PREVALENCE AND FACTORS ASSOCIATED WITH DIARRHEA AMONG CHILDREN LESS THAN FIVE YEARS OLD IN KABAROLE DISTRICT, UGANDA

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ABSTRACT:

Background: About 1.7 billion cases of diarrhea occur every year around the globe, leading to deaths and severe long term sequelae such as decreased cognitive function and stunted growth. About 90% of such deaths occur in Sub Saharan Africa and South Asia. Uganda is among the 15 countries that account for almost three quarters of all deaths from diarrhea among children under-five years old. This study therefore aimed at identifying diarrhea prevalence and its risk factors among children under five years old.

Methods: A community-based cross sectional study was carried out in Kabarole district in Uganda from December 2015 – January 2016. A random sample of 367 subjects from Rwimi Sub County and East Division constituted the study population. Data were collected using an interviewer-administered guide. Logistic regression was used to identify the association of variables with diarrhea occurrence in children under five years old.

Results: Three hundred sixty three subjects were recruited in the study. Mean ages for mother/care takers and under-five children were 28.99 years and 26.54 months respectively. Among mother/care takers, 79% had formal education, and 61% had a household monthly income < UGX90,000. Prevalence of diarrhea over a 7 days period preceding the study was 33%. After controlling for all possible confounders, only 5 factors were associated with diarrhea; fetching water from open well (OR_{adj} = 3.23, 95%CI = 1.34 – 8.01), poor level of practice (OR_{adj} = 49.74, 95%CI = 16.22 – 152.52), reheating of left-over food (OR_{adj} = 0.40, 95%CI = 0.21 – 0.73), and measles as child's previous disease (OR_{adj} = 22.14, 95%CI = 4.18 – 117.03).

Conclusions: Appropriate personal hygiene and household sanitation promotion programs should be implemented to prevent diarrhea in children less than five years old in the study area and likely elsewhere as well.

Keywords: Diarrhea, Hygiene, Uganda, Children under-five years

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INTRODUCTION

World over, diarrhea is the second leading cause of death in children under five years, accounting for 9% of all child deaths [1, 2]. In 2013, this translated into 1,600 young children dying each day, or about 580,000 children a year [3]. According to UNICEF in 2013 [3], 80% of child deaths is entirely due to diarrhea and occurs more commonly among children less than 2 years. More so, an estimated one billion episodes and 2.5 million deaths occur each year among children under five years old [4]. Globally, there are nearly 1.7 billion cases of diarrhea every year [3]. The burden of diarrhea is disproportionately high among children in low-and middle-income countries [5-7]. It is

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imperative to note that most deaths (90%), due to diarrhea occur in South Asia and Sub-Saharan Africa [5]. The highest numbers of childhood deaths were in Sub-Saharan Africa, where 50% of deaths from diarrhea occurred in 2011 [5], a clear indication that the most severe of outcomes of diarrhea are concentrated in the highest burdened countries. To reduce the burden on such number of deaths and the severe outcomes of diarrhea like malnutrition and stunted growth, risk factors need to be identified and eliminated as this is the most definitive way for prevention.

Overall, children in Sub-Saharan Africa experience an average of 3.2 episodes of diarrhea per child per year [8]. For an otherwise healthy child, a single episode of diarrhea is typically self-limiting and has no long-term sequels.

Uganda is the ninth in the whole world among countries with the highest mortality rate due to diarrhea with approximately 29,300 child deaths occurring every year due to the disease [3]. This transforms into severe economic repercussions in terms of treatment. In Kabarole district, the selected area for this study, diarrhea remains among the top 10 causes of morbidity within the district, accounting for 15,179 cases in the financial year 2013 [9]. According to the data from the Health Information Management System, diarrhea cases with in the district are on an increase, with the district having registered 12,335 and 14,606 cases of diarrhea in 2011 and 2012 respectively [9].

Thus, this study aimed at assessing the prevalence and factors associated with diarrhea among children less than five years old at the community level. The ultimate goal of this study was to provide a basis for the development of prevention and control interventions against diarrhea in Kabarole district and Uganda as a whole.

MATERIALS AND METHODS

Study design

A community based cross-sectional study design was used to find the prevalence and factors associated with diarrhea among children aged under-five years old in Kabarole district.

Study area

The study was conducted in Kabarole district which was located in mid-western Uganda, 320 km far away from the capital Kampala city. The district lies at an altitude of 1300 - 3800 meters above sea level. The district bordered with Bundibugyo in the west, Kasese in the south, Kamwengye in the south east and Kyenjojo in the east. It was composed of 3 counties, 18 sub counties, 6 town councils, 3 divisions, 85 parishes and 750 villages. The study covered one rural sub county (Rwimi Sub County) and one urban sub county (East Division) [10].

Study population

The study population involved all children under five years old in Kabarole district.

Sample size estimation

The sample for this study was determined using the Leslie Kish formula of 1965 [11].

$$n = \frac{z^2\, pq}{e^2}$$

From the calculation 334 respondents were needed, adding 10% for in any errors that could occur, the total 367 was used.

Sampling techniques

Under the decentralization policy of Uganda [12], lower local administrative units were established. Below the district is the Sub County, followed by the parish and then the village is the lowest administrative unit [12]. Therefore, after selection of the district as Kabarole district by convenience, selection of two sub counties of Rwimi and East division was done by simple random sampling using the computer generation random numbers. Rwimi Sub County had three parishes with approximately equal number of households [13]. These were: Kakooga, Kadindimo, and Kaina parishes [13]. East division on the other hand had 4 parishes of Kitumba, Bukwali, Nyakagongo and Njara [13]. Using the Simple random sampling technique Kakooga parish was selected in Rwimi Sub County while Kitumba parish was selected in East division.

The chairpersons (village headmen) of all the villages in the selected parishes were contacted and asked to provide the names of all households within their villages that have under-five children. The names of households provided were then assigned numbers and the households that were interviewed were selected randomly using the simple random sampling technique. For households with more than one under five children, a simple random sampling technique was used to select the study subject. This meant that one household was represented by one child.

Inclusion criteria

All the children more than 3 months of age to five years at the day of the interview who were living in the study areas were eligible to be included in this study.

Exclusion criteria

a) Any selected subject who was in a severe stage of any other disease was excluded.

b) Selected subjects who were not present at the time of visit were excluded.

c) And selected subjects who had been taking any immunosuppressant medicine were excluded from the study.

Data collection methods

Data was collected using face to face interviews. In this method, because children were too young to be interviewed, the researcher interviewed the mothers/care takers of children below five years of age on issues of diarrhea occurrence and risk factors for diarrhea occurrence in the local language. The questionnaire was structured and comprised of a set of issues on which the investigator wished to draw data using an interview guide to conduct the interview.

Research instruments

A questionnaire, weighing scale and height taking scale were used as instruments for data collection. The questionnaire consisted seven sections which included; a section on parents' (care takers') characteristics, child's characteristics, factors related to diarrhea, knowledge of diarrhea, attitude towards diarrhea, practice in relation to diarrhea, and child's vaccination status.

Method of validity testing for structured questionnaire

The validity was tested by 3 experts and adjusted using the item objective congruence (IOC) technique developed by Rovinelli and Hambleton in 1977. The IOC technique was used for appropriate question identification. Questions were adjusted and corrected if the IOC value was found to be less than 0.50. IOC was scaled by using the following formula [14].

$$\text{IOC} = \frac{\sum \text{R}}{\text{n}}$$

Method of reliability testing for the questionnaire

Before being used in the field, all the questions were tested for reliability by means of pilot-testing with 10 people in an area with similar characteristics as the study area [14]. KAP questions were tested for reliability (Chronbach's alpha) with the following results; knowledge questions = 0.75, attitude questions = 0.79, practice questions = 0.76.

Pretesting of data collection instruments

The questionnaire was pre-tested among households with children under- five years old in the community that is near the study area. The findings from the pre-testing exercise were used to revise the questionnaire.

Data collection procedure

Permission to conduct this study was sought from Kabarole district authorities. Anonymity and confidentiality of the respondents was observed by not asking the respondents to put their names on the questionnaires. A covering letter from Mae Fah Luang University was used as an introductory letter to the relevant stakeholders.

Approval of this study was sought from the School of Health Science Mae Fah Luang University. Permission from the office of the District Health Officer (DHO) Kabarole and also from the administration of the selected sub county and division in Kabarole district was sought as well. The investigator explained to the participants in the study and a chance was given to them to ask for any clarifications on any points that could have not been clear.

Data was collected by interviewing child mother/caretakers face-to-face, taking, reading and recording the weight and height of children less than five years old. In order to reduce data loss and missing data, the principle investigator and the research assistants rechecked for completeness of the information in the questionnaire after returning from the field each day after which data was entered into the database instantly.

Data analysis

Data analysis was carried out using SPSS version 20, 2014 (SPSS, Chicago, IL). General information of the subjects was analyzed using the descriptive statistics. Logistic regression model was used to find factors associated with diarrhea occurrence.

Ethical consideration

The confidentiality of respondents in this study was fully adhered to by not mentioning the names of study subjects and not availing personal information of study subjects to any one not involved in this study. The ethical committee of Mae Fah Luang University approved this study under certificate No. 95/2558.

Table 1 General characteristics of caretakers and children

Characteristics	n	%
Total	**363**	**100.00**
Sub county		
Rwimi	180	49.60
East Division	183	50.40
Age of caretaker (years)		
≤ 18	6	1.700
18 – 24	135	37.20
25 – 34	152	41.90
≥35	70	19.30
Min. = 14, Max. = 76, Mean. = 28.99, S.D. = 10.62		
Religion		
Christian	327	90.10
Moslem	27	7.40
Others	9	2.50
Education		
No education	73	20.10
Primary school	182	50.00
Secondary school	80	22.20
Diploma	14	3.80
University	14	3.90
Occupation		
Peasant	264	72.50
Government worker	13	3.60
Company	11	3.00
NGO	7	1.90
Businessman/woman	68	18.70
Household monthly income (UGX)		
<90,000	223	61.40
90,000 – 500,000	121	33.40
>500,000	19	5.20
Number of children < 5 years old		
≤ 2	348	95.90
≥ 3	15	4.10
Number of people > 5 years old		
≤3	74	20.40
4 – 6	227	62.50
7 – 9	41	11.30
≥10	21	5.80
Age of children (months)		
≤ 6	23	6.30
7 – 11	42	11.60
12 – 23	102	28.10
≥24	196	54.00
Min. = 3, Max. = 59, Mean. = 26.54, S.D. = 15.47		
Sex		
Male	175	48.80
Female	186	51.20

RESULTS

A total of 363 caretakers for selected under-five children in Kabarole district were interviewed in this study giving a response rate of 98%. The mean average age of child care takers was 28.99 years old (14 to 76 years old) while that of children was 26.54 months (2.2 years old). More than half of the children under this study were female, accounting for 186 (51%). At least 79% of the respondents had attained some formal education while 20% had no formal education at all. Majority of the respondents 223 (61%) reported that their household monthly

Table 2 Access to household sanitation and safe water and diarrhea occurrence

Characteristics	Diarrhea				OR	90%CI	*p-value*
	Yes		No				
	n	(%)	n	(%)			
Household toilet available							
Yes	111	(32.00)	236	(68.00)	0.28	0.10 – 0.79	0.017*
No	10	(62.50)	6	(37.50)	1		
Children feces disposal							
Buried	4	(44.40)	5	(55.60)	2.40	0.61 – 9.0	0.211
Thrown in surrounding	45	(64.30)	25	(35.70)	5.30	3.03 – 9.25	<0.001*
Put in toilet/latrine	72	(25.60)	212	(74.60)	1		
Toilet in good condition							
Yes	71	(32.70)	146	(67.30)	0.92	0.63 – 1.34	0.727
No	50	(34.50)	95	(65.50)	1		
Pond source of water							
Yes	1	(16.70)	5	(83.30)	0.40	0.04 – 3.41	0.399
No	120	(33.60)	237	(66.40)	1		
Open well source of water							
Yes	19	(48.70)	20	(51.30)	2.07	1.05 – 4.04	0.034*
No	102	(31.50)	222	(68.50)	1		
Borehole source							
Yes	56	(41.80)	78	(58.20)	1		
No	65	(28.50)	163	(71.50)	1.80	1.15 – 2.81	0.010*
Shallow well source							
Yes	13	(15.90)	69	(84.10)	0.30	0.15 – 0.57	<0.001*
No	108	(38.40)	173	(61.60)	1		
Rain water harvesting tank source of water							
Yes	2	(16.70)	10	(83.30)	1		
No	232	(66.10)	119	(33.90)	0.39	0.08 – 1.80	0.229
NWSC source of water							
Yes	28	(31.50)	61	(68.50)	0.89	0.53 -1.49	0.666
No	93	(33.90)	181	(66.10)	1		
River and borehole sources							
Yes	119	(33.70)	234	(66.30)	2.03	0.54 – 7.56	0.374
No	2	(20.00)	8	(80.00)	1		
Open well and borehole sources							
Yes	115	(32.70)	237	(67.30)	0.40	0.14 – 1.11	0.142
No	6	(54.50)	5	(45.50)	1		
Open well and shallow well sources							
Yes	120	(33.80)	237	(66.20)	3.57	0.61– 20.94	0.236
No	1	(12.50)	7	(87.50)	1		
Open well and NWSC sources							
Yes	119	(33.10)	241	(66.90)	0.24	0.03 – 1.86	0.255
No	2	(66.70)	1	(33.30)	1		
Access to safe water							
Yes	50	(42.00)	69	(58.00)	0.56	0.38 – 0.83	0.015*
No	71	(29.10)	173	(70.90)	1		
Rubbish pit present							
Yes	60	(31.10)	133	(68.90)	1		
No	61	(35.90)	109	(64.10)	0.80	0.55 – 1.16	0.334
Drying rack present							
Yes	26	(23.20)	86	(76.80)	0.49	0.32 – 0.76	0.007*
No	95	(37.80)	156	(62.20)	1		

Table 2 Access to household sanitation and safe water and diarrhea occurrence (cont.)

Characteristics	Diarrhea				OR	90%CI	*p-value*
	Yes		No				
	n	(%)	n	(%)			
Open defecation							
Yes	54	(45.00)	66	(55.00)	1		
No	67	(27.60)	176	(72.40)	2.15	1.46 – 3.15	0.001*
Kitchen present							
Yes	96	(34.30)	184	(65.70)	1		
No	25	(30.10)	58	(69.90)	1.21	0.77 – 1.88	0.480
Clean kitchen							
Yes	27	(19.60)	111	(80.40)	0.33	0.20 – 0.55	0.001*
No	94	(41.80	131	(58.20)	1		

*Significance level α = 0.10

Table 3 Simple regression model on the association of knowledge, attitude, and practices with diarrhea

Characteristics	Diarrhea				OR	90%CI	*p-value*
	Yes		No				
	n	(%)	n	(%)			
Level of knowledge							
Low	7	(53.80)	6	(46.20)	2.29	0.89 – 5.83	0.147
Middle	14	(25.90)	40	(74.10)	0.69	0.39 -1.18	0.259
High	100	(33.80)	196	(66.20)	1		
Level of attitude							
Negative	27	(28.70)	67	(71.30)	1.21	0.17 – 8.37	0.872
Neutral	93	(35.10)	172	(64.90)	1.62	0.24 – 10.96	0.677
Positive	1	(25.00)	3	(75.00)	1		
Level of practice							
Poor	79	(66.40)	40	(33.60)	28.84	12.64–65.77	<0.001*
Moderate	37	(22.30)	129	(77.70)	4.19	1.88 – 9.50	0.004*
Good	5	(6.40)	73	(93.60)	1		
Hand washing after toilet use							
Yes	8	(11.40)	62	(88.60)	0.21	0.09 – 0.44	0.001*
No	113	(38.60)	180	(61.40)	1		
Hand washing frequency							
All the time	28	(16.80)	137	(83.20)	0.22	0.13 – 0.65	<0.001*
Sometimes	93	(46.40)	105	(53.60)	1		
Hand washing materials							
Water only	60	(28.80)	148	(71.20)	1		
Water and soap	61	(39.40)	94	(60.60)	0.63	0.40 – 0.97	0.036*
Child hand washing helper							
Him/her self	5	(21.70)	18	(78.30)	1		
Older person	115	(33.90)	22	(66.10)	0.54	0.19 -1.49	0.236
Lengths of food storage							
<24 hours	120	(34.90)	224	65.10)	1		
24 hours	1	(5.30)	18	(94.70)	9.64	1.27 -73.11	0.028*
Left-over food covered							
Yes	104	(32.10)	220	(67.90)	0.61	0.31 – 1.20	0.153
No	17	(43.60)	22	(56.40)	1		
Left-over food heated							
Yes	54	(25.10)	161	(74.90)	0.40	0.23 – 0.57	<0.001*
No	67	(47.90)	73	(52.10)	1		
Hand washing method							
Pouring	66	(28.20)	168	(71.80)	0.53	0.33 – 0.82	0.006*
Single bowl	55	(42.60)	74	(57.40)	1		

Table 3 Simple regression model on the association of knowledge, attitude, and practices with diarrhea (cont.)

Characteristics	Diarrhea				OR	90%CI	*p-value*
	Yes		No				
	n	(%)	n	(%)			
Practice of bottle feeding							
Yes	9	(42.90)	12	(57.10)	1.54	0.63 – 3.76	0.343
No	112	(32.70)	230	(67.30)	1		
Measles vaccine							
Yes	8	(27.40)	220	(72.60)	0.22	0.13 -0.35	<0.001*
No	38	(63.30	22	(36.70)	1		
Pneumonia as child's previous disease							
Yes	36	(30.80)	81	(69.20)	0.19	0.74 – 1.90	0.475
No	85	(34.60)	161	(65.40)	1		
Malaria as child's previous disease							
Yes	109	(35.20)	201	(64.80)	0.54	0.27 – 1.07	0.077*
No	12	(22.60)	41	(77.40)	1		
Measles as previous child's disease							
Yes	2	(5.30)	36	(94.70)	10.40	2.46 – 43.96	0.001*
No	119	(36.60)	206	(63.40)	1		

*Significance level $\alpha = 0.10$

income was less than UGX90, 000 meaning that they earned less than a dollar per day. The average number of people per household was 5.09. The findings from the general characteristics of care takers were illustrated in Table 1.

The prevalence of diarrhea in children under five years old in the past 7 days was 121/363 (33%) while that within the past 14 days was 186/363 (48%).

It was found out that subjects who lived in a household with a toilet/latrine had less risk to develop diarrhea compared to those who lived in a household without one (OR = 0.28, 90%CI = 0.10 – 0.79). Similarly children who lived in households that had access to safe water (0.56, 90%CI = 0.38 – 0.83), did not fetch water from a borehole had less risk to develop diarrhea than their counterparts (OR = 1.80, 90%CI = 1.15 – 2.81). Subjects whose households fetched water from a shallow well had less risk of developing diarrhea compared to those that did not (OR = 0.30, 90%CI = 0.15 – 0.57).

On the other hand, subjects who lived in households that practiced indiscriminate disposal of children's latrine (OR = 5.30, 90%CI = 3.03 – 9.25), fetched drinking water from an open well (OR = 2.07, 90%CI = 1.05 – 4.04), had no household utensil drying rack (OR = 0.50, 90%CI = 0.32 – 0.76), and had the presence of open defecation around their home steads (OR =2.15 90%CI = 1.46 – 3.15 had greater risk of developing diarrhea compared to their counterparts (Table 2).

Subjects who lived in households where members washed hands after latrine use (OR = 0.22, 90%CI = 0.13 – 0.65), had a clean kitchen (OR = 0.34, 90%CI = 0.20 – 055), reheated left-over cooked food (OR = 0.40, 90%CI = 0.23 – 0.57), and washed hands by pouring (OR = 0.54, 90%CI = 0.33 – 0.82) had less risk of developing diarrhea compared to their counterparts. On the other hand, subjects, whose mothers/caretakers' had poor practice (OR = 28.84, 90%CI = 12.64 – 65.77), and stored cooked food for a period of over 24 hours (OR = 9.64, 90%CI = 1.27 – 73.11) had a greater opportunity of developing diarrhea compared to their counterparts (Table 3).

Children who had previously suffered from measles were 10.39 times more likely to develop diarrhea than those who had never suffered from the disease (OR = 10.40, 90%CI = 2.46 – 43.96).

Results indicated that increase in child age was associated with decrease in diarrhea occurrence. Children between 3 – 6 months old and 7 – 11 months old were 6.11 and 7.27 times respectively more likely to develop diarrhea than the older age categories (OR = 6.11, 90%CI = 2.43 – 15.33 and OR = 7.27, 90%CI = 3.49 – 15.13) respectively (Table 4).

Results on parent characteristics revealed that subjects who lived in households with an income less than UGX90, 000 had greater risk of developing diarrhea than those whose households earned more than UGX90,000, (OR = 6.31, 90%CI = 1.42 – 27.96) (Table 4).

Results from the multiple logistic regression

Table 4 Simple logistic regression model on association of subject characteristics with diarrhea occurrence

Characteristics	Diarrhea				OR	90%CI	*p-value*
	Yes		No				
	n	(%)	n	(%)			
Child's age							
≤6	15	(65.20)	8	(34.80)	6.11	2.43 – 15.33	<0.001*
7 -11	29	(69.00)	13	(31.00)	7.27	3.49 – 15.13	<0.001*
12 - 23	31	(30.40)	71	(69.60)	1.42	0.83 – 2.43	0.196
≥ 24	46	(23.50)	150	(76.50)	1		
Child's sex							
Male	63	(35.60)	114	(64.40)	1.22	0.78 – 1.88	0.373
Female	58	(31.20)	128	(68.80)	1		
Child's BMI							
Underweight	66	(29.70)	156	(70.30)	0.71	0.45 – 1.16	0.187
Overweight	11	(61.10)	7	(38.90)	2.69*	0.97 – 7.48	0.057*
Obesity	2	(22.20)	7	(77.80)	0.49	0.09 – 2.46	0.387
Normal weight	42	(36.80)	72	(63.20)	1		
Income level of caretaker (UGX)							
<90,000	95	(42.60)	128	(57.40)	6.31	1.42 – 27.96	0.015*
90,000 – 500,000	24	(19.80)	97	(80.20)	2.10	0.45 – 9.73	20.341
>500,000	2	(10.50)	17	(89.50)	1		
Occupation of caretaker							
Peasant	28	(39.40)	43	(60.60)	3.58	0.95 – 13.48	0.114
Farmer	59	(30.60)	134	(69.40)	2.42	0.66 – 8.80	0.260
Businessman/woman	30	(44.10)	38	(55.90)	4.34	1.15 – 16.36	0.069*
Formal employment	4	(12.90)	27	(87.10)	1		
Religion of caretaker							
Christian	106	(32.40)	221	(67.60)	0.24	0.07 – 0.78	0.046*
Moslem	9	(33.30)	18	(66.70)	0.25	0.06 – 0.95	0.090*
Others	6	(66.70)	3	(33.30)	1		

*Significance level at $\alpha = 0.10$

Table 5 Multiple logistic regression model on the factors associated with diarrhea

Characteristics	Diarrhea				OR_{adj}	95%CI	*p-value*
	Yes		No				
	n	(%)	n	(%)			
Open well source of water							
Yes	19	(48.70)	20	(51.30)	3.23	1.34 -8.01	0.009*
No	102	(31.50)	222	(68.50)	1		
Borehole source							
Yes	56	(41.80)	78	(58.20)	1		
No	65	28.50)	164	(71.50)	4.36	2.27 -8.36	<0.001*
Level of practice							
poor	79	(53.80)	40	(33.60)	49.74	16.22.-152.52	0.001*
Moderate	37	(22.33)	129	(77.70)	4.97	1.73 – 14.20	0.003*
Good	5	(6.40)	73	(93.60)	1		
Left-over food reheated							
Yes	54	(25.10)	161	(74.90)	0.40	0.21 – 0.07	0.003*
No	67	(47.90)	73	(52.10	1		
Measles previous disease							
Yes	2	(5.30)	36	(94.70)	22.14	4.18 – 117.03	<0.001*
No	11	(36.60)	206	(63.40)	1		

*significance level at $\alpha = 0.05$

revealed that children in household that fetched drinking water from a borehole, and reheated left-over food before eating (OR_{adj} = 0.40, 95%CI= 0.21 – 0.73) had less risk of getting diarrhea than their counterparts. On the other hand, children in households that fetched drinking water from open wells (OR_{adj} = 3.29, 95%CI= 1.34 – 8.01), whose mothers/caretakers had poor level of practice (OR_{adj}= 49.740, 95%CI= 16.22 – 152.52), had previously suffered from measles (OR_{adj} = 22.14, 95%CI= 4.18 – 11.03), had greater risk of developing diarrhea than their counterparts (Table 5).

DISCUSSION

This study revealed that the prevalence of diarrhea within the past 7 days was 33% while that within the past 14 days was found to be 48%. The findings of diarrhea prevalence within the past 7 days were close to the findings by Bbaale [15], who in his study on determinants of diarrhea and acute respiratory infections among under-fives in Uganda found out that diarrhea prevalence was 32%. The study findings were also found to be similar to Dos Santos [16], in his study on water related factors and childhood diarrhea in African informal settlements in Burkina Faso. On the contrary, findings of this study on the prevalence of diarrhea were different from those of Yilgwan [17], who in his study on the prevalence of diarrhea disease and risk factors in Jos University teaching hospital, Nigeria found the prevalence of diarrhea among children to be only 2%. Such a great difference in the findings of this study and that of Yilgwan could be due to the difference in the study methodologies. While this was a community based study, that one of Yilgwan was hospital based. Yilgwan's study could therefore have missed out on a number of diarrhea cases that did not visit the hospital for treatment, leading to a very low prevalence therein. By collecting data from randomly selected subjects, such a selection bias was eliminated by this study.

Regarding the factors associated with diarrhea children who lived in households that collected their drinking water from an open well were 3.23 times more likely to develop diarrhea than those who did not. These findings are in agreement with Godana and Mengiste [18], who in their study on environmental factors associated with acute diarrhea among children under five years of age in Derashe district in South Ethiopia found that lack of improved water sources was associated with diarrhea among the study subjects.

Study findings further revealed that not fetching water from a borehole predisposed children to contracting diarrhea. This finding was in agreement with Uganda's Ministry of Water and Environment [19] that considers the borehole technology as a safe water source. Never the less, these finding differ from those of Maponga et al. [20] and Huntler et al. [21]. Whereas, Maponga et al. mentioned municipal water, as a protective factor for diarrhea, Huntler found out that children who drunk ground water such as that from the borehole were 62% likely to develop diarrhea. This difference in findings could be due to difference in the depth of the boreholes. Since boreholes are known to have a depth ranging from 7 – 100 meters, shallow boreholes are more likely to be contaminated by the infiltration from contaminated surface water as was explained by Engstrom et al. [22] in his study on prevalence of microbiological contaminants in groundwater sources and risk factor assessment in Juba, South Sudan. Engstrom et al. further suggested that the local topography and on-site hygiene were additionally significant sources of contamination.

It was revealed that children under the care of mothers/caretakers who had poor level practice and moderate level of practice in relation to diarrhea were more likely to develop diarrhea than those under the care of mothers/caretakers with good practice. The results on poor practice are in agreement with Wahed et al. [23] who in their study found out a significant association between the respondents' practice and diarrhea. While the results on moderate practice are in contrast with Agustina et al. [24] who mentioned that moderate levels of practice and experience were associated with decreased diarrheal risk.

This study brought to light the importance of re-heating left-over food before eating it. These study findings are in agreement with Islam et al. [25] who in his study found out that storage of food in the same pot after first time feeding and reheating the food before reuse were significantly associated with reduced diarrhea morbidity and nutritional status among children in Bangladeshi**.** Agustina et al. [24] on the other hand found out that food holding time and reheating before eating were related to the sources of food-born transmission but did not show statistically significant association with diarrhea.

Study findings also revealed that children who had previously suffered from measles were 22.14 times more likely to have diarrhea than those who

had never suffered from the disease. This finding was in agreement with Nhampossa et al. [8], who mentioned measles as one of the infections that can predispose children under five years old to diarrhea. Nhampossa and his colleagues explained that measles leads to immunological impairment, making the body's defense system so weak to fight against infections like diarrhea. He mentions that failure to get immunized for infections such as measles increases the risk of diarrhea.

The strengths of this study lay in its randomization method for the selection of study subjects. This never the les being a cross-sectional study, it had a limitation of the proper sequencing of cause and effect. Recall bias was another limitation which was reduced by using the period prevalence for measuring diarrhea. Information bias was minimized by administering the questionnaire to the child caretakers instead of the children themselves who were too young to understand the questions and the researcher used a checklist for observation to confirm the responses given by subjects.

CONCLUSION

This study indicates the urgent need for effective interventions to curtail the high magnitude of diarrhea among children less than five years old. This study therefore recommends for policy formulation and implementation, increased funding for water and sanitation infrastructure development, and hygiene promotion for the improvement of child health in Uganda. This study further calls for an establishment of a new and well facilitated Ministry of Public health and Disease control that will primarily focus on disease prevention through health education and health promotion. Such a ministry will treat Hygiene promotion at household level as a primary area of attention**.** Through this ministry, immunization campaigns against measles at community level could be strengthened, community members trained on the importance of adopting good health practices and reheating left-over food before eating through health education campaigns and with coordination with the Ministry of Water and Environment develop water infrastructure for provision of safe water to the communities.

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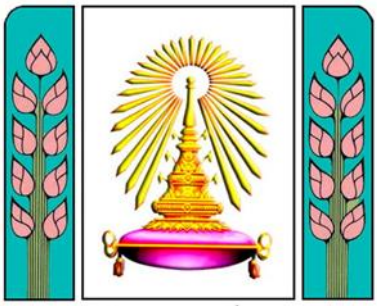

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