual activity were higher among males than among females, and females felt that the reverse was true. Some students gave reasons for the high degree of sexual activity, including the perception that sex was a way to act like a grown-up. The vast majority agreed that in their communities, people began having sexual intercourse at an early age. The discussions reflected a general perception that males began having intercourse at a younger age than did females; the most commonly stated age of sexual debut for females was 15-16, compared with 14-15 for males. Some females remarked that their peers first had sex with older partners then became involved with males in their own age-group. The main reason

participants gave for romantic relationships (which might or might not involve sex) was attraction; material or monetary gain was the most common reason cited for sexual relationships, although peer pressure was also frequently mentioned. There was no clear consensus on whether males or females were more likely to initiate sex, although some males said that males initiated sex more frequently than did females. The focus groups covered perceptions about sex with strangers and sex with multiple partners, including how common and how risky these behaviors are. There was a greater variety of opinion about these behaviors than about sex with a regular partner. Some participants thought that many of their peers had sex with strangers, while others disagreed; there was greater agreement that sex with multiple partners was common. Some participants stated that sex with multiple partners was more common among males than among females. Some of the reasons given for engaging in sex with strangers and multiple partners resembled those given for sexual relationships with a regular partner. Material or monetary gain was cited as the most common reason for these behaviors among both males and females. Other reasons cited for sex with strangers and multiple partners included sexual pleasure or satisfaction and variety. In discussing the risks of having sex with multiple partners and strangers, many participants reported feeling a sense of vulnerability to STIs and AIDS. In some of the groups, participants mentioned an additional concern, related to traditional beliefs, about becoming involved with a stranger: "It is wrong to have sex with a stranger because his background is unknown". The focus group discussions revealed more knowledge about HIV and AIDS than about other STIs, and the students did not mention the link between AIDS and other STIs. A few students gave clear descriptions of AIDS. Some participants demonstrated knowledge about the causes and impact of AIDS; some reported that AIDS can be transmitted through sex and injections, but others incorrectly stated that infection can occur through mosquito bites and from toilets.Overall, the focus group participants had some knowledge about STIs, although there was disagreement about the medical parallels to local names and about the symptoms and causes of the STIs discussed. Gonorrhea and AIDS were identified as STIs in all of the groups, and syphilis, candidacies and trichomoniasis was mentioned in many of them. Pain in the genital area and painful urination were the most frequently mentioned signs of STIs, mostly related to gonorrhea. Most groups mentioned boils, itching, pussy or milky discharge, rashes and swollen organs. Males were more likely to mention swelling, and females were more likely to mention discharge, itching and rashes. Females mentioned fever while males also discussed bloody urine, Participants talked about what they and their peers do when they experience STI symptoms. For those who chose to divulge their symptoms to someone, telling friends was the most common choice; males and females were equally likely to do so. In half of the groups, however, participants stated that people with STIs usually did not tell anyone about their condition, a view expressed more often by males than by females. They stated that peers sometimes disclosed symptoms to a parent. Most of the females specified mothers, and a few males cited fathers; no one mentioned turning to other relatives as confidants. Only a few students reported that peers told their sexual partners about STI symptoms.

The participants agreed that condoms were the best method of STI prevention. Abstinence was thought to be the next most commonly used method of prevention. Abstinence and monogamy were mentioned more frequently by females than by males. Although focus group participants considered condoms the best way to avoid STIs, the reported prevalence of condom use varied. In many of the focus groups, students discussed why people dislike using condoms. Many thought they decrease the enjoyment of sex, a view expressed more frequently by males than by females. Females knew more about sources of STI information than males did. Generally, participants described newspapers, magazines, and posters as the most common sources of STI information for young people, followed

closely by radio, television and film. Some participants reported that young people also learned about STIs from family members and from school-related events. Males said that friends or peers were the most common sources of information. The students viewed public education campaigns using electronic media (radio, television and film) as the most effective way to transmit information on STIs to young people. Health education campaigns at markets and public places were also perceived as effective, particularly by females, as were print media, schools and health seminars. Students had similar ideas about condom promotion: They thought electronic media were the best way to communicate with young people about the advantages of condom use, followed by schools, health seminars and print media.

Conclusion

Results from the analysis suggest possible ways of decreasing STD prevalence by promoting responsible prevention and treatment-seeking behavior. Strengthening reproductive health programs can help achieve these goals by addressing adolescents' perceptions of risk, emphasizing the links between HIV and STIs, decreasing barriers to service provision for youth, involving parents and youth in programs, and considering gender differences in program planning and implementation. Increasing the perception of risk adolescents associate with some sexual activities and highlighting the connections between STIs and HIV could be two components of an STI control program in this setting. To promote effective behavior change, interventions should include the participation of young people in innovative ways. Educational activities should target parents as well, which would enable them to play a more beneficial role in the sexual and reproductive health of their children. The alarming perception that people intentionally spread STIs should be further explored and addressed. Addressing the risk associated with a range of sexual activities, including sex with a regular partner, is a step toward encouraging responsible behavior. Students in the focus groups were aware that some of the sexual activity that was commonplace among their peers could have adverse health consequences. They noted that having multiple partners and engaging in sex with unknown partners were high-risk behaviors, but they did not acknowledge the potential health risks of intercourse with a regular, known partner. This result suggests that familiarity with a sexual partner is accompanied by a perception of decreased risk. STI control should be an important component of AIDS prevention campaigns. Our results reveal that AIDS campaigns in this area have failed to make the link between AIDS and STIs. Many of the focus group participants were aware of the consequences of AIDS, but not the role STIs play in HIV transmission. Emphasizing that STIs increase the likelihood of HIV transmission may increase young people's concern about STIs and lead to less risky behavior. Pointing out that the behaviors that put one at risk for STIs are the same as those that put one at risk for HIV infection is another way to capitalize on knowledge about HIV to promote STI prevention efforts. Establishing youth-friendly services is a way to increase access. Also programs targeting young people's sexual and reproductive health cannot ignore the potential of parental involvement, a theme that emerged several times in the focus groups and that is supported by other studies of the sexual and health behavior. The focus groups demonstrated the need to improve parents' knowledge and their ability to communicate with their children about sexual and reproductive health, since students agreed that few parents know more than their children about STIs, condom use and other reproductive health topics. The focus group discussions indicate that gender differences should be considered when targeting young people with educational interventions, since our analysis of the transcripts revealed differences in males' and females' knowledge about STIs

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