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Article

Drivers of Acute Diarrhea in Mothers of Children between 6 and 59 Months old in Kinshasa Households, Democratic Republic of the Congo

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Abstract: Acute diarrhea is a common affection, among children under 59 months old in Sub-saharan Africa and Asia known to be a global public health concern. It is responsible for significant mortality in developing countries. The main purpose of this study was to identify drivers of acute diarrhea in mothers of children aged 6-59 months in Kinshasa households. This study was conducted in two health areas in Kinshasa namely Centre Supérieur Militaire Mobikisi and Hopital Militaire Central. It is a cross-sectional study of analytical type having a correlational design. In fact, 114 mothers having children aged 6 to 59 months old who had experienced at least three diarrheal episodes were selected and this research was carried out in January 2020. Independent variables were socio-economic factors and dependent variables were biological factors. Descriptive statistical analyses of which frequency and percentage were performed to describe the sampling profile. To measure the strength of association between different variables, the Pearson's Chi-Square (X^2) test was used. The findings showed that 57% live in a high socio-economic environment compared to 43% who have a low socio-economic environment responsible for the occurrence of acute diarrhea. It was observed that 67.7% of participants knew the importance of access to health care services, compared to 32.3% who did not know. Meanwhile, 50.8% lived in a healthy environment versus 49.2% who had an unhealthy environment. Furthermore, 53.8% were in an acceptable demographic and biological situation, compared to 46.2% who were in a precarious demographic and biological situation. Acute diarrhea in children aged 6-59 months is one of the causes of morbidity and mortality in Kinshasa city. Obstacles to effective care are related to the lack of quality service provision. Policy makers must therefore put in place interventions to address these challenges in order to reduce infant morbidity and mortality in this area.

Keywords: Factors, Acute diarrhea, Mothers, Children aged 6-59 months, Kinshasa

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1. Introduction

Acute diarrhea is a common affection, sometimes severe and urgent condition in children under five years old (59 months old). Each year, 2 billion cases of diarrhea occur in children under five years worldwide, and approximately 90% of these diarrheal deaths

happened in Sub-saharan Africa and South Asia. Moreover, 58% of diarrheal diseases deaths still take place in Low and Middle Income Countries [1-4]. In developed countries, diarrhea constitutes the cause of 3 to 4 million medical consultations and the annual incidence of diarrhea in children is estimated between 1.3 and 2.3 episodes per child [4,5]. In the Democratic Republic of the Congo (DRC), the United Nations Children's Fund revealed that the diarrheal diseases are responsible of at least 13.5% of infant mortality in 2003 and the report of Multi Indicator Cluster Survey (MICS-DRC) discovered that the prevalence of diarrhea was 18% in 2010 [6]. Moreover, the acute childhood diarrhea remains a global public health problem because it is responsible for significant mortality in developing countries despite efforts towards its control [2, 5]. Generally, diarrhea tops the list of waterborne infections as a consequence of poor sanitation in most African countries [8,9].

The acute diarrhea and its risk factors are generally benign and evolve favorably after a few days leading to dehydration and undernutrition. Moreover, the number of hospitalizations remains high, which leads to high costs of care [10]. Furthermore, 30% of emerging infections over the last 60 years have been transmitted by food but also by environmental factors or drivers. Foodborne diseases can manifest themselves by several symptoms, however, the most known are diarrhea. The burden of foodborne diseases leading to diarrhea is not yet estimated in developing countries [11]. The nutritional status of the child is a host-related factor but can also be considered because of the care provided to children mainly at the home level. In fact, the main causes of child malnutrition are: insufficient food intake and care of the child as well as infectious diseases such as diarrhea [12,13].

It should be noted that malnutrition can lead to reduced human performance and inadequate physical growth and cognitive development, and it is associated with increased frequency, duration, and severity of diarrheal episodes precisely in children under five [14]. Women economic status at the household level plays a major role in determining a child nutrition status and for them to realize this outcome, time has to be allocated for activities that would yield household food supply [15]. Socio-economic and environmental factors explain the occurrence of acute diarrhea in households where there are mothers having children aged 6-59 months. These factors influence the health of populations by causing high mortality [16-19]. In fact, environmental factors determine the health of the populations insofar as they directly influence the risks of contamination. The access to safe drinking water, poor sanitation and inadequate hygiene constitute elements of greater exposure to enteric pathogens and are associated with acute diarrhea by increasing the risk of morbidity and severity [14, 20-23]. Socio-economic conditions are key determinants of child health, such as the household standard of living or the mother's education level. Indeed, links between maternal education and child health influence the morbidity of childhood diarrheal episodes [8, 24-28]. So, the identification of the basic environmental and socio-demographic factors, which leads to the determination of childhood morbidity remains important in reducing the mortality among children [29]. The rapid growth of African cities and associated overcrowding has been linked to outbreaks of diarrhea, with children under-five among the most affected [26, 30]. It should be noted that diarrhea is not purely medically related but is as well associated with economic, social, environmental and behavioral factors [8].

As the mother education is an important risk factor for the well-being of the child, it is vital to study mother's behavior towards the occurence of diarrhea episodes in their children under five. Thus, the main aim of this study was to identify risks factors associated with acute diarrhea in mothers of children aged 6-59 months in Kinshasa households precisely in Kokolo health zone.

2. Material and methods

2.1. Study area

This study was conducted in two health areas of the Kokolo health zone in Kinshasa, particularly in Centre Supérieur Militaire Mobikisi and Hopital Militaire Central. The transmission of diarrheal diseases is perennial throughout the year, thus constituting in some areas of housing, a hyper-endemicity. The study was conducted between 1st and 30th January 2020.

2.2. Study design and Population

This is a cross-sectional study of analytical type having a correlational design. In fact, 114 mothers of children aged 6 to 59 months who had experienced at least with three diarrheal episodes were selected for this study. A random sampling was performed for the selection of the health areas and the sampling was of non-probability accidental type. This research focused on questions related to the 7-point Likert scale. In order to determine the sample size, we used the Fischer formula [31].

2.3. Data collection

Only one category of information was collected: that related to factors associated with acute diarrhea in mothers of children aged 6-59 months in different households of the two selected health areas and these households have known at least three episodes of diarrhea. In addition, we have also collected socio-economic, environmental and health care access parameters using a questionnaire.

2.4. Study variables

2.4.1. Independent variables

(a) Socio-economic factors

Socio-economic factors are the determinants related to social life and family income that can lead to diarrhea among children. Furthermore, as suggested by Fishbein and Ajzen [31-33], socio-economic factors were measured using a questionnaire with open-ended questions. Each pair of adjectives was presented after the statement, "What is your husband's or caregiver's occupation?" The following adjectives were proposed for the intention measure: unemployed, day laborer, government employee, private company employee, and other.

(b) Context of access to care

The context of access to care is defined by the possibilities of access to health services in the management of diarrhea among children. As suggested by Fishbein and Ajzen [31,32], the context of access to care was measured using a questionnaire with open-ended questions. Each pair of adjectives was presented after the statement: "Do you have access to health care services for children under five years in case of acute diarrhea? The following adjectives were proposed for the intention measure (yes or no).

(c) Immediate environment

The immediate environment is the setting in terms of where resistance occurs. Furthermore, as suggested by Fishbein and Ajzen [31], the immediate environment was measured using a questionnaire with open-ended questions as well. Each pair of adjectives was presented after the statement, "Do you have a source of drinking water production at home or either in your environment." The following adjectives were offered for the measure of intention (yes or no).

(d) Demographic and biological factors

Demographic and biological factors refer to the number of children in the household and humanitarian characteristics in the occurrence of acute diarrhea among children. Following Fishbein and Ajzen [32], demographic and biological factors were measured using a questionnaire with open-ended questions. Each pair of adjectives was presented after the statement, "Do you have how many children under five years in your home?" The following adjectives were offered for the measure of intent: one child, two children, and more than two children.

2.4.2. Dependent variables

(a) Acute diarrhea among mothers of children aged 6-59 months

Acute diarrhea among mothers of children aged 6-59 months of age is the passing of watery stools plus at least three times a day. Moreover, as suggested by Fishbein and Ajzen [32], acute diarrhea in mothers of those children was measured using a questionnaire with open-ended questions.

Each pair of adjectives was presented after the statement, "How often have you taken a child 6-59 months old to the hospital for an episode of diarrhea?" The following adjectives were offered for the measure of acute diarrhea: once, two to three times, more than once, and I don't know.

2.5. Data analysis

Descriptive statistical analyses namely frequency and percentage were done to describe the profile of the sample. To measure the strength of association between different variables, and odds ratios (ORs) were estimated with their CI (95%) using Pearson's Chi-Square (X^2) test. The p-value was 0.05. Data analysis was performed using SPSS software version 20.

2.6. Ethical Consideration

The study was approved by the ethics committee of the School of Public Health, University of Kinshasa and an informed consent form was obtained from all mothers who participated in this study.

3. Results

3.1. Socio-demographic characteristics

Table 1 presents socio-demographic characteristics of participants.

Table 1. Socio-demographic characteristics of participants

Characteristics	n=114	%
Marital status		
Single	13	11.4
Married	91	79.8
Divorced	8	7.0
Widow	2	1.8
Total	114	100
Education level		
Illiterate	6	5.3
Primary	43	37.7
Secondary	53	46.5
University	12	10.5
Total	114	100
Professional activity		
Housewife	100	87.7
Not Housewife	14	12.3
Total	114	100
Have you heard about acute diarrhea?		
Yes	113	99.1
No	1	0.9
Total	114	100
Do you have a child of 6-59 months having acute diarrhea?		
Yes	113	99.1
No	1	0.9
Total	114	100
What is the profession of your partner?		
Jobless	12	10.5
Day laborer	7	6.1
Civil servant	79	69.3
Employee	1	0.9
Others	15	13.2
Total	114	100
What salary range does your partner fall into?		
Less than 100$	83	72.8
Between 100-200$	21	18.4
More than 1000$	1	0.9
I don't know	9	7.9
Total	114	100

The majority of participants (79.8%) are married compared to 46.5% who have a secondary education. In fact, most of the participants are housewives (87.7%). In addition, 99.1% of participants had heard of acute diarrhea, compared to 69.3% whose partners occupation was a government employee. Furthermore, 72.8% had a salary range of less than US$100 per month.

3.2. Bivariate analysis between study variables

3.2.1. Relationship between socio-economic factors and the occurrence of acute diarrhea among participants

Table 2 presents the relationship between socio-economic factors and the occurrence acute diarrhea among participants.

Table 2. Socio-economic factors and the occurrence of acute diarrhea in participants

Factors socio-economic	Acute diarrhea in mothers of children aged 6-59 months in households		χ^2	p
	Knowing the factors that lead to diarrhea in children	Not knowing the factors that promote diarrhea in children		
	n(%)	n(%)		
Strong socio-economic **layer**	65 (100)	0 (00)	114,0	0,000
Weak socio-economic **layer**	0 (00)	49 (100)		
Total	65(100)	49(100)		

As observed, 57% live in a high socio-economic environment compared to 43% who have a low socio-economic environment responsible for acute diarrhea. The bivariate analysis between socio-economic factors and acute diarrhea among participants showed that there was a statistically significant association (p-value = 0.000).

3.2.2. Relationship between access to health care and acute diarrhea among participants

The relationship between the access to health care and acute diarrhea among participants is presented in the table below.

Table 3. Access to health care and the occurrence of acute diarrhea among participants

Context of access to care	Acute diarrhea in mothers of children aged 6-59 months in households		χ^2	p
	Knowing the factors that lead to diarrhea in children	*Not knowing the factors that promote diarrhea in children*		
Knowledge of the importance of access to health care services	*44 (67,7%)*	*19 (38,8%)*	*9,4*	*0,001*
No knowledge of the importance of access to health care services	*21 (32,3%)*	*30 (61,2%)*		
Total	65 (100%)	49 (100%)		

It was observed that 67.7% of participants knew the importance of access to health care services, compared to only 32.3% who did not know. Furthermore, the bivariate analysis between the context of access to care and acute diarrhea among participants showed a statistically significant association (p-value = 0.001), with the context of access to care, OR = 3.308 [1.524-7.180].

3.2.3. Relationship between Immediate Environment and Acute Diarrhea among participants

The influence of the immediate environment on the acute diarrhea in participants is described in Table 4 below.

Table 4. Relationship between the immediate environment and the occurrence of acute diarrhea in participants

Immediate environment	Acute diarrhea in mothers of children aged 6-59 months in households		χ2	P
	Knowing the factors that lead to diarrhea in children	*Not knowing the factors that promote diarrhea in children*		
Living in a healthy environment	*33 (50,8%)*	*13 (26,5%)*	*6,82*	*0,005*
Living in an unhealthy environment	*32 (49,2%)*	*36 (73,5%)*		
Total	72 (100%)	72 (100%)		

It emerges from the table that 50.8% lived in a healthy environment versus 49.2% who live in an unhealthy environment. Indeed, the bivariate analysis between the immediate environment and the occurrence of acute diarrhea among participants showed that there was a statistically significant association: p-value = 0.005, the immediate environment (OR = 3.308 [1.284-6.350]) with a df=1.

3.2.4. Relationship between demographic and biological factors and the occurrence of acute diarrhea among participants

The association of bio-demographic parameters and acute diarrhea is presented below.

Table 5. Relationship between bio-demographic parameters and the occurrence of acute diarrhea in participants

Demographic and biological factors	Acute diarrhea in mothers of children aged 6-59 months in households		χ^2	P
	Knowing the factors that lead to diarrhea in children	**Not knowing the factors that promote diarrhea in children**		
	n(%)	n(%)		
Having a good demographic and biological situation	35 (53,8)	33 (67,3%)	2,1	0,054
Having a precarious demographic and biological situation	30(46,2)	16 (32,7)		
Total	34(100)	71(100)		

It emerges from the above that 53.8% were in an acceptable demographic and biological situation, compared to 46.2% who were in a precarious demographic and biological situation.

Moreover, the bivariate analysis between bio-demographic factors and the occurrence of acute diarrhea among participants showed that there was a statistically significant association (p-value = 0.054) with demographic and biological factors and the occurrence of the diarrhea in the family (OR = 0.566 [0.262-1.223] with a df=1).

4. Discussion

Diarrhoea is the second gravest killer of under five children worldwide [34] and it constitutes a contributory factor for high rates of morbidity and mortality in under-five children [25]. It should be noted that diarrhea is a condition where individuals experience defecation as much as 3 or more per day with a soft consistency. Diarrhea in children is one of the environmentally-based diseases, and many cities of developing countries where the environment favors the occurrence of acute diarrhea in children under-five [25]. Furthermore, other factors, such as access to health care, behavior, education level of mothers and socio-economic life also affect the incidence of childhood acute diarrhea [25].

4.1. Socio-demographic parameters

The majority of participants in the study (79.8%) were married, while 46.5% had a secondary education level. Besides, most of the participants are housewives (87.7%). This situation can be explained by the fact that in most cases, African women are not interested in education. Therefore, low educational attainment exposes them to ignore some of the causes of acute diarrhea in children aged 6-59 months and exacerbates infant mortality rates. An educated mother has greater autonomy and can break with certain traditions that are not conducive to health on that which may affect children under 6 to 59 months of age. She can also take steps to ensure the household sanitation, improve hygiene and nutrition, as well as intervene in the family's health care decisions. Finally, social factors that govern individual norms, values and beliefs may influence breastfeeding and weaning practices, representations of illness, and treatment of illness [35,36].

Furthermore, 99.1% had heard of acute diarrhea, while 69.3% whose husband's or caregiver's occupation was a government official. We believe that the socio-economic conditions of the civil servants in Kinshasa are precarious because most of them live below the poverty line of one dollar a day, which does not allow them to ensure adequate hygienic and dietary conditions allowing children to prevent themselves from diseases through environmental and food hygiene. Meanwhile, 72.8% had a salary range of less than $100. The mother's bio-demographic characteristics (age at childbirth, inter-genital interval, parity, religion, ethnicity, migration status, marital status) and survival are also identified in the literature as powerful determinants of child health and exposing them to diarrheal diseases [37].

4.2. Bivariate analysis between study variables

4.2.1. Relationship between socio-economic factors and the occurrence of acute diarrhea

Among the 114 participants selected, only 57% lived in a high socio-economic background compared to 43% with a low socio-economic background responsible for the occurrence of acute diarrhea. Furthermore, the bivariate analysis between socio-economic factors and the occurrence of acute diarrhea among participants showed that there was a statistically significant association (p-value = 0.000). The socio-economic situation of a household is one of the key indicators that can cause waterborne diseases through unhygienic food and especially the consumption of unsafe water. In developing countries, many people lack access to safe water in the household, and are forced to collect water from unsafe water sources outside the household where water quality often is poor [38]. Therefore, inadequate water and sanitation affect human health, and especially the health of children [39]. The most common disease caused by unsafe drinking water is acute diarrhea, which remains a leading cause of illness and death among children under five [39]. Thus, improving water supply, sanitation and hygiene interventions can make a huge difference in reducing diarrhea morbidity [39]. However, the disease is also transmitted through food and through the air, which means that the disease can not entirely be attributed to water, and lack of sanitation and hygiene [40]. However,

infectious diarrhea is probably the largest contributor to diseases related to poor water quality, sanitation and hygiene [38].

These findings are in line with those found by Ferrer et al. [35] who emphasized that socio-economic level and cultural conditions at the distal level do not directly affect the occurrence of acute diarrhea. They have an impact on the characteristics of the habitat, the hygiene conditions, the care provided to the children, the access to care and the contact (at the proximal level), which in turn will have a direct effect on the risk of occurrence of acute diarrhea [1]. It is not an easy task to combat poor drinking water in the developing world, and several different factors have to be taken into account. Correct managing of the water in the household is a vital factor to reduce contamination of water in areas where water taps in the household are not available and where water often have to be transported long distances and stored at the home [39].

4.2.2. Relationship between the context of access to care and the occurrence of acute diarrhea

In fact, 67.7% of participants knew the importance of access to health care services compared to only 32.3% who did not know the importance of access to health care services. Diez Roux and Mair, [37] highlighted the effect of the neighborhood and households on health in urban areas, with the populations with poor health being those exposed to risk factors in their neighborhoods and precisely in the household. Several resources and factors are related to the neighborhood, such as: the context of access to care and quality of urban services, the influence of social networks (parents, peers, etc.), but also the perception that residents have of their neighborhood. Furthermore, the bivariate analysis between the context of access to care and the occurrence of acute diarrhea among participants showed a statistically significant association (p-value = 0.001) with the context of access to care (OR = 3.308 [1.524-7.180]). We believe that financial accessibility, geographical accessibility, i.e. the distance between homes and health centers and the distance between the technical platform of the health center limit some households to resort to it for the lack of means and thus expose children under 5 years to severe dehydration.

These findings are consistent with Stephenson et al. [41] who reported that the variables related to parental health behaviors include knowledge of effective treatment methods, use of prenatal care, attitudes toward child health, health care practices, and appropriate use of health care services, including all immunizations. In addition, these behaviors are influenced by the socio-economic status of the household, the education level of the parents, but also directly by the local context of residence [42].

4.2.3. Relationship between the immediate environment and the occurrence of acute diarrhea

It was observed that 50.8% of participants lived in a sanitary environment compared to 49.2% who had an unhealthy environment. Henry and Dos Santos, [20] illustrated that environmental factors as determinants of health to the extent that they directly influence contamination risks. Furthermore, environmental factors such as access to safe drinking water, sanitation, and hygiene are associated with acute diarrhea and fever. However, environmental factors cause diarrhea to decrease by more than half in healthy households, but increase with crowded housing conditions [43].

In fact, the bivariate analysis between the immediate environment and the occurrence of acute diarrhea in participants showed that there is a statistically significant association: p-value = 0.005, the immediate environment (OR = 3.308 [1.284-6.350]) with a df=1. Schémann [44] believed that unsanitary conditions are the cause of the proliferation of pathogen vectors through several factors (unsafe water etc.). Thus, by depositing eggs in the feces, flies can carry pathogens and directly contaminate drinking water and food. This demonstrates the links between pig feces and childhood diarrhea.

4.2.4. Relationship between demographic and biological factors and the occurrence of acute diarrhea in participants

The findings showed that 53.8% live in an acceptable demographic and biological situation compared to 46.2% who live in a precarious demographic and biological situation. Mokori et al. [45] indicated that due to biological factors, boys are more vulnerable at birth. In addition, children's resistance to disease aggression also depends on social behavior toward boys and girls as well as biological differences. However, the bivariate analysis between demographic and biological factors and the occurrence of acute diarrhea among participants showed that there is a statistically significant association (p-value = 0.054), demographic and biological factors (OR = 0.566 [0.262-1.223]) with a df=1. However, there is an association between bio-demographic and the occurrence of acute diarrhea among participants.

5. Conclusion

Acute diarrhea in children aged 6-59 months is one of the causes of morbidity and mortality in Kinshasa city. The findings showed that all the factors related with acute diarrhea among participants was statistically significant. Thus, variables that were significantly related were: socio-economic factors, context of access to care and the immediate environment. Socio-financial factors conditioned the use of child care, but also the geographical inaccessibility of the households. Obstacles to effective care are related to the lack of quality service provision. Policy makers must therefore put in place interventions to address these challenges in order to reduce infant morbidity and mortality especially by providing an easy access to a safe drinking water.

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