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Research Article

Prevalence of Diarrhea and Risk Associated Factors Among Children Under 5 Years in Kano, Northwestern Nigeria

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Abstract

Diarrhea infection has been recognized as one of the major world's leading causes of morbidity and mortality, resulting in over two million deaths per year, especially children in developing countries. The study was aimed to determine the prevalence of diarrhea and risk associated factors among children less than 5 years in Kano, Northwestern Nigeria. The study was conducted at Microbiology Department of Murtala Muhammad Specialist Hospital (MMSH), Danbatta General Hospital and Wudil General Hospital Kano. A total of two hundred and fifty (250) simple structured questionnaires were designed using open ended questions to provide information about the socio-demographic factors of participants and predisposing factors to both infections. A total of two hundred and fifty (250) simple structured questionnaires were designed using open ended questions to provide information about the socio-demographic factors of participants and predisposing factors to both infections. From the total of 250 subjects, 132 were males (52.8%) while 118 which accounted for 47.2% were female. Based on the age of the subjects, age category 1 – 2 years has the highest frequency 91 (36.4%) followed by 0 – 1 year with total frequency of 73 (29.2%) while least frequency 21 (8.4%) was recorded by subjects with age category 4 – 5 years. The result showed that the majority of the mothers (58%) do not have formal education, but 30 (12%) of the mothers had primary education, 43 (17.2%) had secondary education while 32 (12.8%) had tertiary education. It is concluded that environmental and behavioral factors of the subjects such as source of water, types of latrines, disposal of water waste, child hygiene and living with other animals contributed to childhood diarrhea.

Keywords: Diarrhea; Infection; Kano; Prevalence; Risk factors

Introduction

In developing countries, children under 3 years of age experience on average three episodes of diarrhoea every year. And each episode contributes to a significant nutritional deprivation which negatively affects child growth [1]. Diarrhoea disease is the leading cause of infant and child mortality in developing countries, and about 1.8 million children die per annum from this disease. These numbers of diarrheal deaths are still high despite a fall in childhood diarrheal disease from 4.6 million to 0.8 million over the

last three decades [2,3]. Young children are especially vulnerable to diarrheal disease, and most deaths related to diarrhoea took place in Africa and South Asia [4].

Diarrhea diseases remain among the most common causes of mortality and morbidity in children, particularly in low and middle-income countries. In 2013, of the 6.3 million children worldwide who died before they reached their fifth birthday, about half (3.2 million) died from infectious diseases, with diarrhoea killing more than 500,000 children [5]. By 2030, it is estimated that 4.4 million children under the age of five will die from infectious diseases annually and that 60% of those deaths will occur in sub-Saharan Africa [6]. Diarrhoea accounted for an estimated 3.6% of the global burden of disease, as expressed in disability-adjusted life years [7]. Although mortality from diarrhoea has declined considerably over the past 25 years globally, morbidity from diarrhoea in sub-Saharan Africa has not, as risk factors related to inadequate water, sanitation and hygiene (WASH), insufficient promotion of breastfeeding and malnutrition remain unacceptably high [8]. The rapid growth of African cities and associated overcrowding has been linked to outbreaks of diarrhoea, with children under the age of five among the most affected [9].

Diarrhea is commonly a sign of an infection in the intestinal tract that is caused by different bacteria, virus and parasitic entities [10]. In low resource areas, Rotavirus and Escherichia coli bacteria cause the highest incidents of diarrhea [11]. These microorganisms spread throughout unclean water and contaminated food or from one person to another and are most widespread in settings with poor hygiene and absence of access to clean drinking water and sanitation [11]. Transmission of agents that cause diarrhoea are usually by the faecal oral route, which include the ingestion of faecal contaminated water or food, person to person contact and direct contact with infected faeces [12]. Epidemiological studies of diarrhoea have been reported from several African countries [13,14]. Cases of diarrhoea have long term complications like malnutrition, growth retardation and immune impairment. The study was aimed to determine the prevalence of diarrhea and risk associated factors among children less than 5 years in Kano, Northwestern Nigeria.

Materials and Methods

Study Area

The study was conducted at Microbiology Department of Murtala Muhammad Specialist Hospital (MMSH), Danbatta General Hospital and Wudil General Hospital Kano. Kano State is located in the North-western Nigeria, it is coordinated at latitude 110 30' N and longitude 80 30' E [15]. It shares borders with Kaduna State to the South-West, Bauchi State to the South-East, Jigawa State to the East, Katsina State to the North. It has a total area of 20,131km^2 (7,777sqm) and estimated population of 13.4 million Figure 1 [16].

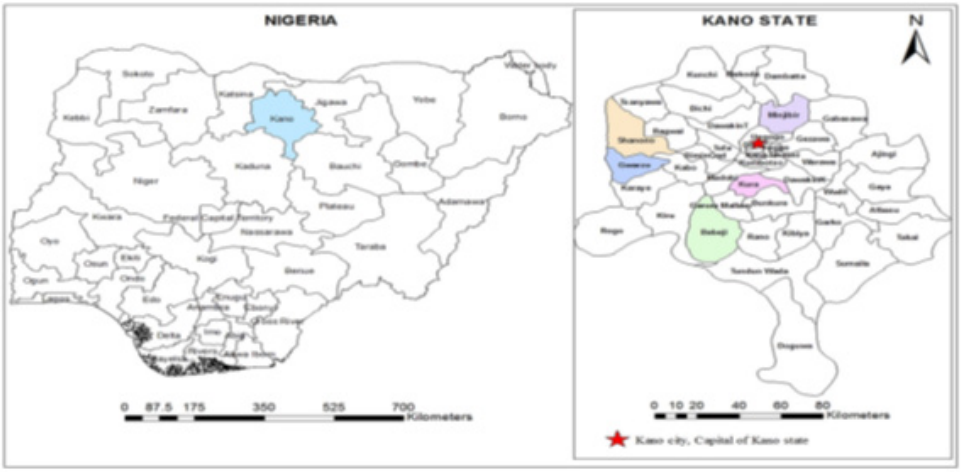

Figure 1: Maps of Nigeria Showing Study Area.

Ethical Consideration

An approval for the study (Reference Number: NHREC/17/03/2030) was obtained from Research and Ethic committee Kano State Ministry of Health through Health Service Management Board Kano based on the approval from Ethical Committee of Murtala Muhammad Specialist Hospital (MMSH), Danbatta General Hospital and Wudil General Hospital. The aim of the study was explained clearly to the clients and informed consent obtained before proceeding to the study [17].

Determination of Sample Size

Sample size for the study was determined from a standard formula for the calculation of minimum sample size. Sample size will be calculated using the formula; $N = (Z1\text{-}a)^2 \times (p) \times (1\text{-}p)/d^2$ as described by Omole et al. [18] where N= minimum sample size,

Z1--a = Value of standard normal deviate which at 95% confidence interval is found to be 1.96. p = the best estimate of prevalence obtained from literature review (18.8%) [19], and d = difference between the true population rate and sample that can be tolerated, this is the absolute precision (in percentage) on either side of the population = 0.05.

N = $(1.96)^2$ x (0.188) x (1-0.188)/ $(0.05)^2$ = 0.5864/0.0025 = 234.56 which is approximately equals to 235, is the minimum number of samples for the study. Therefore, a total of 12 subjects accounted for 5% of the minimum number of subjects will be added to the research for attrition, making a total of 250 samples.

Questionnaire Administration

A total of two hundred and fifty (250) simple structured questionnaires were designed using open ended questions to provide information about the socio-demographic factors of participants and predisposing factors to both infections. Informed consent was obtained from all participants before inclusion [17].

Statistical Analysis

The data on the prevalence and associated risk factors among study subjects with diarrhea were analyzed using Chi-square (X2) test to assess relationships between selected categorical variables such as age, gender and residential area. Significance level for the differences for both the tests will be set at $p<0.05$.

Results

Age and Gender of the Study Subjects

A total of 250 stool samples of children under five years of age, were examined in the study after meeting the inclusion criteria. Interviews based on questionnaire were conducted with their mothers. From the total of 250 subjects, 132 were males (52.8%) while 118 which accounted for 47.2% were female. Based on the age of the subjects, age category 1 – 2 years has the highest frequency 91 (36.4%) followed by 0 – 1 year with total frequency of 73 (29.2%) while least frequency 21 (8.4%) was recorded by subjects with age category 4 – 5 years Table 1.

Table 1: Age and Gender of the Study Subjects.

Characteristics	Number (n)	Percentage (%)	P value
Gender			
Male	132	52.8	0.784*
Female	118	47.2	
Total	**250**	**100**	
Age (Years)			
0 – 1	73	29.2	.00001**
1 – 2	91	36.4	
2 – 3	36	14.4	
3 – 4	29	11.6	
4 – 5	21	8.4	
Total	**250**	**100**	
Key: * Result is not significant at p<0.005; **Result is significant at p<0.005.			

Demographic Characteristics of the mothers/Care givers

The demographic characteristic of the mothers/care givers of the subjects of the study is presented in Table 2 below. The result showed that the majority of the mothers (58%) do not have formal education, but 30 (12%) of the mothers had primary education, 43 (17.2%) had secondary education while 32 (12.8%) had tertiary education. Based on working status, 208 of the mothers which accounted for (83.2%) were not working while 42 (16.8%) of them were working. The age category of the mothers with highest frequency (202) which accounted for 80.8% were those aged between 21 – 40 years. The resident of the mothers showed that 142 of them (56.8%) were from rural areas while 108 (43.2%) were from urban areas. The number of households of the subject indicated that those having between 11 – 20 household has the highest frequency 90 (36%), followed by those having household between 1 – 10 while those with higher than 30 household has the least frequency (37) which accounted for 14.8%.

Environmental and Behavioral Condition of the Study Subjects

Table 3 below shows the result of environmental and behavioral condition of the subjects. The result showed that majority (41.2%) of the subjects depended on well as source of water. This is followed by borehole (36%), river/stream (18) while 12 subjects (4.8%) use sachet water. On account of toilet facilities, 127 of the subject (50.8%) use water closet while 118 subjects accounted for 47.2% use pit latrine. Only 5 subjects (2%) use bush as toilet facilities. Majority of the subject (64%) disposed their water waste using sewage system, but 90 of the subjects (36%) throw away

their water waste to their immediate surroundings. The result also showed that 105 subjected which accounted for 42% live with animals while 145 subjects (58%) do not live with animals. Majority of the subjects washed their hand before meal, and they do not eat unwashed vegetables.

Table 2: Demographic Characteristics of the mothers/Care givers.

Characteristics	Number (n)	Percentage (%)	P value
Education level			
No formal Education	145	58	.00001**
Primary	30	12	
Secondary	43	17.2	
Tertiary	32	12.8	
Work Status			
Not working	208	83.2	.00001**
Working	42	16.8	
Age (years)			
Less than 20	32	12.8	.00001**
21 – 40	202	80.8	
Above 40 15 6			
Resident			
Urban	108	43.2	.03153**
Rural	142	56.8	
No. of household			
1 – 10	68	27.2	0.0002**
11 – 20	90	36	
21 – 30	55	22	
Above 30	37	14.8	
Key: **Result is significant at p<0.005			

Table 3: Environmental and Behavioral Condition of the Study Subjects.

Characteristics	Number (n)	Percentage (%)	P value
Source of drinking water			
Well	103	41.2	
Borehole	90	36	
Sachet water	12	4.8	
River/Stream	45	18	
Toilet facilities			
Pit latrine	118	47.2	
Water closet	127	50.8	
Bush	5	2	
Disposal of wastewater			
Sewage system	160	64	
Pour away in open surrounding	90	36	
Living with Animals			
Yes	105	42	

No	145	58	
Washing hand before meal			
Yes	240	96	
No	10	4	
Eating unwashed vegetables			
Yes	13	5.2	
No			
237			
94.8			

Discussion

Diarrhea infection has been recognized as one of the major world's leading causes of morbidity and mortality, resulting in over two million deaths per year, especially children in developing countries [20,21]. Nigeria is among low-income country, mostly the Northern part where diarrhoea is the second leading cause of deaths among children less than five years of age. Low socio-economic status, economic development has been poor due to collapse of infrastructure, environmental degradation; limited education, poor environmental sanitation and low hygienic-practices, all of which pose as a serious threat to people's health especially children's health [22].

The Result of the study revealed that number of males were higher than in females, However, the result is not significant ($p<0.05$). This is consistent with results of other researchers Anasari [23] and Nwaoha et al. [22]. In children under 5 years of age in Kathmandu Nepal, Ishiyama et al. [24], reported higher prevalence in males than females. A biological explanation may be related to the fact that boys during infancy have to build a larger muscle mass than girls. Consequently, boys might have increased demands for micronutrients and are therefore more at risk of a negative balance, including lack of vitamin A and zinc [25]. This vulnerability might increase the risk of diarrhoea and place the boys as the weaker sex regarding infections. Among older children, because boys are more active than girls, boys tend to move around and touch objects in the surrounding ground, whereas girls might tend to stay close to their mothers and play with more hygienic toys [22].

Finding of the present study revealed that cases of diarrhoea were mostly found among children aged between 1 – 2 years and number of cases decreased in older children (result is significant at 0.005). This finding agrees with that of Nwaoha et al. [22]. A decrease in number of cases among older children might be due to fact that the immune system of older children get stronger in resistance against agents of diarrhoea as can be seen in the work of Gascon et al. [26] symptoms of a diarrhoea in older children may also be lighter compared to younger children, because they could easily be given over-the-counter-drugs for treatment.

The findings of the present study emphasize that the higher the level of education of the mother the less was the risk of the under five years child to experience diarrheal episodes. This agrees with a study that was conducted by Mihrete et al. [27] to identify the determinants of childhood diarrhea among under five years children in northwest Ethiopia which found that education was significantly associated with child diarrhea. The result of the present study is in conformity with that of Gibru et al. [28], which found that children whose mothers cannot read and write were more likely to have diarrhea. Mother's education level provides knowledge on hygienic practices, child feeding and additional sanitation practices, which in turn are critical factors of childhood diarrhea. Literacy has been earmarked consistently as a major determinant of health in any population, especially with regard to female education. Educated women have a better understanding of personal hygiene, nutrition and are more knowledgeable about accessing the healthcare system. (Desmennu et al. [29] concluded in one of their studies that maternal education is the most important risk factor to diarrhea prevalence among children under five years of age in Nigeria.

The finding of the present study revealed more prevalence among rural dwellers than the urban counterparts. The urban center of Kano is more cleaner and has more educated people that had a very good knowledge of the risk factors of diarrhoea than the rural areas, which attributed to more cases in the rural areas. This might be explained using the work of Ugboko [30] and Yassin [31], which both states that in rural areas, due to low income, inadequate water source and unhygienic environment, people suffer more to infectious diseases. The result showed that majority of the subjects depended on well as source of water. Lack of access to potable water is a key player in the transmission of diarrheal diseases because unclean water harbors diarrheagenic pathogens. The level of microbial contamination of the water used for domestic purposes is due to high population, thus leading to poor management of wastes, which could lead to pollution of water [32]. Children in households using unimproved sources including unprotected well, unprotected spring, surface water and sachet water were prone to diarrheal episodes. This was in line with Mengistie et al. [33] where diarrhea was significantly associated with domestic water

supply from unimproved sources among children under five in eastern Ethiopia. Water source is part of the hygiene and correct handling of drinking water is an important factor to prevent any contamination. Thus, purifying techniques prior to drinking should be a part of implementation programs for households since even if water came from a protected source, it could be under high risk of contamination due to unhygienic drawing from wells or storage at home that explain the presence of diarrhea among children in households that used protected sources for drinking water. On account of toilet facilities, majority of the subject use water closet while some subjects use pit latrine. Majority of the subject disposed their water waste using sewage system. However, few throw away their water waste to their immediate surroundings which may lead to transmission of the disease.

Conclusion

Based on the finding of this study, male is more prevalent than female and the most affected age group is those between 1 – 2 years. A decrease in number of cases among older children might be due to fact that the immune system of older children gets stronger in resistance against agents of diarrhoea. The mother level of education, residence and socio-economic activity play vital role in childhood diarrhea. Environmental and behavioral factors of the subjects such as source of water, types of latrines, disposal of water waste, child hygiene and living with other animals contributed to childhood diarrhea. It is recommended that female education should be encouraged by the right government policy to achieve child favorable health outcomes in the future. Interventions targeted at improved sanitation, hygiene and better child spacing is also recommended.

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Conflict of interest

None.

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