USING THE FACTORIAL CORRESPONDENCE ANALYSIS TO DETERMINE THE RISKS OF WATER RELATED DISEASES, HYGIENE AND GOOD PRACTICES WITH SURVEY DATA IN GHARB AREA, MOROCCO

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Abstract

Water related diseases, hygiene and good practices in Gharb area have been a major health problem especially in the rural areas. This investigation concerns the cities under such conditions in the region of: Kenitra, Sidi-Kacem and Sidi-Slimane. In this paper, we interpreted the case of water-related diseases in the region of the case study section diseases. Second step is to locate the main causes of the study in each city by the factorial correspondence analysis (FCA)using the SphinxV5 software.

Kenitra city is characterized by the dominance of anemia followed by hepatitis and ascariasis. This is as a result of absence of good drinking tap water, going to the bathroom (always) during cooking, home not connected to the sewage network, poor toilet facilities and toilet papers thrown into the wastewater network. The city of Sidi-Kacem is characterized by candidacies, poor drinking tap water, people swimming in lakes, people eating fruits and vegetables without washing, finding the visual quality of the water (can leave deposits), people visiting the toilet during cooking, frequent changing of underwear (per week), people (rarely) wash their hands before cooking and solid waste near homes. Finally, the city of Sidi-Slimane is characterized by the trachoma which is accompanied by diarrhea and malnutrition; thus, this diseases is caused due to bad drinking water from "Saguia" village, people

(rarely) washing their hands before cooking, home exposed to sewage and the use of septic tank type toilet.

Keywords: Epidemiology, waterborne diseases, hygiene practices, Gharb region, Survey

Introduction

The enormity of water related diseases, hygiene and good practice in the Gharb area are still poorly understood. According to WHO, there are now more than 2.6 billion people who lack access to improved sanitation, and nearly 900 million people who lack access to improved drinking water (OMS,2010).

Drinking water can account for a good health and the wastewater management is a preventive action of diseases. Currently, water, hygiene and good practices guarantee good health. Therefore, the application of hand washing can reduce 45% of the number of cases of diarrheal diseases (OMS, 2004).

According to HAMMOUR HAFIDA, out of 138 children in the area, there are 76 children who have at least one intestinal parasitism with a prevalence of 55.07%, and 42 cases of poly-parasitism. In his study, the population of the rural villages of origin hospitalized children located on the main courtyard water of Gharb: WadiSebou and its tributaries reuse water from these wadis which are heavily exposed to pollution due to urban waste in the area for irrigation purpose in agriculture (Hammour H., 2011).

In this sense, we conducted a survey in the Gharb region for adults in order to seek the causes of waterborne diseases and daily practices to the possible solution. In another publication, we interpreted the results of a general way throughout the region. In this study, we used the CFA analysis in the software SphinxV5 to locate these causes in three major cities: Kenitra, Sidi-Kacem and Sidi-Slimane and to determine the correlation between them.

Study area

The Gharb area covers a geographical area of about 388,000 ha of which 616.000ha are agricultural areas, with an irrigated area of about 100,000 ha. Therefore, the climate of Gharb is favorable in the development of a wide range of cultures.

Average temperatures ranges from 11 ° C in winter and 27 ° C in summer, and the average annual rainfall is about 500 mm. Also, the soils of the Gharb essentially consist of alluvium clay content. Regarding water resources, the main river of the perimeter of Gharb is the Sebou with its main tributaries; the Beht on the left bank and Ouergha on the right bank.

Their annual contributions are of the order of 6.6 billion m3, or about 27% of the national potential for usable water. For groundwater, there are two superimposed layers fed by the infiltration of rainfall and the Sebou. Thus, the reserve is estimated at 900 million m3 (Daniane M *et al*.).

Materials and Methods

However, a descriptive study on the causes of water related diseases was conducted by a survey in the Gharb region in Morocco. The total sample used was 1020 people by which 44.3% of the people were male and 55.7% of people were female. The minimum age requirement is 12 years old, the maximum is 59 and the standard deviation is 6.13. For the province, there are 76.8% of people from urban areas and 23.2 % of people from the rural areas. In this study, we used the statistical software SphinxV5 for the factorial correspondence analysis (FCA) to locate the main statement caused by the survey in each city.

The presentation of the AFC is a projection of cross between the dependent variable (the city) and the other variables tables (Singly, 1992). The dependent variable is filed online, while the other variables are in columns. The square in the factorial map shows the frequencies of each mode. Hence, the large square explains that the frequency of this mode is larger than the other. Dependent variable (City) has three modality (Kenitra, Sidi-Slimane, Sidi-Kacem) crossed with the variables of each section of the survey:

-City with diseases reported in the survey;

-City with variable consumption of water;

- City with variables Hygiene and good practices;

-City with variable of Home;

Therefore, more questions to this survey are nominal. In the result, the modality of the answers is written between brackets; for example (always), (Often), (Rarely) and (Never).

Results and Discussion

1. Case Study

Statistic of waterborne diseases obtained by the Ministry of Health, Morocco is very unique in several ways. In this axis, we try to find out from these diseases, which were more common result in disease in the patients, and also the health problems of families in general.

Diarrhea is among the water borne diseases which affects the gastrointestinal which results to the death of about 2.2 million people each year in the world, especially children in developing countries. (OMS, 2013)

For children under 5 years of age, the causes of death are represented primarily by infectious diseases (50%) and prenatal causes (37%). Note that

according to data from the PAPFAM survey conducted in 2004, the neonatal mortality rate is 57% for all infant deaths. (OMS, 2005)

In the figure below, the analysis of mortality rates shows that the region of Gharb has a mortality rate of 28% which is high when compared to national mortality rate of 36.5% live births.

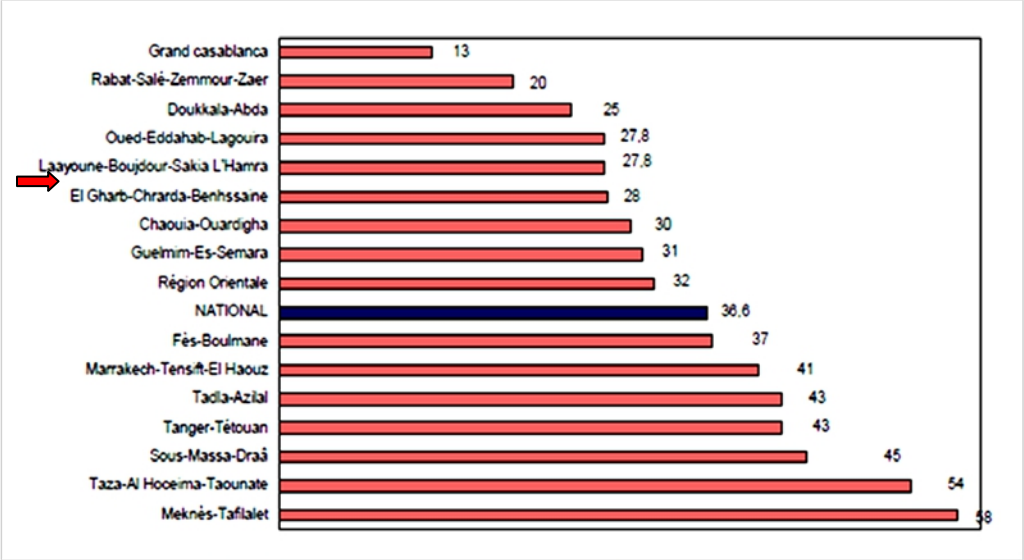
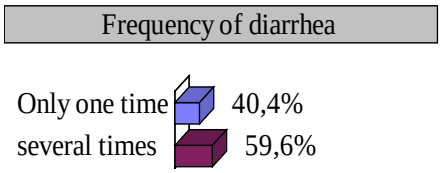
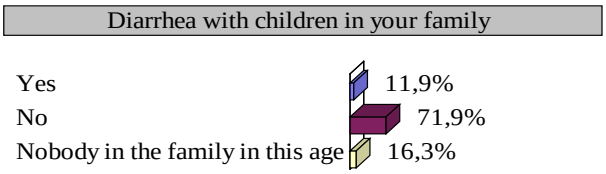


Figure 1 : Distribution of infant mortality rates by region – 1997 (OMS, 2005)

In this study, there are 59.6% of people who suffer repeatedly from diarrhea and 40% of people suffers that at least once from this water related disease. Among children in families interviewed, it was shown that there are 11.9% of children who have frequent diarrhea.



2A



2B

The percentage of Moroccan children with vitamin A deficiency is estimated at 40%, just behind Afghanistan (prevalence of 65%) and just before Iraq (prevalence of 30%). The prevalence of anemia among pregnant women in Morocco is 35%. It is therefore normal that maternal and neonatal mortality is still high (Najib A., 2010).

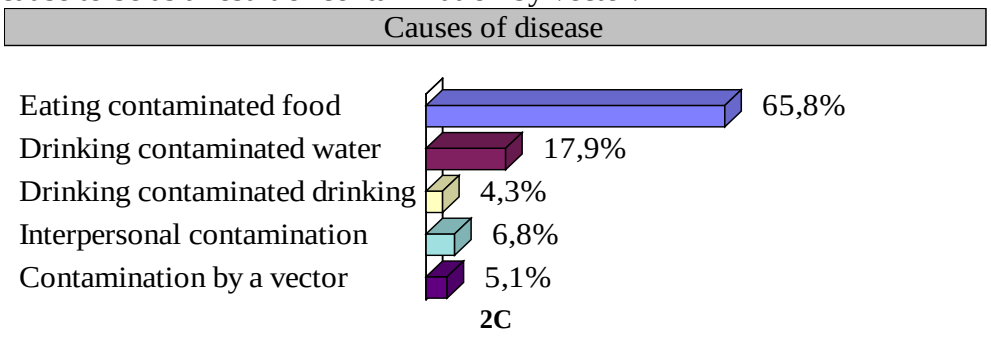
In our study, the solutions to the questions of diseases is multiple due to the many water related diseases. Anemia takes second place of 348 cases

after the diarrhea in this investigation, followed by candidacies with 162 cases, 120 cases of malnutrition, 108 cases of trachoma hepatitis and 105 cases of hepatitis. The date of these diseases was between 2000-2013.

Tableau 1 : Cases number of water related diseases in the survey in the region of Gharb, Morocco

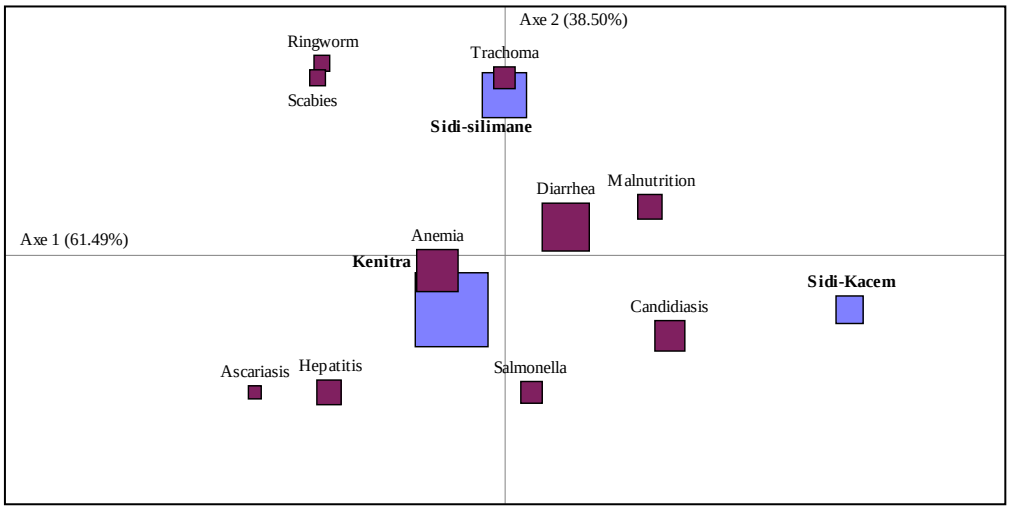
Diseases	Cases number
Anemia	348
Malnutrition	120
Cholera	21
Arsenicosis	21
Dengue and Dengue Hemorrhagic	3
Ascariasis	51
Diarrhea	435
Ring Worm	60
Malaria	36
Cyanobacterialtoxins	9
Salmonella	99
Shigellosis	3
Schistosomiasis	12
Candidiasis	168
Scabies	60
Poliomyelitis	15
Trachoma	108
Giardiasis	6
Leptospirosis	6
Ambieosis	21
Hepatitis	105

Therefore, the objective of the survey is to know the causes of diseases which are basically water related. In this sense, it raises a question about the causes of disease from the point of view of persons affected by this disease. However, there are 65.8% of people who thought that it was by eating contaminated food, 17.9% of people thought it was by drinking contaminated water, 4.3% of people believed it was by drinking contaminated drinking, 6.8% of people assumes the cause of this disease to be as a result of interpersonal contamination and 5.1 % of people believes the cause to be as a result of contamination by vector.



2C

The figure below shows the distribution of the most common diseases in the survey for three cities under surveillance: Kenitra, SidiKacem and SidiSlimane. Trachoma is common in Sidi-Slimane followed by diarrhea and malnutrition; anemia is more common in Kenitra followed by hepatitis and ascariasis; and candidiasis is common in Sidi-Kacem which is followed by the salmonella.



2D

Figure 2 : A to D results of cases study

2. Correspondent Factor Analysis (CFA)

A. Water Consumption

In the region, there are 75.3% who drink tap water. In rural areas, there are 38% who drink from "Saguia" village. The corresponding factor analysis shows that the city of Sidi-Slimane is characterized by people who drink from "Saguia ' village (often) and tap water (rarely). People are drinking tap water (often and always) in the city of Kenitra, but in the city of Sidi-Kacem, it is the opposite with tap water (often and rarely) for “Saguia” village.(Fig 3)

There are 13% of people who swim in lakes and 71% of people who are (never) aware of the risk of waterborne diseases. The people of Sidi - Kacem bathe in lakes (always and often) .Therefore, they are not aware of water-related diseases and also the people of Kenitra cannot swim in the lake. The quality of the water is roily and can leave deposits to 36.3% of people interviewed. There are 29.1% of people who eat fruits and vegetables without washing, thus 28.3% suggested that the storage of water in home is still open. In the city of Sidi-Kacem, the inhabitants eat fruits and vegetables without washing and also they discovered that the visual quality of the water can leave deposits. (Fig 4, 5)

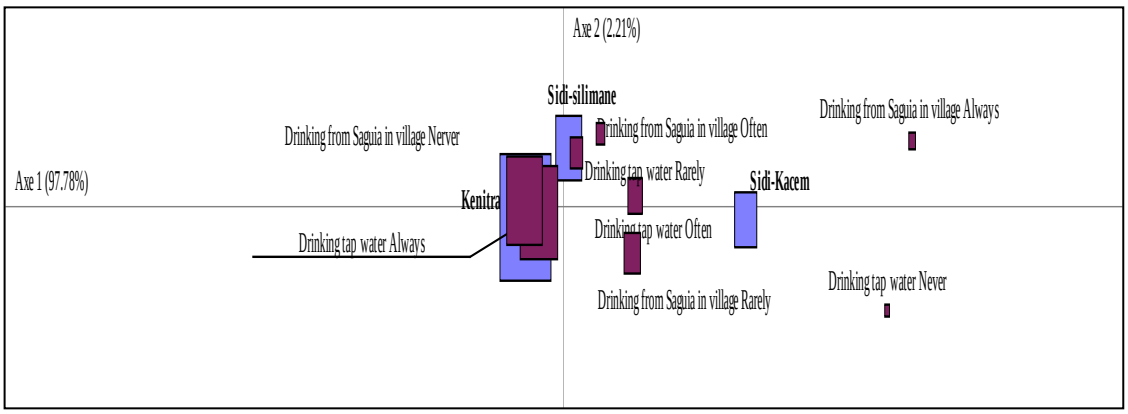


Figure 3: CFA to drink tap water and Saguia village in the three cities

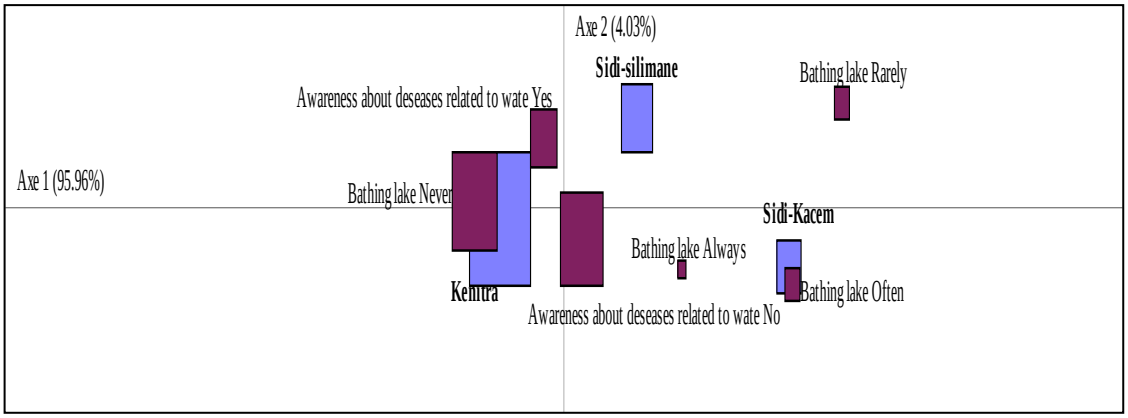


Figure 4 : CFA to swim in lakes and Awareness for diseases related to water

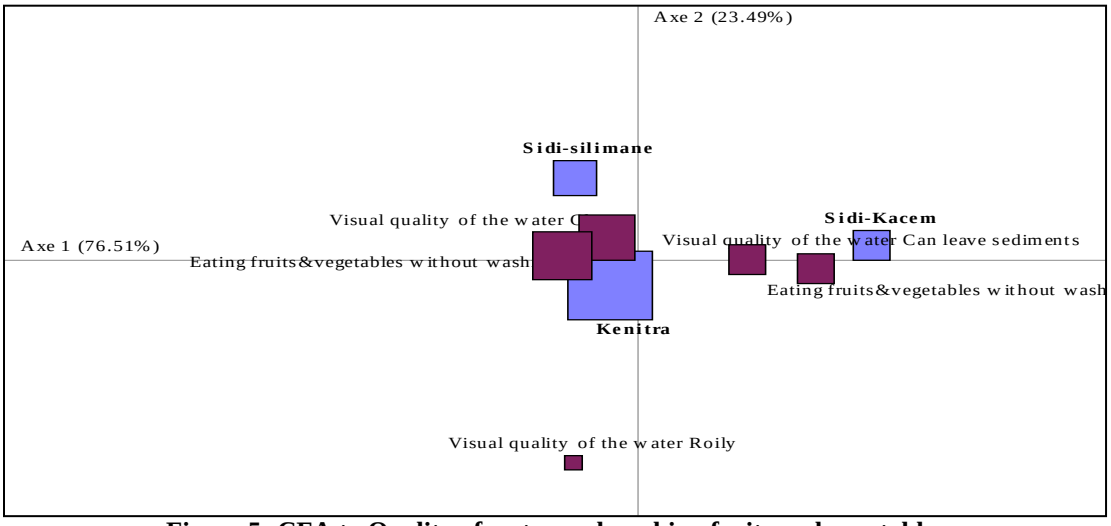


Figure 5: CFA to Quality of water and washing fruits and vegetable

B. Hygiene and Good Practices and Home

There are 53.3% of people who wash their hands with water and disinfect (often), 31% of people who use the towels for collective toilets, 8.9% are going to the toilet while still cooking and 21.5% (often) go to the toilet during cooking. Sidi-Kacem is characterized by people who go to toilet during cooking; Sidi-Slimane is characterized by people who wash their hands (often) before cooking and Kenitra city is made up of people who make use of the bathroom when cooking. (Fig 6)

In this region, there are only 12.5% of people who took their bath (every day), and 41.3% of people who changes their underwear (every day). Kenitra city is characterized by the small percentage of people who bathe (less than once a week), while Sidi-Slimane city is characterized by people who are exposed to wastewater. The city of Sidi-Kacem is characterized by the change of underwear (by week) and it is different from people who are exposed stagnant water and changing underwear in (3 days). (Fig 7)

Concerning the location of residence and exposure to sewage, there are 21% and 58% of people exposed to the presence of stagnant water. In the region, there are 55.6% of people who use traditional toilets and 39.4% of people who were not connected by a network of them were worn out.

There are 37% of people who lived near solid waste. Kenitra is characterized by modern home (not connected to the waste water system) type of toilet and papers used after using the toilet are thrown into the waste water network. Sidi-Slimane is characterized by home exposed to sewage and the type of toilet used is pit tank. The city Sidi-Kacem is characterized by solid waste around home and type of toilet is modern. (Fig 8)

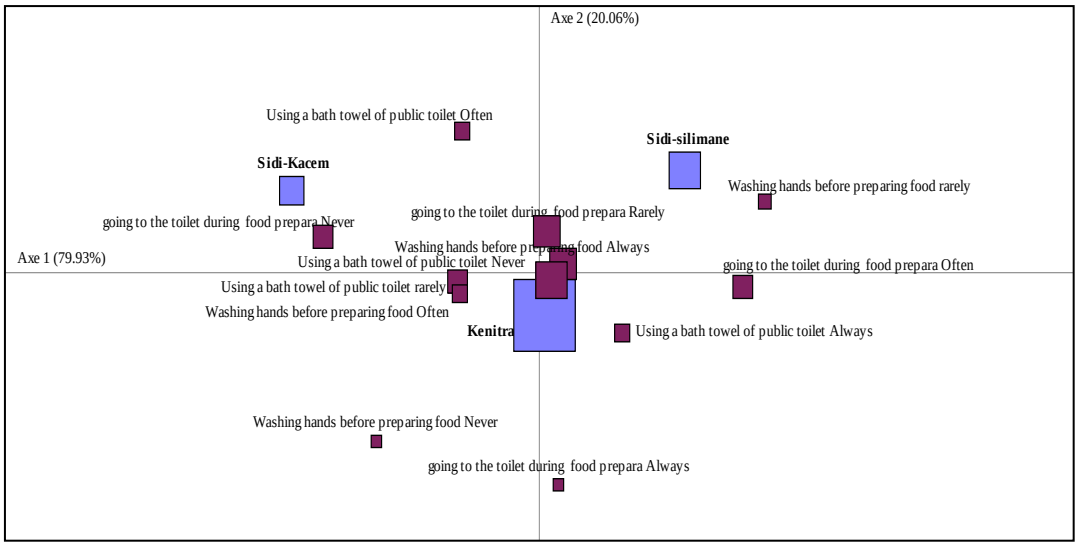


Figure 6: FCA in washing hands before cooking, going to toilet during cooking and using the bath towel of public toilet

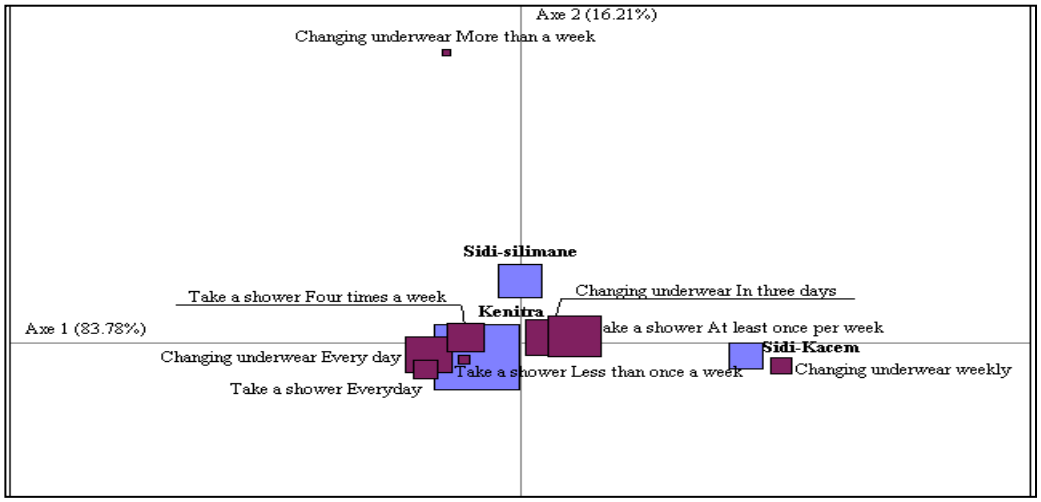


Figure 7: CFA to Frequency of changing underwear and take a shower

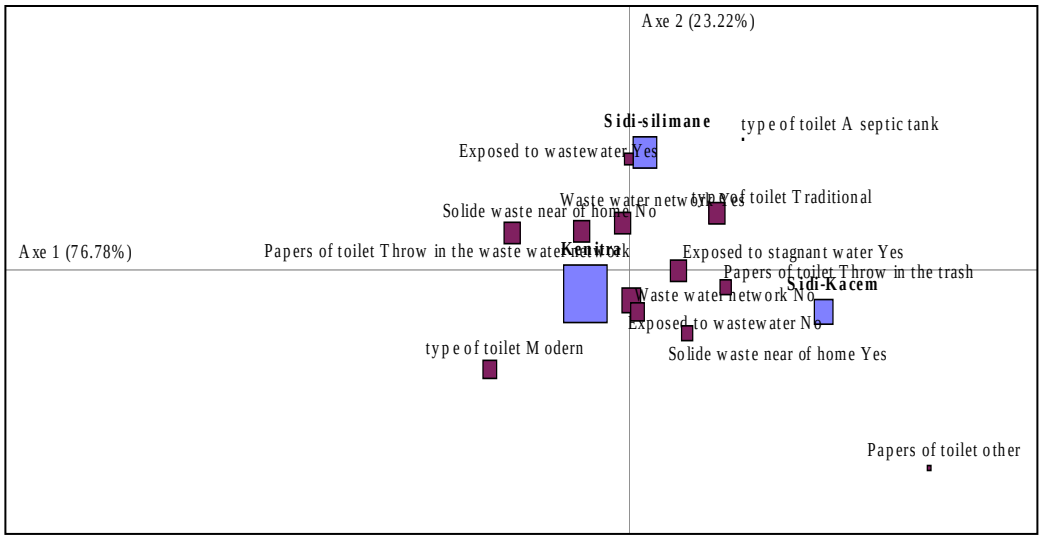


Figure 5 : FCA to be exposed to waste water, type of toilet, papers of toilet and solid waste near to home

Conclusion

The people interviewed in this survey reported that the existence of several diseases may be related to water borne between 2000 and 2013. Diarrhea represents the largest percentage in the region of Gharb. Anemia is second which is followed by candidiasis, malnutrition and hepatitis.

According to these people, the two main causes of these diseases are eating of contaminated food and drinking of contaminated water.

The study identified 18 main causes of these diseases. Hence, we have located these causes in the region of each city by the corresponding

factor analysis (CFA) using Sphinx software V5 which interpret the correlations between the variable dependent city and the other variable.
Therefore, as a result of this study, we recommend the following:

- Connecting the population to drinking water;
- Installation of sewerage systems;
- Health education and awareness on waterborne diseases;
- Encouraging people to use simple methods of water filtration;
- Public awareness on hygiene and good practices;
- Improved wastewater network in the region;
- Protection of water against contamination by waste**;**

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