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Prevalence of Diarrhea and Associated Risk Factors among Children Aged Under Five Years Presenting at Hoima Regional Referral Hospital

Maimuna Bashir Ali

Faculty of Clinical Medicine and Dentistry Kampala International University Western Campus Uganda

ABSTRACT

Diarrhea is among the top ten killers worldwide and in 2015, it accounted for 11% of child deaths globally. Many of these cases are from low and middle-income countries including Uganda. The last Uganda Demographic and Health Survey (UDHS) report in 2015 showed that the prevalence of childhood diarrhea was 19.5%. The local prevalence in Hoima was not known as no study had been done concerning the subject. The purpose of this study therefore was to identify the prevalence of diarrhea and its associated risk factors among children aged under five years presenting at Hoima Regional Referral Hospital. A cross-sectional descriptive study design was adopted for this study. Data was collected from 241 mother-child pairs using a pretested semi structured questionnaire. Collected data was entered in the computer after cleaning and analyzed using IBM SPSS version 25. Descriptive statistics were one to get the prevalence of diarrhea while Chi square and binary logistic regression analysis was done to find the independent variables associated with diarrhea among children under 5 years. The prevalence of diarrhea among under 5 years old in this study was 12.4%. The risk of diarrhea was increased in non-working mothers (OR=8.571; CI=2.889-25.426; p<0.001), child's age between 6 and 24 months (OR=9.098; CI= 3.282-25.220; p<0.001) and unprotected water sources (OR=12.100; CI=3.559-41.133; p<0.001). Christian religion (OR=0.263; CI=0.090-0.768; p=0.015), and not using bottle feeding (OR=0.229; CI=0.104-0.507; p<0.001) showed a reduced risk of diarrhea. The present study showed a high prevalence of diarrhea among children under five years of age. The independent variables that were found to be associated with diarrhea were mother's working status, child's age, source of drinking water, religion and bottle feeding. The results of this study have serious policy implications for health intervention programs and the researcher recommends that promoting women income generating programs may have a significant importance on child health and survival in the study area and Uganda in general. The long-term solution for decreasing morbidity from diarrhea may include the delivery of improved sanitation and hygiene through efficient health educational programs that concentrate on personal hygiene which lead to full sanitation. This should be reinforced in combination with health workers educating households on sanitation and child feeding practices.

Keywords: Diarrhea, Children under 5 years, Mothers, Women, Child deaths.

INTRODUCTION

Diarrhea is among the top ten killers worldwide and causes 11% of child deaths globally World Health Organization (WHO) [1]. In addition, UNICEF [2] reported that global diarrhoea mortality in children under five years old accounted for 9% in 2015. According to WHO [1], diarrhoea deaths in children under five reached 525,000 and children global diarrhoea cases were 1.7 billion in 2016. In the last decade, global diarrhoea was responsible for 1.7 million deaths per year among children under 5 years [3]. Many cases are from low and middle-income countries [4] in Africa and parts of Asia [5]. In East Africa, diarrheal diseases are common. For example, a study conducted in Tanzania indicated that the incidence of diarrheal disease was estimated at 6.1% and affected mostly children aged between 12 to 23 months (11.6% to 15.8%) [6]. A study conducted in Burundi found that diarrhoea episodes affected

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32.6% of children under 5 years old [7]. The situation in Rwanda was documented in the recent DHS 2015. According to the report, 12% of Children under 5 years had diarrhoea within two weeks preceding the Rwanda Demographic and Health Survey [8]. In Uganda, diarrhea affected 19.5% of children under 5 years in the two weeks preceding Uganda Demographic and Health Survey [9]. Diarrheal diseases continue to be a public health issue in developing countries, especially in Sub-Saharan Africa. The diseases have many consequences that include high morbidity/mortality especially among young children and can lead to childhood malnutrition which leaves children vulnerable to infections and delayed growth [4, 10, 11]. Many competing factors might explain the vulnerability of Sub-Saharan Africa. These include poverty, socio-political instability and lack of resources, all these factors constitute an open ground for pathogens to develop [12, 13]. Finally, the transmission from infected feces to people through poorly prepared food and unsafe drinking water, interpersonal contact, or manipulation of fecal matter, constitutes a major danger in relation to controlling diarrheal diseases [14-16]. Despite the efforts made by the Ugandan Government including availing water and sanitation from 74% to 84% [17], diarrheal diseases continue to be among the top ten leading causes of mortality and morbidity for children under 5 years in Uganda [18]. Uganda demographic and health survey (UDHS) conducted in 2016 to update the information related to burden of disease revealed that diarrhea prevalence among children under five years of age was 19.5% [19]. This population-based survey targeted households of children five years of age. However, though UDHS indicated the prevalence of diarrhoea among children under five, it did not identify the factors associated as it was not its focus. Thus, to identify factors which are associated with diarrhoea diseases among children under five years in Hoima Regional Referral Hospital, this study was needed. Local epidemiology of diarrhea and associated risk factors in Hoima had never been studied before. This study therefore, aimed at identifying local prevalence and risk factors for diarrheal illness among children aged under 5 years presenting at Hoima Regional Referral Hospital.

METHODOLOGY

Study design

A cross-sectional descriptive study design was used.

Area of Study

The study was conducted in pediatric ward at Hoima regional referral hospital. The hospital is found in Hoima district in western Uganda. Hoima district is bordered by districts of Masindi in the north, Kiboga in the east, Kibaale in the south and lake Albert in the west. The hospital is about 200 km west of Kampala city. The hospital caters for the populations of the greater Bunyoro region overall grossing a population of over 3 million people and it has an abed capacity of 300 beds.

Study population

The current study involved caretakers of children below 5 years with diarrhoea admitted to the pediatric ward.

Inclusion criteria

- All women with children below 5 years with diarrhoea in the pediatric ward during the study period.
- Willing to participate.

Exclusion criteria

- Not willing to participate in the study.
- Mothers with children above five years.

Sample size determination

This will be determined by using Kish's formula [20] which states that,

$$\mathbf{n} = \frac{Z^2(p(1-p))}{\varepsilon^2}$$

Where;
n = the required sample size
p= estimated prevalence of diarrhea, which is 19.5% national prevalence as per UBOS, [9]).
ε = margin of error on p (set at 5)
z= standard normal deviate corresponding to 95% confidence level (=1.96)

$$\mathbf{n} = \frac{(1.96)^2 x 0.195 x (1 - 0.195)}{0.5^2} = 241$$

Sampling technique

The researcher used consecutive enrolment sampling where the respondents meeting the inclusion criteria and consents to the study were interviewed in order in which they were identified.

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Data collection methods

This study used a semi structured questionnaire to collect information on socioeconomic characteristics, environmental and behavioral characteristics. It was written in English but the questions were translated to Runyoro during data collection for those who did not understand English language.

Data Processing and analysis

After data collection, data were entered and analyzed using IBM SPSS version 25. The descriptive statistics were presented as percentages since most of the variables were categorical. The bivariate analyses included Chi-square tests to assess significant differences in proportions experiencing outcomes. The multivariate analyses were based on logistic regression to establish differences in odds of experiencing the outcome of interest between various subgroups, when the other important factors are controlled for. For the multivariate analysis of childhood diarrhea, other important variables namely age, sex of child, residence, region, education level of the mother, age of mother were included as covariates so that their effects are controlled for.

Quality control

The questionnaire for data collection was pre-tested to ensure that questions were clear and allowed the gathering of information needed for the study. The questions that showed ambiguity during pre-testing were modified as required.

Ethical considerations

Ethical approval was sought from Kampala International University Western Campus Faculty of Clinical Medicine in the form of an introduction letter after approval of the proposal. A verbal and written consent was sought from the mothers before they participated in the study. Permission to collect data was sought from the hospital administrator.

RESULTS

Mother and household characteristics

The current study shows that majority of the respondents had ≤2 number of under 5 in the household (80.1, n=193). One hundred seventy-four (72.1%) respondents were Christians, 162 (67.2%) respondents were rural dwellers, and more than half (51.5%, n=124) of the respondents were working (employed or business). The education level slightly low with almost half of the respondents (41.9%, n=101) having just primary education and only 33 (13.7%) had completed tertiary level of education. Table 1.

Table 1: Frequency distribution of mother and household characteristics (N=241)

Characteristics	Frequency	Percent
Mother's education level		
Non	73	30.3
Primary	101	41.9
Secondary	34	14.1
Tertiary	33	13.7
Work status		
Not working	117	48.5
Working	124	51.5
Residence		
Urban	79	32.8
Rural	162	67.2
Religion		
Christian	174	72.2
Muslim	43	17.8
Traditional	24	10.0
Wealth index		
Poor	115	47.7
Middle	94	39.0
Rich	32	13.3
Number of U5 in household		
≤2	193	80.1
≥3	48	19.9

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Frequency distribution of child characteristics

Table 2 below shows the characteristics of children in the study. More than half of the children were females (55.2%, n=133) and 127 (52.7%) were in the age range of 25-59 months. Majority were not bottle fed and had an up-to-date vaccination status (70.1%, n=169).

Table 2: Frequency distribution of child characteristics (N=241)

Characteristics	Frequency	Percent
Child's sex		
Male	108	44.8
Female	133	55.2
Age (months)		
<6 months	33	13.7
6-24 months	81	33.6
25-59 months	127	52.7
Vaccination status		
Not up-to-date	72	29.9
Up-to-date	169	70.1
Bottle feeding		
No	169	70.1
Yes	72	29.9

Environmental and behavioural characteristics

The study findings show that the majority (69.7%, n=168) of the respondents had unimproved toilets and 60.2% (n=145) had shared toilet facilities. More than half of the respondents (51.5%, n=124) had protected water sources and 59.8% (n=144) would take less than 30 minutes to reach the water source. Most of the respondents (70.1%, n=169) were disposing off child's stool properly. Table 3.

Table 3: Environmental and behavioral characteristics (N=241)

Characteristics	Frequency	Percent
Source of drinking water		
Unprotected	117	48.5
Protected	124	51.5
Time to reach water source		
On premises	49	20.3
<30 minutes	144	59.8
> 30 minutes	48	19.9
Type of toilet facility		
Unimproved	168	69.7
Improved	73	30.3
Child stool disposal		
Improper	72	29.9
Proper	169	70.1
Shared toilet facility		
No	96	39.8
Yes	145	60.2

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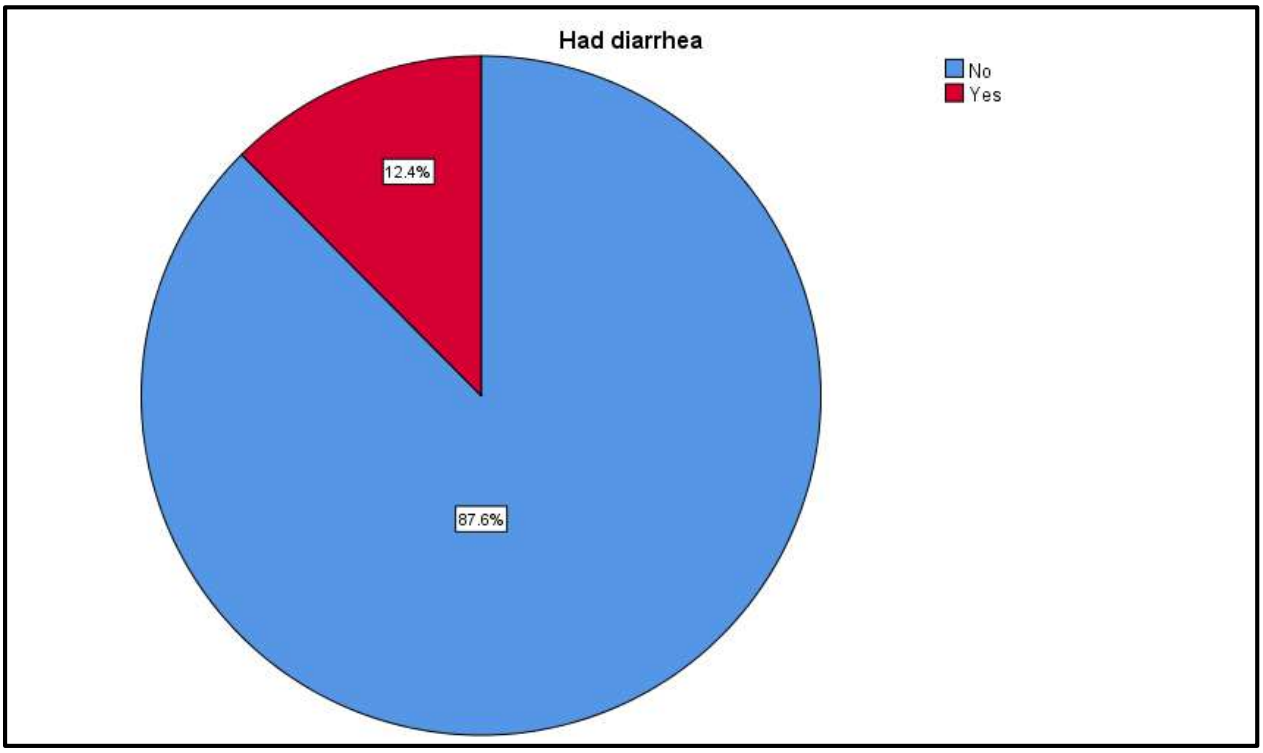
Prevalence of diarrhoea among children under five years

Results show that the prevalence of diarrhoea in this study was 12.4% (n=30) while the majority (87.6%, n=211) had no diarrhoea as shown in Figure 2 below.

Figure 1: Prevalence of diarrhoea among children under five years



Risk factors associated with diarrhea among children U5 years presenting at HRRH

Socioeconomic risk factors

The analysis of the socioeconomic risk factors shows that work status (X^2=19.933; P=<0.001), religion (X^2=11.172; P=0.004), wealth status (X^2=17.627; P=<0.001) and child's age (X^2=24.870; P=<0.001) were statistically associated with childhood diarrhea. Table 4.

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Table 4: Chi-squared analysis of socioeconomic risk factors of diarrhea among children U5

Variables	Prevalence of diarrhea		Chi-square (X^2)	P-value
	No	Yes		
Mother's education level			2.882	0.410
Non	60 (28.4%)	13 (43.3%)		
Primary	91 (43.1%)	10 (33.3%)		
Secondary	30 (14.2%)	4 (13.3%)		
Tertiary	30 (14.2%)	3 (10.0%)		
Work status			19.933	<0.001
Not working	91 (43.1%)	26 (86.7%)		
Working	120 (56.9%)	4 (13.3%)		
Residence			4.038	0.062
Urban	74 (35.1%)	5 (16.7%)		
Rural	137 (64.9%)	25 (83.3%)		
Religion			11.172	0.004
Christian	160 (75.8%)	14 (46.7%)		
Muslim	33 (15.6%)	10 (33.3%)		
Traditional	18 (8.5%)	6 (20.0%)		
Wealth status			17.627	<0.001
Poor	90 (42.7%)	25 (83.3%)		
Middle	91 (43.1%)	3 (10.0%)		
Rich	30 (14.2%)	2 (6.7%)		
Number of U5 in household			0.000	1.000
≤2	169 (80.1%)	24 (80.0%)		
≥3	42 (19.9%)	6 (20.0%)		
Child's sex			4.052	0.060
Male	89 (42.2%)	19 (63.3%)		
Female	122 (57.8%)	11 (36.7%)		
Child's age (months)			24.870	<0.001
<6 months	30 (14.2%)	3 (10.0%)		
6-24 months	59 (28.0%)	22 (73.3%)		
25-59 months	122 (57.8%)	5 (16.7%)		

P-value <0.05 is significantly associated with diarrhea.

Environmental risk factors

Analysis of environmental risk factors associated with diarrhea showed that source of drinking water was significant (X^2=23.571; P=<0.001). However, time taken to reach the water source (X^2=0.002; P=0.999) and type of water facility (X^2=1.530; P=0.288) were not found to be significant.

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Table 5: Chi-squared analysis of environmental risk factors of diarrhea among children U5

Variables	Prevalence of diarrhea		Chi-square (X^2)	P-value
	No	Yes		
Source of drinking water			23.571	<0.001
Unprotected	90 (42.7%)	27 (90.0%)		
Protected	121 (57.3%)	3 (10.0%)		
Time to water source			0.002	0.999
On premises	43 (20.4%)	6 (20.0%)		
<30 minutes	126 (59.7%)	18 (60.0%)		
> 30 minutes	42 (19.9%)	6 (20.0%)		
Type of water facility			1.530	0.288
Unimproved	150 (71.1%)	18 (60.0%)		
Improved	61 (28.9%)	12 (40.0%)		

P-value <0.05 is significantly associated with diarrhea

Behavioral risk factors

The chi-squared analysis showed that child's stool disposal (X^2=1.595; P=0.207), shared toilet facility (X^2=5.814; P=0.027) and vaccination status (X^2=1.667; P=0.206) were not statistically significant. However, bottle feeding was statistically significant (X^2=14.843; =P<0.001).

Table 6: Chi-squared analysis of behavioral risk factors of diarrhea among children U5

Variables	Prevalence of diarrhea		Chi-square (X^2)	P-value
	No	Yes		
Child's stool disposal			1.595	0.207
Improper	66 (31.3%)	6 (20.0%)		
Proper	145 (68.7%)	24 (80.0%)		
Shared toilet facility			5.814	0.027
No	78 (37.0%)	18 (60.0%)		
Yes	133 (63.0%)	12 (40.0%)		
Vaccination status			1.667	0.206
Not up-to-date	60 (28.4%)	12 (40.0%)		
Up-to-date	151 (71.6%)	18 (60.0%)		
Bottle feeding			14.843	<0.001
No	157 (74.4%)	12 (40.0%)		
Yes	54 (25.6%)	18 (60.0%)		

P-value <0.05 is significantly associated with diarrhoea.

Binary logistic regression analysis of risk factors of diarrhoea among children U5 years

To identify the independent risk factors associated with diarrhoea in under 5 years children, the researcher conducted a binary logistic regression analysis on factors which were significant at Chi-squared analysis and results are summarized in table 7. The researcher found that working status, religion, child's age, source of drinking water and bottle feeding were significantly associated with diarrhoea. Regarding the work status, results showed that children whose mothers were not working had a 9-fold risk of having diarrhoea than children with working mothers (OR=8.571; CI=2.889-25.426; p<0.001). Regarding religion, findings show that Christian children were less likely to have diarrhoea compared to children from traditional faith families (OR=0.263; CI=0.090-0.768; p=0.015) According to child's age, results showed that children aged between 6 and 24 months were nine times at risk of having diarrhea (OR=9.098; CI= 3.282-25.220; p<0.001) compared to those with age ranged between 25-59 months.

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In addition, source of drinking water showed a statistically significant association with childhood diarrhea. Children in households where the main source of drinking water was not protected had 12 odds of having diarrhea compared to children in households that used a protected water source (OR=12.100; CI=3.559-41.133; p<0.001) Regarding bottle feeding, children who were not bottle fed were less likely to develop diarrhea than those who were bottle fed and this was significant (OR=0.229; CI=0.104-0.507; p<0.001) Finally, although wealth status was not statistically significant at logistic regression analysis, children from poor households were 4 times at risk of having diarrhea than children from rich families (OR=4.167; CI=0.931-18.643; p=0.062).

Table 7: Binary logistic regression analysis of risk factors of diarrhea among children U5

Variables	Had diarrhea		OR	95% CI		P-value
	No	Yes		Lower	Upper	
Work status						
Not working	91 (43.1%)	26 (86.7%)	8.571	2.889	25.426	<0.001
Working	120 (56.9%)	4 (13.3%)	1			
Religion						
Christian	160 (75.8%)	14 (46.7%)	0.263	0.090	0.768	0.015
Muslim	33 (15.6%)	10 (33.3%)	0.909	0.284	2.911	0.872
Traditional	18 (8.5%)	6 (20.0%)	1			
Wealth status						
Poor	90 (42.7%)	25 (83.3%)	4.167	0.931	18.643	0.062
Middle	91 (43.1%)	3 (10.0%)	0.495	0.079	3.102	0.452
Rich	30 (14.2%)	2 (6.7%)	1			
Child's age						
<6 months	30 (14.2%)	3 (10.0%)	2.440	0.552	10.784	0.239
6-24 months	59 (28.0%)	22 (73.3%)	9.098	3.282	25.220	<0.001
25-59 months	122 (57.8%)	5 (16.7%)	1			
Source of drinking water						
Unprotected	90 (42.7%)	27 (90.0%)	12.100	3.559	41.133	<0.001
Protected	121 (57.3%)	3 (10.0%)	1			
Bottle feeding						
No	157 (74.4%)	12 (40.0%)	0.229	0.104	0.507	<0.001
Yes	54 (25.6%)	18 (60.0%)	1			

Key: OR= odds ratio, CI= confidence interval, p<0.005= significantly associated, p<0.001 is strongly significant associated, 1= Reference.

DISCUSSION

Prevalence of diarrhea among children under five years of age presenting at HRRH

The prevalence of diarrhea found in the present study was to be 12.4% which is slightly lower than the Uganda national prevalence of 19.5% reported by the latest Uganda demographic and health survey [19]. The difference could be attributed to the difference in time of the study and study methods. The current study was done in 2021 in one hospital while the UDHS was done in 2016 and a nationwide survey was done in communities. The UDHS could have captured children with diarrhoea that don't have gone to the hospital for treatment. Higher prevalence was also reported by studies in Burundi (32.6%) [7], Cameroon (19.4%) [21] and Ethiopia (22.5%) [22]. However, the result from the current study is comparable with previous studies in Tanzania (11.6%) [6], Rwanda (12%) [8], Philippines (14%) (World Bank, 2015) and Burkina Faso (15.3%) [23]. The similarity in prevalence could be due to similar methods of data collection and study designs.

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Risk factors associated with diarrhoea among children under five years old

This study assessed predictor variables of diarrhea among children aged below 5 years. In Binary logistic regression only working status, religion, child's age, source of drinking water and bottle feeding were independently associated with diarrhea among children under 5 years old. In this study, working status was significantly associated with diarrhea. Children whose mothers who were not working (no formal job or business) were 9 times more likely to have diarrhea than those whose mothers were currently working (OR=8.571; CI=2.889-25.426; p<0.001). This may be due to the fact that mothers who have no formal job or business are more likely to be exposed to poor hygiene practices and may lack clean water. This finding is supported by studies done in Indonesia [24], Ethiopia [25] and Nigeria [26]. The similarity could have been due to similar study setting and methods of data collection. However, contradicting results were reported by studies in low and middle-income countries [27] and Burundi [7] which found no association between work status and diarrhea. This study also revealed that diarrhea in under 5 years children was influenced by respondents' religion. Children from Christian families were 75.8% less likely to have diarrhea than children from non-Christian families (OR=0.263; CI=0.090-0.768; p=0.015). The reduced risk of childhood diarrhea among Christians could be attributed to difference in religious teachings and practice. The finding of this study however disagrees with that of studies done in sub-Saharan Africa [28), Central Uganda [17], and Ethiopia [25] which no association between religion and childhood diarrhea. The disagreement may be due to the difference in study setting and the fact that Christians were the majority in this study (72.2%, n=174). Thus, religion may be related to diarrhea only based on the socioeconomic background of the participants rather than the belief itself. The current study found that child's age was significantly associated with childhood diarrhea. Children aged 6 to 24 months were 9 times more likely to have diarrhea than those aged 25 to 59 months (OR=9.098; CI= 3.282-25.220; p<0.001). This might happen because the child is transitioning from exclusive breastfeeding to introduction of complementary foods that may be contaminated during preparation especially if the mother has poor hand washing practices. In this way, the child may ingest some microorganisms which may result in diarrhoea. Also, children at this stage are still young and when they play on the bare floor with soil, they don't have capacity to stop the transfer of pathogens from their hands to mouths. Similar findings were reported by studies in Tanzania [6], Ethiopia [29], and Nepal [30]. The similarity could be due to the fact that the child at this age starts to crawl and to walk which increases the risk of ingesting contaminated material and this favour the transfer of pathogens between hands and mouths that results in diarrhea. This study further revealed childhood diarrhea was influenced by respondents' source of drinking water. Children in households where the main source of drinking water was not protected were 12 times more likely to have diarrhea compared to children whose households used water from a protected source (OR=12.100; CI=3.559-41.133; p<0.001). Similarly, studies done in Ethiopia [25], Bangladesh [10], Sub-Saharan Africa [11, 27] and Indonesia [24] revealed that children whose households had unprotected water sources were more likely to have diarrhea than those from households with protected water sources. The association may be due to the fact that the water from unprotected sources is likely to be contaminated leading to diarrhea. In contrast, a study in Kenya [31] did not find any significance between water source and childhood diarrhea. In this study, bottle feeding was significantly associated with diarrhea among children under 5 years old. Children who were not bottle fed were 74.4% less likely to develop diarrhea than those who were bottle fed (OR=0.229; CI=0.104-0.507; p<0.001). This finding is supported by studies done in Cameroon [21], Uganda [17] and Tanzania [32]. The result of this study also in line with studies done in sub-Saharan Africa [27] and India [33]. This association may be due to the fact that bottle fed children are likely to take contaminated feeds which may result from poor bottle hygiene practices by the mothers.

CONCLUSION

The present study showed a high prevalence of diarrhea among children under five years of age presenting at Hoima Regional Referral Hospital (12.4%, n=30). Several important socioeconomic, environmental and behavioural risk factors that lead to the occurrence of diarrhea in children under five were identified and need to be focused on. The independent variables that were found to be associated with diarrhea were mother's working status, child's age, source of drinking water, religion and bottle feeding.

RECOMMENDATIONS

The results of this study have serious policy implications for health intervention programs and emphasize that promoting women income generating programs may have a significant importance on child health and survival in the study area and Uganda in general. The long-term solution for decreasing morbidity from diarrhea may include the delivery of improved sanitation and hygiene through efficient health educational programs that concentrate on personal hygiene which lead to full sanitation. This should be reinforced in combination with health workers educating households on sanitation. The health workers should constantly encourage mothers to wash their hands with water and soap before feeding the child, after going to the toilet/latrine and those bottle-feeding their children should thoroughly clean the bottles with hot water before using them. As pointed out earlier, diarrhea problem is

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due to the increased spread of pathogens caused by poor water and sanitation. The Ugandan government therefore must focus on comprehensive diarrheal disease control approaches, involving enhancement of water quality, hygiene, and sanitation. Finally, the researcher recommends longitudinal studies which are the best designs to provide data on the changing prevalence of diarrhea and address seasonality by including relevant factors.

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