EVALUATION OF EDENTULISM, INFLUENCE OF SOCIO-ECONOMIC, BEHAVIOURAL FACTORS AND GENERAL HEALTH ON PROSTHETIC STATUS OF ADULT POPULATION OF GEORGIA

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Abstract

Background: Georgia is a country with a Human Development Index (HDI) score of 0.744. There has not been an epidemiological survey evaluating the edentulism and prosthetic status among the adult population of Georgia since the 1990s. The aim of the study was to identify the level of edentulism from different age and gender groups of the adult population of Georgia, to assess the influence of family income, education level, and general health on people's prosthodontics status.

Methods: The cluster- stratified method with multistage sampling design was used for sampling. Investigated population included 2370 adults-1289 women and 1081 men from nine regions of Georgia and the capital, Tbilisi, distributed in four age groups I- (20-34), II-(35-44), III-(45-64), IV- (65-74).

Results: Partial (13.2%) and complete dentures (20.4%) were prevalent in elders, while implant retained prosthesis were observed in only 0.1% of the investigated population. Fixed prosthesis were more noticed in younger population due to partial edentulism. Metal-ceramic (12.4%) and metal crowns (6.3%) were more commonly detected than zirconia ceramic crowns (0.1%). Tooth loss and prosthetic status of the population as well as crown choice was significantly associated with socio-economic, medical (general heath) and behavioral factors.

Conclusion: Edentulism is a serious public problem in Georgia. Inadequate Dental prosthetic care, less access to high quality zirconia ceramic crowns and implant retained prosthetic appliances indicates less

access to expensive dental procedures in Georgia and is related to low socio-economic, medical and behavioral factors.

Keywords: Edentulous, Prosthesis, Georgia

Introduction

Edentulism is the important problem throughout the world population. As irreversible condition it can lead to functional impairment, physical, psychological, and social disability**.** Dental diseases (especially dental caries and periodontal diseases) play an important role in tooth loss in the adult population throughout the world due to their high prevalence. At the age of 65-74[1] 30% of the world population experiences edentulous. Tooth loss has been associated with several socio-demographic, behavioral, or medical factors [2].

In elderly people, socioeconomic factors such as low income, low education level, and limited social support are closely associated with wearing complete dentures (CD) or removable partial dentures (RPD) and with having poor oral health [3]. Edentulism can also be the main concern of younger people and may be associated with cultural, individual access to care, and socioeconomic factors. These factors impact the distribution and prevalence of complete and partial edentulism between developed and less-developed countries [4].

Satisfaction with one's teeth increases self-confidence and self-esteem [5]. In contrast, tooth loss due to untreated caries or periodontal diseases leads to functional and aesthetic disruptions and significantly influences oral health-related quality of life [6].

Georgia, a country with a Human Development Index (HDI) score of 0.744 [7] has approximately 4.5 million people, 53% of which live in urban areas [8]. Due to a significant deterioration in socioeconomic conditions in the1990s, the health status of the population changed significantly, including oral health [9].

Financial disparities due to political and economic changes in the country reduced access to oral and common health care leading to edentulism, though epidemiological studies of oral health care are scarce in Georgia. There are only a few reports providing information about the prevalence of dental diseases [10] and there have been no reports about the prosthetic status since 1990s [11].

The aim of the study was to identify the level of edentulism from different age and gender groups of the adult population of Georgia, to assess the influence of family income, education level, and general health on the population prosthodontics status.

Methods

Our research was carried out based on the stratified -cluster probability sampling technique. According to the National Center for Disease Control and Public Health(NCDC) of Georgia, the age distribution of the adult population ranges from 20 to 85 +. The sample was distributed into four age groups – 20-34, 35-44, 45-64, 65-74 and two gender groups –male and female. Two index age groups (35-44and 65-74) were allocated according the recommendations of the WHO for teeth and periodontal status and dental morbidity assessment [12]. Two other age groups (20-34, 45-64) were studied due to their significant size in the adult population of Georgia: 33.6% (20-34) and 36% (45-64) compared to 19.5% (35-44) and 10.9% (65-74) [13]. The sampling design was multistage [10]. Clusters were chosen first consisted of ten geographical units and included nine regions (from north-west, south, central, east and south-east) and the capital, Tbilisi. Clusters were internally stratified. The strata were formed based on index age groups derived by WHO, age groups as defined above, and gender. The country was divided into six strata comprising ten geographical units. According to the WHO, "Sampling adult subjects is often difficult and can be drawn from organized groups, such as offices or factory workers" [12]. As such, the second–level clusters were formed by randomized selection of organizations, institutions and households. In the third-level clusters, adults were randomly chosen. The studied individuals had different socio-economic and education levels and employment statuses as well as different levels of oral disease and/or intervention needs. Dental clinic patients were not selected to avoid obvious selection bias.

The sample size within each stratum was calculated taking into account the proportion of the population in the particular stratum in order to form an equal probability sample. According to Georgian demographic data [13] different age groups make up different shares of the population. Based on their proportionality within strata, the volume (number) of elements was chosen. The total sample size was 2370[10].

The study was conducted from January 2013 to May 2014 by experienced examiners- a dentist and a prosthodontist, assisted by four invited postgraduate students from the stomatological faculty. Data were obtained by structured questionnaires and clinical examinations. The administrations of the organizations the research was held in were contacted and informed about the study goals in advance. They assisted in enhancing involvement in the study.

Data on socio-economic, demographic, behavioral (related to oral hygiene practices and dental activity) and medical characteristics were

collected through application of questionnaires administered by a specially trained stuff with five dentists.

Education level was classified into two groups: low (completing elementary school, secondary [high] school or technical college or having no formal professional education), and high (holding a bachelor's degree or any university degree).

Family financial status was categorized into low, medium and high self-reported income level. Generally, unemployed people or people with state pension or state social aid as an income source considered their income low. People working in different public or private facilities with a salary in the 500-600GEL per month range (mean income in Georgia is 597.6 GEL)[7] thought their income medium. Material status was reported as high only by individuals having jobs as well as other sources of income (e. g a business)

Investigation of the oral cavity was performed in medical cabinets of the organizations according to WHO recommendations. The examiners were equipped with sterile instruments for single use to control the infection transmission and performed examination under natural lighting conditions using a dental mirror and an explorer and a periodontal index (CPI) probe for measurements of periodontal pocket depth [12]. The clinical examination included a full-mouth recording of 32 teeth; tooth status was recorded using DMFT index. A tooth was recorded as missing due to caries (M-caries) if there was a history of a cavity and as missing due to periodontitis (M-periodontitis) if there was a history of tooth mobility prior to extraction.

Criteria for the assessment of "teeth-lost" conditions were based on the concept of the shortened dental arch proposed by Kayser and Witter [14]. They suggested that "a minimum of 20 teeth is sufficient to meet oral functional demands". The extent of tooth loss due to any reason was recorded as loss of 0 tooth, loss of 1-20 teeth, loss of ≥21 teeth.

In addition to dental status, periodontal health was assessed and prosthetic status was established according to the WHO criteria[12].Prosthetic status was recorded as follows: no prosthesis, fixed prosthesis (a bridge, more than one bridge), a partial removable prosthesis or a denture, both bridge(s) and partial denture(s), both bridge(s) and complete denture(s) and complete denture(s).

Statistical analysis was performed using the Statistical Package for Social Sciences 21. Descriptive statistical methods (mean, standard deviation) were used for the evaluation of the data. Non-parametric data were compared using the chi-squared test to correlate the prosthetic status and edentulism with socio-economic factors and general health of

different age groups of the population and values of p<.01were considered significant.

Results

A total of 2370 adults underwent oral examinations. **Table** 1 represents the socio-demographic characteristics of study population. 30.1% of investigated people were current smokers, 36.3%former smokers or irregular smokers and 33.6% had never smoked. 32.1% of the investigated people were dentulous and 67.9% partial or complete edentulous. Caries and periodontitis were the most common causes of tooth loss in 97.4% of surveyed people and the prevalence of tooth loss due to other reason was 2.6% (congenitally missing teeth, trauma, orthodontic extractions).

6.9% of the adults showed some degree of wear of their anterior teeth involving at least some dentine due to partial edentulism. In this study, the DMFT was 11.53±7.69. The mean number of filled teeth showed the value of 1.71±2.51. Untreated decayed teeth were present in 99% of the participants. The mean number of missing teeth due to caries (M-caries) was 4.46±5.953, and the mean number of missing teeth due to periodontitis (M-periodontitis) was 2.59±7.697. In addition, the loss of one tooth due to caries was observed in 11% of the population, while the loss of all teeth (28-32) for the same reason was found in only 0.1-1% of the surveyed group. Periodontal pockets of different depth were observed in the 44% of the population. Periodontal pocketing of ≥4 mm was noted in 6% of the participants, shallow pocketing- in 38%. The loss of one tooth due to periodontitis was observed in 0.1% of each cohort and of all teeth (28-32) in 0.3-3%. Edentulism due to caries was more prevalent than M-periodontitis and was characterized by a greater quantity of teeth lost (from two to 16 teeth). Statistical analysis showed significant differences by age and gender. Complete edentulism was observed mainly in the 3rd and 4th age groups: M-caries 1.1% and 6%; M-periodontitis 4.1% and 14% respectively. The 1st and 2nd age groups were distinguished by an absence of complete tooth loss (0.0%). There were not statistically reliable differences found according to tooth loss by gender groups, though most women had artificial crowns.

Prosthetic status was estimated by the presence of different types of prosthesis and artificial crowns. Prosthesis were not observed in 72.8% of the population and the distribution of different prosthetic appliances was as follows: one bridge in 8.3% of the surveyed contingent, more than one bridge- in 7.6%, partial denture –in 3.2%, bridge and partial denture- in 1.2%, complete denture in 4.7%, partial and complete dentures in 1.2%,

bridge and complete denture in 0.7%, implant retained prosthesis in 0.1% of the investigated population.

Five groups were allocated according to crown types, though crowns were observed in 28% of the whole studied population. Metal-ceramic crowns were found -in 12.4%, metal crowns-in 11.3%, combination of different types of crowns-in 4.2%, zirconia ceramic crowns-in 0.1%.

Statistically reliable differences were seen between gender and age groups according to prosthetic status **(Table 2).**

Financial disparity often predicts the low level of medical activity of the population including dental restorative and/or prosthetic care that leads to high values of lost teeth. Therefore the extent of tooth loss was assessed according to family income. The results showed statistically reliable differences (p=0.00) (**Table 3**).

Effect of socioeconomic class and education level on the prosthetic status was also assessed to find the correlation between these variables among the Georgian population. Statistically reliable differences were found (P=0.00). **(Table 4)**

General disease such as endocrine system disorders (thyroid gland disfunctions and diabetes) often represent the common cause for tooth loss as they impact the development of caries and periodontal diseases), so the study aimed the influence of health status on the tooth loss of Georgian adult population to be studied. Endocrine pathologies were observed (p=0.00) in 11.5% of investigated sample. 8.6% of the surveyed people had thyroid gland disfunction, 2.5% mentioned the existence of diabetes in questionnaires and diabetes and thyroid gland disfunctions together were only in 9 people (0.4%) presented. Statistically reliable differences were not seen in people with endocrine system disorders in case of teeth loss due to caries (p=0.846, p>0.01) whilst the relation to M-periodontitis was statistically reliable**.** As the results showed, complete and partial dentures due to complete/partial edentulism in diabetic cohorts were more prevalent- 16.9% and 8.5% respectively, more than one bridges was observed in 13.6% of diabetics.

Assessment of dental activity of the population according to education level and family income showed the following distribution: 20.1-44.2% according to education level and 33.0-48.3% according to material income. Significant differences were found in respect of dental activity of the population and prosthetic status (p=0.00) more prosthetic appliances were found in people with more dental activity. It must be noted that lack of dental services were mostly related to shortage of money or negative attitudes towards dental care (95.8% took dental care

only in case of pain and discomfort and ignored preventive check-ups) [9].

Discussion

Statistical analysis showed that tooth loss was expressed to different extents and due to different reasons in the population. Complete edentulism mainly observed in the 3rd (45-64 years) and 4th (65-74 years) age groups could be related to more prevalent chronic forms of periodontitis (with more periodontal pockets of 0-3 mm depth, and less pockets of 4-5mm depth or more) 1st and 2nd age groups were distinguished by a greater quantity of up to five teeth lost for different reasons and replaced with fixed dental prosthesis (crowns, bridges).

Increases in age caused a decrease in the absence of prosthesis, and the IV age group was characterized by a greater frequency of partial and complete dentures. Higher prevalence of fixed prosthesis were belonging to age group 45–64 years (III group) compared to any other age group. Felt need or demand for natural-looking artificial crowns was expressed most in the 1st age group. Statistically reliable differences in various types of crowns found when comparing age groups by this variable support this finding. Metal-ceramic crowns were most common in the 1st age group indicating a greater concern among young people related to their appearance.

Almost all kinds of prosthesis and crowns were more frequent among women. This indicates more positive attitudes among women towards prosthetic treatment and a healthy and beautiful smile.

The results showed a direct influence of education and family income on the prosthetic status of the population. There were slight differences found by education level, but material welfare dictated attitudes towards prosthetic dental care and choice of crown types. Metal-ceramic crowns were more common in people with medium and high family income. High income defined the existence of zirconia ceramic crowns and implants, though bridges and removable dentures were more common than implant retained dental prosthesis throughout the population indicating less access to expensive dental procedures in Georgia. Differences in types of prosthesis and crowns might be related not only to sex, age and individual peculiarities, but also to the dental activity of the population and general health that also impacted the prosthetic status. As it is proven, diabetes is one of the main risk factors for periodontitis and eventual tooth loss. In our research removable prosthesis were more seen in diabetic people. The study showed that dental activity defined the prosthetic status of the population, though different types of prosthesis and crowns were mostly related to material

welfare. Potentially, people understand non-aesthetic disorders because of lack of teeth, but they do not realize the consequences of the functional changes in the tempo-mandibular joint (TMJ) and other results of developing pathological tooth wear due to tooth loss and mastication problems. They postpone making prostheses for single lost tooth for extended periods, leading to remaining teeth disfunction, extraction and eventual edentulism. On the other hand, material disparity represents the main obstacle to prosthetic procedures. As a result, the breakdown of alveolar processes takes place and requires implants for retaining the removable dentures, but implants are too expensive and shortages of money define the lack of access to them. This is proven by the fact that implants were the least common in the population and essentially were seen in people with high material well-being ($p<0.01$).

Conclusion

The study found that edentulism is a serious public problem in Georgia, not only among the elderly, where money shortages define low access to dental services but also in younger people. Fixed prosthesis were more noticed due to partial edentulism in younger population, elders were characterized by a greater frequency of partial and complete dentures.

Inadequate dental activity due to low medical education background and negative attitudes towards dental services as well as general health influence on edentulism and prosthetic status of the adult population of Georgia, though dental prosthetic care, less access to high quality zirconia ceramic crowns and implant retained prosthetic appliances is related to low socio-economic status. Therefore, public health centers and insurance companies should take care of edentulous people by implementing protocol models for eradication of edentulism.

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Tables:

Studied population		frequency	%
Age group(years)	20-34	797	33.6
	35-44	469	19.8
	45-64	854	36.0
	65-74	250	10.5
Gender	Famele	1289	45.6
	Male	1081	54.4
Education level	Low	601	25.4
	Middle	208	8.8
	High	1561	65.9
Family income	Low	699	29.5
	Medium	1642	69.3
	High	29	1.2

Table 1. Socio-Demographic characteristics of study population (*n* =2370)

Prosthetic status	Age groups				Gender	
	20-34 (%)	35-44 (%)	45-64 (%)	65-74 (%)	Males (%)	Females (%)
No prothesis	97.4	80.2	56.8	35.6	77	69.4
Bridge	1.9	10	13.7	7.2	7	9.4
More than one bridge	0.6	7	12.9	12.8	5.9	9
Partial removable denture	0.1	1.1	4.9	13.2	3.3	3.6
Bridge and partial removable denture	0	0.4	1.6	4.8	1.1	1.2
Complete denture	0	0.6	6.7	20.4	4.5	4.8
Partial and complete dentures	0	0	2.1	4	0.6	1.7
Bridge and complete denture	0	0.2	1.2	2	0.6	0.7
Implant retained prosthesis	0	0.4	0.1	0	0	0.2
P=0.00						
No crowns	4.5	23	16.4	17.8	27.4	8.9
Metal -Ceramic crowns	68.2	48	31.9	16.9	29.3	42.8
Plastic cast	9.1	9	16.9	20.3	14.2	15.3
Metal crowns	13.6	12	19	30.5	18.6	18.5
Different types of crowns	4.5	7.5	15.5	14.4	10.4	14.1
Zirconia ceramic crowns	0	0.5	0.2	0	0	0.5
P=0.00						

Table 2: Prosthetic status according to gender and age group

Family income	M-caries			M-periodontitis		
	0 tooth (%)	1-20 teeth (%)	≥21 teeth (%)	0 tooth (%)	1-20 teeth (%)	≥21 teeth (%)
Low	30.5	63.6	5.9	79	7.5	13.5
Medium	32.6	65.1	2.3	91.2	3.8	5
High	37.9	60.7	1.4	100	0	0
P=0.00						

Table 3: extent of tooth loss according to family income

Prosthetic status	Education level		Family income		
	Low (%)	High (%)	Low (%)	Medium (%)	High (%)
No prosthesis	73	72.7	68.8	74.4	79.3
Bridge	8.2	8.4	8.3	8.3	10.3
More than one bridge	5.4	8.7	6.3	8.2	6.9
Partial denture	4.2	3.0	4.0	3.2	0
Bridge and partial denture	1.4	1.1	1.4	1.1	0
Complete denture	6.4	3.8	8.7	3	0
Partial and complete dentures	1	1.3	1.7	1	0
Bridge and complete denture	0.4	0.8	0.7	0.7	0
Implant retained prosthesis	0	0.2	0	0.1	3.4
	p=0.03		*p=0.00*		
No crowns	19.7	16.2	18.3	16.5	35.7
Metal -Ceramic crowns	23.2	42.9	21.6	41.9	50
Plastic cast	18.5	13.1	22.5	12.3	0
Metal crowns	29.1	13.6	23.9	16.8	7.1
Different types of crowns	9.4	13.8	13.6	12.3	0
Zirconia ceramic crowns	0	0.4	0	0.2	7.1
	P=0.00		*p=0.00*		

Table 4: Prosthetic status of the population according to education level and family income