

Epidemiological profile of patients with waterborne diseases in the cities of Meknes and Khemisset (Morocco)

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ABSTRACT: Water supply for agriculture is sometimes insufficient in several regions of Morocco, the reuse of untreated wastewater in irrigation poses serious risks to the health of the population with spread of cases of waterborne diseases; At this level, the present study has set the initial objective of describing the epidemiological profile of these cases (patient characteristics) and then determining the causal links between the emergence of waterborne diseases and the characteristics of the population. The survey targeted the cities of Meknes and Khemisset (cities with one of the largest perimeters of reuse of raw wastewater in Morocco) during 2015, 2016 and 2017; The methodology adopted is to use the socio-economic data recorded on the "mandatory declaration" sheets for each patient who has acquired a waterborne disease, then to better exploit the qualitative data obtained from the survey sheets, we have descriptive statistics (using Excel software) and analytical statistics by calculating the Chi 2 test (using SPSS software version 21) to facilitate interpretation. The study of the profile of the patients who contracted a water-related disease at the level of the study area revealed: (a) characteristics in favor of a socio-economic vulnerability of this population; this vulnerability results in a supply of fruits / vegetables during the weekly Souks, and informal urban markets; (b) a negative perception of the population towards wastewater and its risks to the health of individuals; (c) a significant association has been found between the occurrence of waterborne diseases and schooling.

KEYWORDS: vulnerability, wastewater, waterborne diseases, profile, epidemiology.

1 INTRODUCTION

Water, which is the source of life, has become the leading cause of mortality and morbidity in the world, especially in the air from water stress [1].

In developing countries, wastewater is increasingly used for irrigation. This use is mainly motivated by: (a) the shortage of water resources and the increasing tensions on these resources; (b) population growth and the resulting increase in food demand [2]. However, their reuse in agriculture, without prior treatment and monitoring of water quality, could pose health risks to human health.

Since water supply to agriculture is sometimes inadequate in several regions of the world, the reuse of untreated wastewater in the irrigation sector poses serious health risks, as these are a factor conveying pathogenic microorganisms and Chemicals that are harmful to the human body and to the whole of nature. According to WHO, wastewater causes: (a) 4 billion cases of diarrhea / year; (B) 2.2 million deaths, especially children under 5; (C) 10% intestinal worm infections in developing countries [3].

In Morocco, reuse of the wastewater has been practiced for decades, it has become important because of the aridity of the climate in most of the national territory, but also because of the interest it represents in the supply of fertilizers Irrigated plots. In addition, domestic wastewater is often reused without prior treatment, causing major public health effects, thus constituting a real health problem. Yet the protection of public health and the environment is today the major concern of each country. Hence the usefulness of zooming in on the characteristics of patients who have contracted a waterborne disease to know the factors that favour their appearance.

2 MATERIAL AND METHOD

2.1 STUDY AREA

The Meknès-Khémisset axis (one of the largest perimeters for the reuse of wastewater, with an area of + 3000 ha) Agriculture is the main activity of the economy and the source of income for the majority of the population [4].

The study consists firstly of 301 survey cards corresponding to 301 cases reported during 2015, 2016 and 2017 at the prefectural epidemiology cells (EPC) level in the study area (cities of Meknes and Khemisset. Morocco).

Following a 4-week schedule during which access to information requests were sent to the delegates of the Ministry of Health in the 2 provinces, then meetings with the EPC officials to explain the purpose initial investigation

2.2 DATA PROCESSING

In order to make better use of the quantitative and qualitative data obtained from the survey forms, the information retrieved is analyzed and the resulting data are captured and analyzed using the SPSS software (version 21) Based on descriptive statistics and using the representation of data as figures by the Excel software to facilitate interpretation.

3 RESULTS AND DISCUSSION

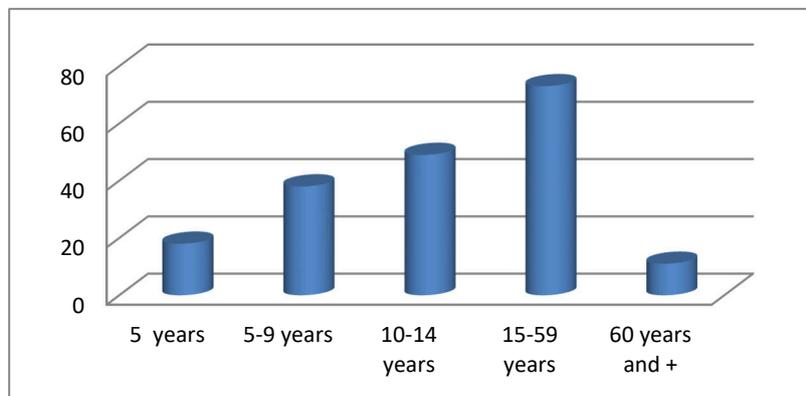


Fig. 1. Distribution of patients by age group

Children (up to 14 years old) are more vulnerable to waterborne diseases. This result reaffirms WHO statistics that "children" is the population most affected by waterborne diseases.

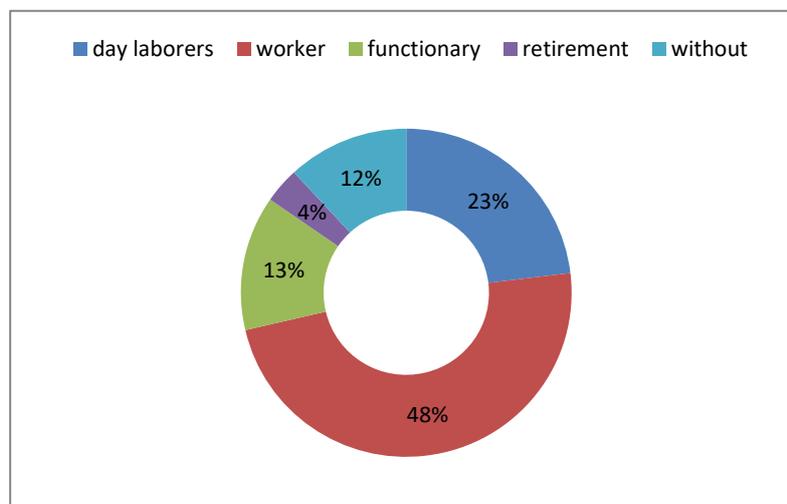


Fig. 2. Profession of householder

The majority of heads of household are workers (48%), 23% of day laborers, 12% "without" any professional activity, and only 13% are functionary. This explains why the incidence of waterborne diseases is higher in poor environments where there is socio-economic vulnerability. This result is perfectly in line with the results of the survey conducted by Lahmani and All in 2013 on the socio-economic diagnosis of wastewater reuse in agriculture [5].

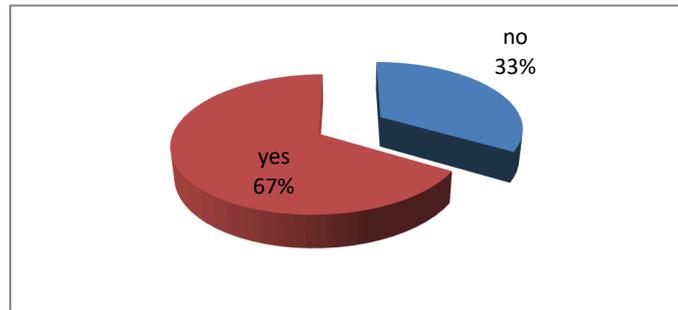


Fig. 3. Schooling

Table 1. Cross table Disease* schooling

		schooling		Total
		yes	no	
Disease	Hepatitis A	88	21	109
	Typhoid	113	79	192
Total		201	100	301

Table 2. Chi-square tests

	Value	ddl	Asymptotic significance (bilateral)	Exact meaning (bilateral)	Exact meaning (unilateral)
Pearson chi-square	15,003a		,000		
Correction for continuityb	14,033	1	,000		
Likelihood ratio	15,769	1	,000		
Fisher's exact test				,000	,000
Linear association by linear	14,953	1	,000		
Number of valid observations	301				

a. 0 cells (0.0%) have a theoretical size less than 5. The minimum theoretical size is 36.21.

b. Calculated only for a 2x2 board

Table 3. Symmetrical measurements

	Value	Approximate meaning
Nominal by Nominal		
Phi	,223	,000
V de Cramer	,223	,000
Number of comments valid	301	

67% of patients have already attended school, but they have contracted a waterborne disease, hence the need to introduce a basic hygiene and sanitation health education programme to train / sensitize the general population (in and out of school) on basic hygiene rules.

Similarly, at a degree of freedom (ddl) equal to 1, we have the Chi-square tests 15,003 > 7.88 (referring to the interpretation table of the Chi 2 test) so we can say that there is a significant association between "schooling" and "waterborne diseases" [6].

If we refer to the results of the Phi coefficient and Cramer's V., we can say that the correlation is average [7].

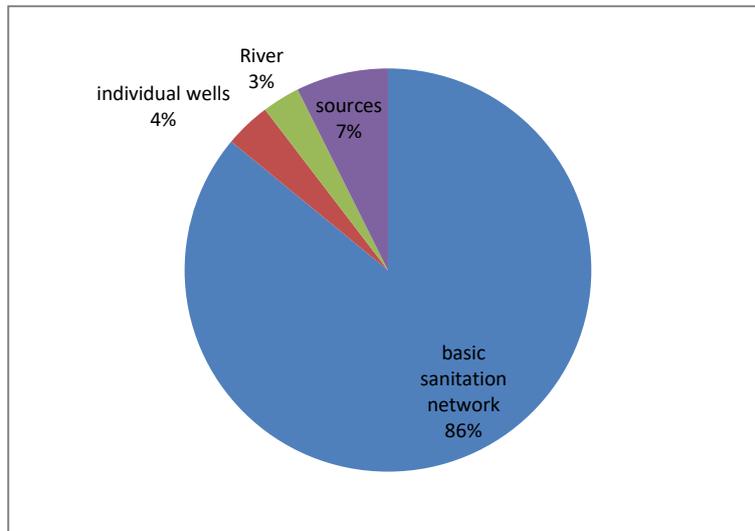


Fig. 4. Water supply

Most surveys (86%) are connected to a basic sanitation network. This result confirms the objective of the moroccan sanitation and wastewater treatment program, which aims to achieve a global connection rate of 80% for the sanitation network [8]. However, we still note the use of the sources (7 %) individual wells (4%), and river (3%), which exposes their users to health risks.

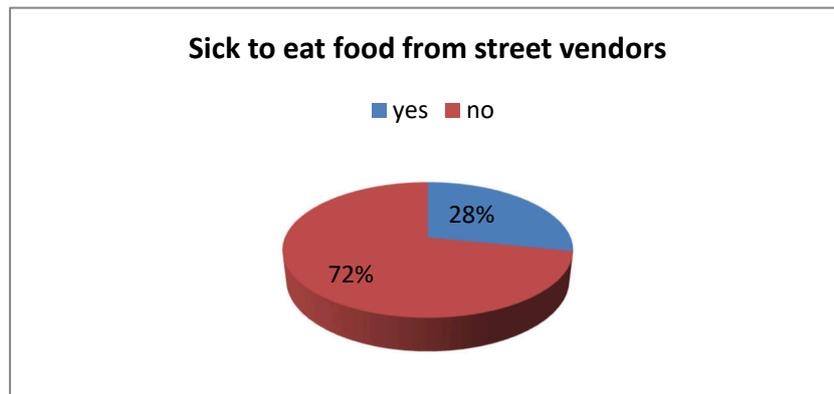


Fig. 5. Sick to eat food from street vendors

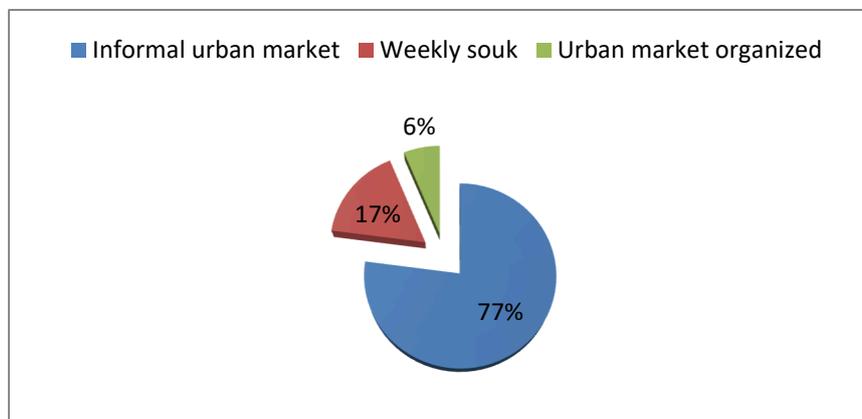


Fig. 6. Supply of fruits and vegetables

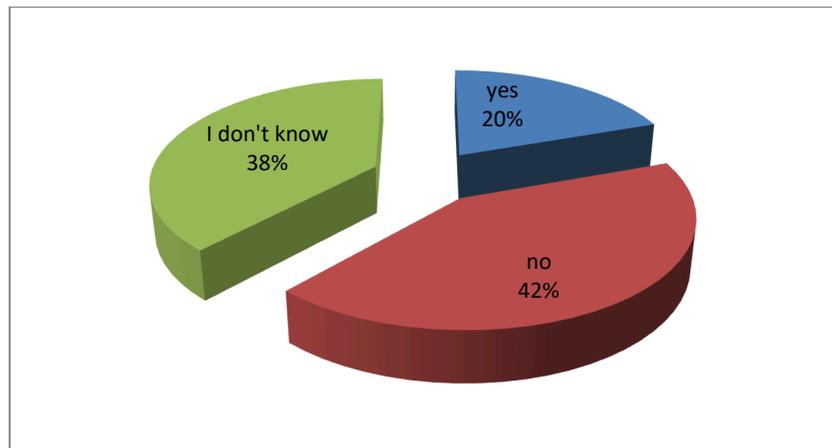


Fig. 7. Consumption of fruit / vegetables irrigated by wastewater

28% of respondents say they have eaten food from street vendors, and most confirm that their supply of fruit and vegetables is regularly delivered either in the informal urban market (77%) or the weekly market (17%), with all the risks generated by this attitude due to the complexity and complexity of health checks at the informal level.

Almost half of the respondents are unaware of the fact that the fruits / vegetables they consume are irrigated by the wastewater, however a significant proportion (20%) know for sure that they consume food that is irrigated by wastewater, yet they continue to eat. to use them without taking into account the health risks they can face.

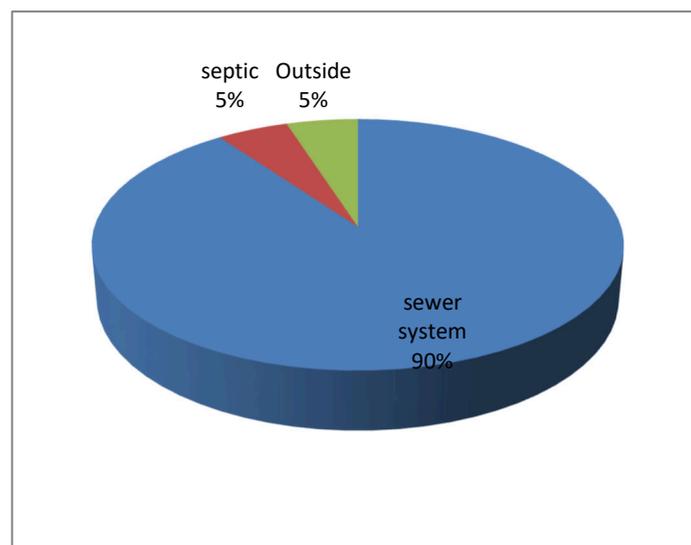


Fig. 8. Wastewater evacuation

The sewer system is the main mode of evacuation for wastewater (90%) in accordance with the Moroccan Basic Sewage Program [9], which recommends the need to evacuate the wastewater for greater security through a sewer system. In addition, the use of septic tanks continues to exist (15%) in our study area, and Outside (5%).

4 CONCLUSION

The study of the profile of patients who contracted a water-related disease at the level of the study area during 2015, 2016 and 2017 highlighted characteristics in favor of a socio-economic vulnerability of this population (48% of heads of households are workers, 23% are laborers, 12% are unemployed, and only 13% are functionary). This vulnerability translates into a supply of fruits / vegetables during the Weekly Souks (17%) and informal urban markets (77%).

The survey revealed a negative perception of the population for wastewater, and their health risks as 20% of patients were confident that they were eating waste water irrigated food, yet they continued to serve, even worse, street vendors fleeing

any health check. Also, there is a significant association between "schooling" and "waterborne diseases", that why we need to encourage schooling and introduce a health education program in basic hygiene.

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