Prevalence of diarrheal diseases and associated factors in households in the city of Isiro in Haut-Uélé Province

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ABSTRACT

Waterborne diseases remain a major public health problem in many countries. The aim of this study was to determine the prevalence of diarrheal diseases and associated factors in households in the Isiro health zone.

An analytical cross-sectional study was conducted in 384 households from 1 to 14 December, 2020. Data were collected through guided interviews of mothers and caregivers of children under 5 years old. Data analysis was done using SPSS 20 and STATA 13 software. The prevalence of diarrhea was calculated, the analysis of factors associated with diarrhea was done using logistic regression. The strength of association was estimated using the adjusted ORs. After dada analysis, the following results were observed:

The overall prevalence of diarrhea was 6.54 (95% CI: 5.7-7.4); in children under 5, it was 14.57 (95% CI: 12.1-17). This prevalence was higher in rural areas (p <0.05). Care in the health facility was higher in rural areas (78.8%) and home treatment in urban areas (92.2%) (p <0.05). Home water treatment (aOR = 0.206; p <0.05) and improved source use (aOR = 0.435; p <0.05) protect against diarrhea. Long access to water and lack of awareness about diarrhea increased the risk of diarrhea more than twice (p <0.05).

Diarrheal diseases are frequent in households and higher in rural areas. They are taken care of differently depending on the place of residence. The treatment of water, the use of improved water sources, the reduction of access time and the sensitization of mothers are actions to be promoted.

Keywords*: prevalence of diarrhea, risk factors, children, Isiro, DRC*

1. INTRODUCTION

In developing countries, diarrhea is among the major cause of childhood morbidity and mortality. It results from contaminated food and water sources [1]. However, water is essential for life, yet it can also be a source of disease. According to a report by the World Health Organization [2] five million infants and children die each year from diarrheal diseases due to the contamination of food or drinking water. Moreover, It was reported by UNICEF that, about 2.5 million cases of diarrhea in children under five with the highest incidence being in children under two years of age [3].

Unsanitary water sources, and poor overall hygiene are some environmental factors that increase the risk of developing diarrhea [4]. Also, the quality of drinking water raises concerns for human health, all over the world, both in developed countries that developing. Health risks are linked to the presence of infectious agents, toxic chemicals or even hazards of a radiological nature [5]. Waterborne diseases remain a major public health problem in many countries. We report the discovery of nearly three decades, from waterborne diseases [6].

About 60% of infant mortality worldwide is due to infectious or parasitic diseases, most of which are related to water. For the Global Health and Education Foundation, the poorest populations in developing countries, especially children, suffer the most. Water-related illnesses keep millions of people in a vicious cycle of poverty and poor health, making them unable to work or go to school. In the developing world, the cumulative effects of

water-related illnesses cripple the economy and weigh heavily on already overburdened medical organizations [7].

In Africa, 88% of deaths from diarrheal diseases in children under 5 are attributable to unsafe water consumption, inadequate sanitation and poor hygienic behavior. Each year, this situation affects more than 600,000 African children. Diarrhea remains a major cause of morbidity and mortality in children under 5 in sub-Saharan Africa [8].

In the Democratic Republic of Congo (DRC), the water distribution company (REGIDESO), which has the mission of serving the Congolese population with quality drinking water, is proving more and more difficult to meet the needs of the populations. The immediate consequences are the limitation of the consumption of potable water for drinking, insufficient water to meet basic hygiene needs, the use of more easily accessible non-potable water points and the increase in the retention periods of the collected water. However, the difficulties experienced by households in obtaining the subsistence minimum of water entail health risks that must be addressed.
In Haut-Uélé Province, although the MICS-Palu RDC 2017-2018 survey presented the coverage of the population with access to water from improved sources at 64.8%, the prevalence of diarrhea in children under of five years remains worryingly estimated at 21.8% [9]. As many cities in the DRC, Isiro continues to expand and its population is growing. The population's needs for drinking water are growing, the spontaneous establishment of neighborhoods is not accompanied by urban planning or the establishment of water supply infrastructure. As the prevalence of diarrheal diseases is high in the Isiro health zone, the associated factors must be analyzed in order to propose saving actions for the entire population. The aim of this study was to determine the prevalence of diarrheal diseases and associated factors in households in the Isiro health zone.

II. MATERIAL AND METHODS

Materials

The Isiro health district is one of 13 Health zone in the Haut-Uélé Province. It is limited:

- East and South-East: Health zone of PAWA
-West: Health zone of POKO AND BAFWAGBOGBO
- In the North and North-East: Health zone of RUNGU
- In the North and North-West: Health zone of VIADANA

It has an area of 3,577 km^2 and a total population of 308,200 inhabitants [10]. The study population is made up of the inhabitants of the Isiro Health zone.

Methods

An analytical cross-sectional study was carried out in Isiro health zone, Haut-Uélé province, during the period from 01 to 14 December 2020, to assess the prevalence of diarrheal diseases in households and analyze its determinants.

The sample size was calculated using the following formula: $N = Z^2 x \frac{p*q}{d2}$
Considering the percentage of the population using drinking water from improved sources as one of the important indicators to be determined in this study, this percentage being estimated in the Haut-Uélé Province at 64.8% [9]. For an accuracy of 0.05; coefficient Z = 1.96; the 95% confidence interval and the 10% nonresponse anticipation. The calculated sample size was 386 households. This sample was distributed in 8 Health Areas (HA) in two strata (urban and rural) according to demographic weight. At the level of each health area, the households to be surveyed were distributed equally, example, 48 households divided into 2 clusters, including neighborhoods (urban part) or villages (rural part). These households were selected by the systematic sampling technique, after the household survey, carried out as follows:
All households in the targeted stratum were listed (urban or village) (N) then, we calculated the sampling interval (k) to determine the number of households necessary to be included in the study by dividing the total number of households survey (N) by the number of households to be surveyed (n): afterward, simple random selection of a number between 1 and k which corresponded to the first household surveyed; gradual addition of sampling steps until the number of households required for the cluster was reached.

Data were collected by the guided interview technique from mothers / guardian of the children under 5 and analyzed using SPSS 20 and Stata 13 software. The description of the variables was made by means of frequency

measurement for the qualitative variables and mean ± SD for the normally distributed quantitative variables. Statistical inferences were made using the 5% threshold confidence interval and Pearson's chi-square test.

The explanatory variables used in the model are: home water treatment, duration of water storage, main source of drinking water, sensitization on diarrhea, registration of a case on diarrheal disease in the household 2 weeks before the interview and time to access water. All the independent variables were dichotomized, the adjusted OR derived from the model was presented as well as the chi2 p-value of WALD using the logistic regression model by a stepwise top-down approach including the significantly associated variables ($p < 0.05$).

Due to time and resource constraints, Health Areas with difficult access and / or with a problem of insecurity were excluded in this study.

III. RESULTS

The table 1 present the socio-demographic characteristics of mother /guardian of the children under five years in the household.

Table 1. Socio-demographic characteristics of mother/ guardian of the child

	Place of residence						
Variables	**Urban (N = 240)**		**Rural (N = 144)**		**Total (N = 384)**		
Educational level	not	%	NOT	%	not	%	p-value
No	13	5.4	24	16.7	37	9.6	0.000
Primary	61	25.4	74	51.4	135	35.2	
Secondary	145	60.4	43	29.9	188	49.0	
Higher or University	21	8.8	3	2.1	24	6.3	
Profession							
Household	91	37.9	14	5.8	105	43.8	
Farmer	38	15.8	88	36.7	126	52.5	
Small business	33	13.8	11	4.6	44	18.3	0.000
Pupil / Student	25	10.4	10	4.2	35	14.6	
Public official	26	10.8	8	3.3	34	14.2	
Private civil servant	17	7.1	6	2.5	23	9.6	
Job	10	4.2	7	2.9	17	7.1	
	Average	SD	Average	SD	Average	SD	
Average age	36.01	15.38	34.58	13.46	35.48	14.69	
Number of people in households	8.35	3.1	9.04	3.55	8.6	3.3	
Number of children in households	1.92	1.1	2.33	1.25	2.07	1.17	

It appears in this table that, most respondents in urban areas had secondary level study, while the primary level was predominant in rural areas. The difference in level of study between the two settings was significant ($p < 0.05$). The dominant profession, regardless of the environment, is agriculture. It is significantly higher in rural areas. The mean age in the two groups is 35.48 ± 14.69; the average number of persons in households is 8.6 ± 3.3 and the average number of children per household is 2.07 ± 1.17.

Table 2. Prevalence of diarrhea

	Place of residence					
	Urban		Rural		Together	
Prevalence of diarrhea	N	% (CI95)	not	% (CI95)	not	% (CI95)
Number of persons households	2003		1302		3305	
Number of children under 5	461		335		796	
People with diarrhea	104	5.2 (4.2-6.1)	112	8.6 (7.1-10.1)	216	6.54 (5.7-7.4)
Children with diarrhea	44	9.5 (6.8-12.1)	72	21.5 (17.1-25.9)	116	14.57(12.1-17)

According to this table, the prevalence of diarrhea was more than twice as higher among children under 5 compared to the total household population (14.57 vs 6.54) and in rural areas more than urban areas ($p < 0.05$).

Table 3. Presentation of the respondents according to the arrangements for managing diarrhea in households

	place of residence						
	Urban (N = 240)		Rural (N =144)		Total (N = 384)		p-value
Diarrhea	N	%	N	%	not	%	
Yes	51	21.3	52	36.1	103	26.8	0.001
No	189	78.8	92	63.9	281	73.2	
Place of care	**Urban (N = 51)**		**Rural (N = 52)**		**Overall (N = 103)**		
Health center	4	7.8	41	78.8	45	43.7	0.000
Home	47	92.2	11	21.2	58	56.3	
Type of treatment	**Urban (N = 51)**		**Rural (N = 52)**		**Overall (N = 103)**		
Modern	38	74.5	46	88.5	84	81.5	0.068
Traditional	13	25.5	6	11.5	19	18.5	

The treatment of diarrhea in rural areas is done significantly in health facilities, on the other hand, in urban areas, it is more at home ($p < 0.05$). In any case, treatment with modern drugs is the most used, regardless of environment ($p > 0.05$).

Table 4. Associated factors (bivariate analysis and logistic regression)

	Presence of diarrhea		**aOR**	**95% CI**	**p-value**
Treats water	**Yes**	**No**			
Yes	4	55	0.206	0.069-0.62	0.005
No	99	226			
Storage period					
24 hours	23	38	0.51	0.261-1.004	0.051**
> 24 hours	80	243			
Main water source					
Improved	34	47	0.435	0.241-0.785	0.006
Not improved	69	234			
Awareness of diarrhea					
Yes	21	122	2,259	1.26-4.039	0.006
No	82	159			
Water access time					
Less than 30 minutes	40	78	2,159	1.264-4.039	0.004
More than 30 minutes	63	203			

** Not included in the final model for lack of meaning.

It was found in this study that home water treatment (aOR = 0.206; p <0.05) and improved source use as the main source of drinking water (aOR = 0.435; p <0, 05) protects against diarrhea. In contrast, increased access to water and lack of awareness about diarrhea increases the risk of diarrhea in the household more than twice.

IV. DISCUSSION

4.1 socio-demographic characteristics

Related to the level of study, the secondary level was dominant of respondents in urban areas while the primary level in rural (table 1). The difference in level of study between the two settings was significant (p <0.05). For our study, the secondary level in urban areas and the primary level in the rural respectively represented 60.4% and 51.4%. This findings were different from Gilany and Hammad [11] finding which was 51.7% for no schooling and 32.9% for secondary school in Egypt. However, 46.6% of mothers with a secondary level was reported by Dairo et al.[12]. We think that the education level influences hygiene and can probably explain the increase of cases in rural areas than in urban areas.

The agriculture was the dominant profession, regardless of the environment 52.5% (Table 1). It was significantly high in rural areas. We believe that the profession influences the hygiene between housewives who care only for children and those whose profession is in agriculture. This statement was in accordance with El-Gilany [11] who reported an association between mother's profession and diarrhea to children in Egypt. This might be due to the availability of time for the farmer with their children. They spent more time for working and they don't take care of their children during the day.

4.2 Prevalence of diarrhea

The prevalence of diarrhea found in this study was very high, more than twice as high among children under 5 (table 2), compared to the total household population and in rural areas more than in urban (p <0, 05). This finding (14.57%) was close to that found by Jacques and Ngianga [13] which was 16.4% in the Democratic Republic of Congo (DRC). However, these prevalence of diarrhea in this study was lower the prevalence of diarrhea 23.6% by El-Gilamy [11] in Egypt and 27% by Jinadu [14] in Jos North central Nigeria for children under five. Diarrheal diseases rank with acute respiratory infections as among the major causes of morbidity and mortality among children under 5 years of age [15]. Persistent high rates of morbidity are of concern because early childhood diarrhea may have long-term effects on linear growth and physical and cognitive function [16]. This prevalence of diarrhea in children under five could be due to the poor hygienic conditions of mothers or caregivers. Since children are more sensitive for many bacterial diseases because their immune system is too weak then they are more vulnerable to infectious diseases.

4.3 Management of diarrhea in the Households

It emerges that self-medication was frequent 56.3%. Oral Rehydration Solutions (ORS) of which 59.2% considered it the most important treatment for acute diarrhea before being admitted to the nearest health center. King et al. [17] reported 71,0% children who received the ORS, also he stated that, Oral rehydration treatment, including rehydration and maintenance fluids with ORS, was the most beneficial treatment, because it is simple and facilitates the management of uncomplicated cases of diarrhoea of any etiologic agent at home. We believe this practice is explained by WHO recommendations to avoid dehydration before going to training for proper treatment. Moreover, most women are advised to administer the oral rehydration solution to children at the health center by personal health.

4.4 **Associated factors** (bivariate analysis and logistic regression)

It was found in this study that home water treatment (aOR = 0.206; p <0.05) and improved source use as the primary source of drinking water (aOR = 0.435; p <0, 05) protects against diarrhea (table 4). In contrast, increased access to water and lack of awareness about diarrhea increases the risk of diarrhea in the household more than twice. Dairo et al.[12] in its study on prevalence and determinants of diarrhoea among infants in selected primary health centers in Kaduna, reported a significant association between infants whose mother/ care giver had poor knowledge of cause of diarrhea and the high prevalence of diarrheal diseases. According to this research, the lack of home water treatment is a factor associated with the transmission of diarrheal disease. It was reported that children living in unsanitary households were the primary victims of diarrhoea [18]. In addition, El-gilamy [11] observed that, diarrhoea was encountered more often among children in homes where refuse was disposed in front of the house and flush toilets were absent. These conditions provide breeding sites for flies and other insects that convey enteropathogens from refuse to food and water. There are clear scientific evidence that support the practice of hand washing and water treatment reduce diarrhea risk by 47% [19].

Out of a total of 103 cases of diarrhea, 99 cases were from households that do not treat water at home. This would expose the population to diarrheal diseases. In this study, 69 of 103 children with diarrhea used water from unimproved sources. In contrast, decreasing access to water and lack of awareness about diarrhea increases the risk of diarrhea in the household more than twice.

V. CONCLUSION

Diarrheal diseases remain a public health problem in Democratic Republic of Congo in general and particularly in Haut-Uele province. Its prevalence is high in rural areas than in the cities. Water treatment, the use of improved water sources, reduction of access times and education level of mother/caregivers are some determinants which correlated to the decreasing of the prevalence of diarrheal diseases. It appears important so to set a program including sanitation, water source management and education practice to raise de awareness of mothers/caregivers on diarrheal diseases in order to decrease that prevalence.

Conflict of interest: None

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