

Incidence of Diarrhea and Contributing Factors in Nakaloke Town Council, Eastern Uganda, among Children Below 5 Years of Age

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ABSTRACT

Diarrheal diseases are a major cause of mortality and morbidity in children, with 3.2 million deaths in low and middle-income countries in 2013 due to infectious diseases. This study aimed to assess the prevalence of diarrhea and identify risk factors among children under five years old in Nakaloke Town Council, Mbale District, Uganda. A community-based cross-sectional study was conducted among 200 parent or caretaker/children pairs between April 3rd and 12th, 2020. Data were collected using pre-tested and structured questionnaires and analyzed using Univariate analysis and modified Poisson regression. The mean age of the study participants was 32.74 months, and the prevalence of diarrhea in the two weeks preceding the study was 36.00%. Maternal and childhood-related factors independently associated with diarrhea included a child's age of ≥ 45 months, a birth order of 2 versus 1, non-vaccination against Rotavirus, and maternal secondary education versus illiteracy. Water, sanitation, and hygiene-related factors included drinking water from unprotected wall springs and having no handwashing facility beside the toilet.

Keywords: Diarrhea diseases, Infectious diseases, Drinking water, Sanitation, Hygiene.

INTRODUCTION

The challenge of the time is to study child health in relation to community, social values, and social policy. Child health has been given the greatest priority over the years, both at the national level and at the state level. However, acute diarrhea continues to be one of the main health problems in children[1]. One in four deaths in children under the age of five years is estimated to be due to diarrhea[2]. One out of ten babies born in developing countries fails to reach its fifth birthday, falling victim to diarrhea diseases[3]. The high mortality and morbidity due to diarrhea diseases can be markedly reduced by Oral Rehydration Therapy (ORT), which includes proper home management with home-available fluids (HAF), oral rehydration salts solution (ORS), and by continuing usual feeding[4]. Oral Rehydration Therapy is rightly considered as one of the important medical advances of the 20th century in

terms of simplicity and its potential to save lives[5].

Diarrhea is defined as the passage of three or more loose or liquid stools per day or more frequent passage than is normal for the individual [6]. 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 diarrhea killing more than 500,000 children [7]. By 2030, it is estimated that 4.4 million children under the age of five will die from infectious diseases annually, and 60% of those deaths will occur in sub-Saharan Africa [8, 9]. Diarrhea accounts for an estimated 3.6% of the global burden of diseases, as expressed in disability-adjusted life years (DALY), based on a systemic analysis for the Global Burden of Disease study in 2010.

Although mortality from diarrhea has declined considerably over the past 25 years globally, morbidity from diarrhea 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 [10]. The rapid growth of African cities and associated overcrowding has been linked to outbreaks of diarrhea, with children under the age of five among the most affected [11].

A cross-sectional study using the 2000/2001 Uganda Demographic and Health Survey [12] gathered information from women's questionnaires administered to sampled mothers aged 15-49 years and with living children aged 0-5 years. The results showed that the overall prevalence of diarrhea in children aged 0-5 years was 23.8%. The Northern and Eastern regions of the country had the highest prevalence of diarrhea in children (29.3% and 26.9%) respectively. Independent determinants of diarrhea were age below two years, residing in the Northern and Eastern regions, and children with a history of fever in the two weeks preceding the survey [13].

Globally in 2015, 5.9 million children under the age of 5 years died, and the majority of these children were in the African region [14]. Most of these mortalities occurred as a consequence of diarrhea and acute respiratory infections [15]. Childhood diarrhea is a preventable disease, and Uganda is among the countries where the burden of childhood diarrhea is heavily

concentrated [16, 17]. In 2008 in Uganda, 16% of all under-5 deaths were attributed to diarrhea [17]. This study addresses the impact of the length of breastfeeding, completion of childhood immunization status of the child, and the presence of acute respiratory infection on the occurrence of diarrhea in children in Uganda by analyzing secondary data from the UDHS 2011 dataset [18].

Exclusive breastfeeding of children under 6 months of age contributes to a reduction in morbidity and mortality [19], including a reduction in episodes of diarrhea. The benefit of breastfeeding beyond this age in terms of reducing diarrhea is not clear. While UNICEF [20] recommended continued breastfeeding for up to 2 years, the effect of a longer breastfeeding period in terms of potentially reducing the occurrence of diarrhea needs to be explored. There is also a paucity of information on the benefits offered by routine immunization, which has been seen to reduce all-cause morbidity and mortality in children [21]. The impact of acute respiratory infection on diarrheal disease has not been fully explored, although it is an equally common childhood disease. These risk factors were studied with respect to their potential impact on the incidence of diarrheal episodes [22]. With associations established, they could provide important evidence for guiding the design of prevention strategies that would help reduce morbidity due to childhood diarrhea in Uganda and areas with similar settings.

METHODOLOGY

Research Design

The study population comprised mothers of children less than five years of age living in Nakaloke town council who fell among the households sampled.

Sample size and sampling technique

The sample size was calculated using the formula kishLislie [23] below:

$$N = z^2 p (1-p) / e^2$$

Where;

n = Estimated minimum sample size required

P = proportion of a characteristic in a sample (84.5% [Babriye, 2009])

Z = 1.96 (for 95% Confidence interval)

E = Marginal of error set at 5%

$$N = \frac{1.96^2 * 0.845(1-0.845)}{0.05^2}$$

N = 201 mothers

Sampling technique

Simple random sampling technique was used to sample the households, this was done using a lottery where the names of the households were written on papers, folded and put in an opaque bag from which the number of households to be visited were picked at random and considered the random households. Each of the sampled households was visited on different days until the required sampled size of the mothers of

children under five years was accessed. Simple random sampling was also used to get the consented mothers of children below five years.

Inclusion criteria

All women aged 15-49, whether permanent residents or visitors, prior to the night of the survey. All men aged 15-49, whether permanent residents or visitors, prior to the night of the survey and willing to participate. Household heads with children aged five years or younger.

Exclusion criteria

Not willing to participate in the survey. Household heads having children above five years of age.

Quantitative data

Quantitative data was collected using structured interviews to read the questions exactly as they appeared on the survey questionnaire for the respondents to answer.

Data collection instruments

Quantitative data collection was conducted using a structured questionnaire to obtain all of the required information. These questionnaires were close-ended questions developed in English. Qualitative data collection was conducted using an open-ended focused group guide.

Data collection procedure

All women aged 15-49 years available in the sampled households during the days of data collection were approached. Those who met the study criteria were told the purpose of the study verbally and after consent, they were enrolled for the study.

Data management

The study performed will be analyzed and kept. To be destroyed after five years.

Quality control

The data collection team comprised of four research assistants who were university graduates in the area of health service. The study team was recruited based on the experience they had in conducting similar research. Two-day training was conducted by the principal researcher.

Pre-testing of questionnaires

The principal researcher and the data collection team conducted the pre-testing of the questionnaires over a

period of two days in Ishaka Division. A total of 20 households were covered with each research assistant covering five households. Pre-testing was done to impart practical experience to the team in administering questionnaires as well as giving the researcher an idea of the population characteristics.

Validity and Reliability of the Research instrument

Data collection instruments were designed by the principal researcher who ensured that the questions and items were suitable to answer or measure the specific objectives of the study. Quality of data collected was ensured through close supervision of the data collection team daily by the principal researcher. Completed questionnaires were reviewed daily for inconsistency or incomplete responses and corrected. Sets of data were entered onto an excel spreadsheet. Data was entered using the statistical products and service solution (SPSS) Data entry module version 12.0 software which has an inbuilt verification ability to check for range and logistical errors.

Data process and analysis

Data from the survey was statistically analyzed using the statistical package for social sciences (SPSS) (version 17.0). Basic descriptive analysis was done using frequency distributions. Quantitative data was sorted, categorized and conceptualized systematically to see the pattern of diarrhea. Measures of central tendencies were used to give expected summary statistics of variables studied. Descriptive statistics was used to describe a distribution of scores. Findings were presented using frequency distribution tables, charts and graphs. Inferential statistics and chi-square was performed to compare different effects of different factors on diarrhea. Since the study was about a relationship (dependence on diarrhea on other factors), chi-square statistics (*2) was used to establish whether relationships existed among the variables. Statistical significance was assumed for p-values, < or = 0.05. Associations between significant variables in the chi-square test were then further examined using adjusted odds ratios.

Ethical considerations

Permission was sought and granted by the District health officer (DHO). Before undertaking this research, ethical approval was also sought from various sources to ensure that the study adhered to acceptable ethical guidelines. In addition, the researcher explained the purpose of the study to each study participant after which an

informed consent was obtained from the participants before participating in the study. In order to ensure confidentiality, names of the respondents were not taken and the information given during the interview sections were not released to anyone. To further gain the trust and safeguard the privacy of respondents, the interviews were done privately and in secured areas.

RESULTS

Descriptive Statistics for Characteristics of the Study Participants

Childhood Related Characteristics

Table 1 below shows the childhood related characteristics of the study participants. It can be observed that majority of the children 34.50% (69/200) were in the same group of 6 - 18 years and the same proportion 34.50% (69/200) were aged ≥45 months, were females 54.50% (109/200), having birth

order of two 45.00% (90/200) and were born within a health facility 77.00% (154/200). The results further revealed that majority of the children 73.00% (146/200) started receiving supplementary foods at ≥6 months and had not received vaccination for rota virus 59.00% (118/200).

Table 1; Frequency table for Childhood Related Characteristics

Variable	Frequency (n)	Percentage (%)
Age of the Child in months	69	34.50
6 - 18	27	13.50
19 - 31	35	17.50
32 - 44	69	34.50
≥45		
Sex of the Child		
Male	91	45.50
Female	109	54.50
Birth Order		
1	54	27.00
2	90	45.00
3	20	10.00
≥4	36	18.00
Place of Birth		
Home	46	23.00
Health Facility	154	77.00
Introduction of Supplementary food		
<6 months	54	27.00
≥6 months	146	73.00
Vaccination for Rota Virus		
Yes	82	41.00
No	118	59.00

Presented in table 2 are the summary statistics for the continuous variable of age of the children who participated in study. The mean age of the study participants was 32.74 months with a standard deviation of 18.45. The

minimum age was 06 months meanwhile the maximum age was 59 months. The data on age of the infants had a variance of 230.36 with a positive skewness of 0.17 and a kurtosis of 1.53.

Table 2; Summary statistics of age of children who participated in the study

Observations	Mean	Std Dev	Median	IQR	Min	Max	Variance	Skewness	Kurtosis
200	32.74	18.45	32	17,52	06	59	340.36	0.17	1.53

Std Dev = Standard Deviation, Min = Minimum, Max = Maximum, IQR = Inter quartile Range

Maternal Related Characteristics

As presented in the table 3 below, Majority of the mothers 46.00% (92/200) were in the age group of 16 - 23 years, were married 46.50% (93/200), belonged to Catholic religion 42.50% (85/200) and had attained tertiary level of education 32.50% (65/200). Furthermore, majority of the mothers 27.50% (55/200) were

merchants earning average monthly income of less than 500,000 shillings 81.00% (162/200). Finally, half of the participants 50% (100/200) had less than 5 family members meanwhile the remaining half of the study participants 50% (100/200) had 5 or more family members.

Table 3: Frequency table for Maternal Related Characteristics

Variable	Frequency (n)	Percentage (%)
Age of the Mother in years	92	46.00
16 - 23	71	35.50
24 - 30	29	14.50
31 - 37	08	04.00
≥38		
Marital Status		
Divorced	23	11.50
Married	93	46.50
Single	78	39.00
Widowed	06	03.00
Religion		
Catholic	85	42.50
Protestant	84	42.00
Muslim	22	11.00
Born Again	09	04.50
Education		
Illiterate	36	18.00
Primary	46	23.00
Secondary	53	26.50
Tertiary	65	32.50
Occupation		
Government Employee	26	13.00
Self Employed	36	18.00
Housewife	35	17.50
Merchant	55	27.50
Farmer	48	24.00
Family Size		
<5 members	100	50.00
≥5 members	100	50.00
Average Monthly Income		
<500,000	162	81.00
500,000 - 1 Million	32	16.00
> 1 Million	06	03.00

Sanitation, Water and Hygiene Characteristics

Table 5 shows that majority of the study participants 88.50% (177/200) had toilet facilities at home with 61.50% (109/200) having pit latrine made from concrete slab. Regarding disposal of household wastes, majority 61.00% (122/200) disposed household solid wastes in privately prepared pits meanwhile more than half of the participants 59.00% (118/200) disposed liquid wastes anywhere in open space. Also, 39.50%

(79/200) collected their drinking water from piped sources and the same proportion 39.50% (79/200) collected their drinking water from unprotected springs with 67.50% (135/200) saying that the water source is not far from their homes. Finally, majority 61.02% (108/200) never had hand washing facilities near their toilets though more than half of the participants 52.00% (104/200) disposed under-five wastes in the toilet.

Table 4; Frequency distribution table of Sanitation, Water and Hygiene Characteristics

Variable	Frequency (n)	Percentage (%)
Availability of Latrine		
Yes	177	88.50
No	23	11.50
Type of Toilet Facility		
Flush connected to municipal sewer	31	17.51
Flush connected to septic tank	20	11.30
Ventilated improved pit latrine	08	04.52
Pit latrine made from concrete slab	109	61.50
Shared latrine	09	05.08
Disposal of Household Solid Waste		
Privately prepared pit - hole	122	61.00
Refuse pit collected by municipality	16	08.00
Dumped in street/open space	22	11.00
Garbage can	23	11.50
Collected by private establishment	17	08.50
Household Liquid Waste Disposal		
In septic tank/latrine pit	44	22.00
In seepage pit	38	19.00
Anywhere in open space	118	59.00
Source of drinking water		
Pipe	79	39.50
Protected wall spring	42	21.00
Unprotected wall spring	79	39.50
Water Source Far from Home		
Yes	65	32.50
No	135	67.50
Hand Washing facility beside the toilet		
Yes	69	38.98
No	108	61.02
Disposal of under-five waste		
In the toilet	104	52.00
Left it open everywhere	50	25.00
covered by soil	46	23.00

The Prevalence of Diarrhea among Children under 5 years in Nakaloke Town Council

Overall Prevalence of Diarrhea

Table 5 shows the overall prevalence of diarrhea among children under 5 years of age in Nakaloke town council. As observed from the table, the prevalence

of diarrhea in 2 weeks preceding the study was 36.00% (72/200) with a 95% CI of 29.29 - 42.71.

Table 5; Overall Prevalence of Diarrhea

Diarrhea	Frequency (n)	Percentage (%)	95% Confidence Interval
No	128	64.00	57.29 - 70.71
Yes	72	36.00	29.29 - 42.71

Type of Diarrhea

As shown in figure 1 below, majority of the children 87.50% (63/72) who had

diarrhea 2 weeks preceding this study had watery diarrhea meanwhile 12.50% (09/72) had bloody/mucoid diarrhea.

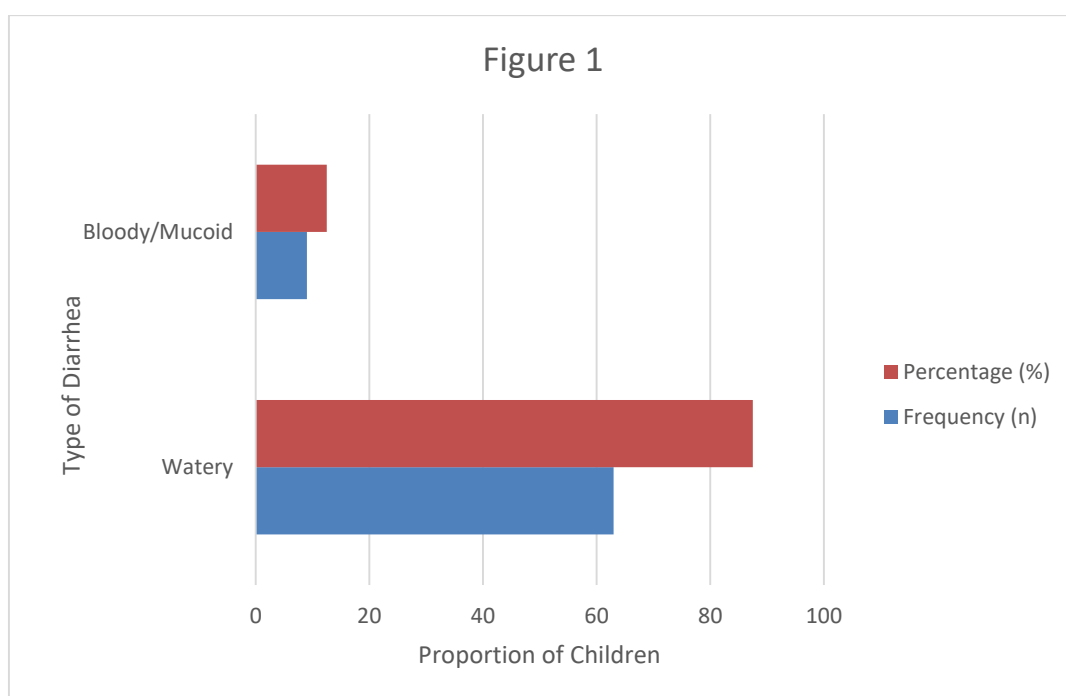


Figure 1: Bar Graph showing the overall prevalence of Diarrhea

Actions taken by Mothers of Children who had Diarrhea

Table 6 below shows the actions taken by mothers of children who had diarrhea. As observed from the table more than half of the mothers 52.78% (38/72) took their children to the health institution meanwhile 13.89% (10/72) took their children to traditional

healers. On the other hand, 09.72% (08/72) of the mothers gave their children ORS and the same proportion 09.72 (07/72) increased feeding of their children meanwhile 05.56% (04/72) either decreased or stopped feeding their children. Then finally, 08.33% (06/72) participants used homemade treatment.

Table 6: Actions taken by Mothers of Children who had Diarrhea

Action taken	Frequency (n)	Percentage (%)
Take him/her to the health institution	38	52.78
Take him/her to the traditional healers	10	13.89
Give him/her ORS	07	09.72
Increase feeding	07	09.72
Decrease/stop feeding	04	05.56
Homemade treatment	06	08.33

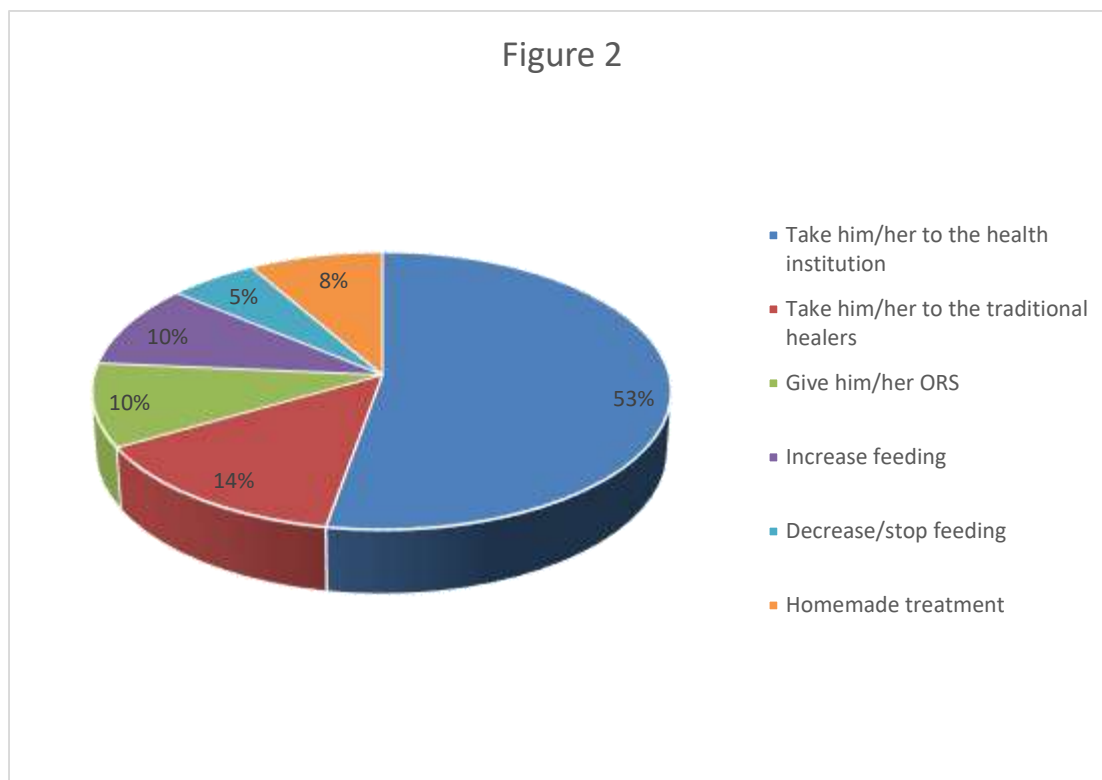


Figure 2: Actions taken by Mothers of Children who had Diarrhea

Maternal and Childhood Related Factors Associated with Diarrhea among Children under 5 years in Nakaloke Town Council

Childhood Related Factors

Given the fact that the prevalence of diarrhea was found to be more than 30%, a modified Poisson regression was run to determine the factors associated with diarrhea. Shown in table are the childhood-related factors associated with diarrhea. Results of the analysis showed that Age, Birth Order and Vaccination status for Rota virus were the childhood related factors associated with diarrhea. Children who were 45 months and above were 58% less likely

to suffer from diarrhea as compared to children who were in the age group of 6 - 18 months (cPR0.42, 95%CI 0.24-0.73, P=0.002). Children who had birth order of 2 were 48% protected from diarrhea compared to children who had birth order of 1 (cPR0.53, 95%CI 0.35-0.82, P=0.005). Children who were not immunized for Rota virus were 1.94 times at risk of suffering from diarrhea than children immunized for Rota virus (cPR1.94, 95%CI 1.24-3.02, P=0.003).

Table 7; Childhood Related Factors Associated with Diarrhea among Children under 5 Years of Age

Variables	Diarrhea		cPR (95% CI)	P Value
	No Count, (%)	Yes Count, (%)		
Age of the Child in months				
6 - 18	38 (55.07)	31 (44.93)	Reference	
19 - 31	13 (48.15)	14 (51.85)	1.15 (0.74-1.81)	0.531
32 - 44	21 (60.00)	14 (40.00)	0.89 (0.55-1.44)	0.638
≥45	56 (81.16)	13 (18.84)	0.42 (0.24-0.73)	0.002
Sex of the Child				
Male	56 (61.54)	35 (38.46)	Reference	
Female	72 (66.06)	37 (33.94)	0.88 (0.61-1.28)	0.508
Birth Order				
1	27 (50.00)	27 (50.00)	Reference	
2	66 (73.33)	24 (26.67)	0.53 (0.35-0.82)	0.005
3	11 (55.00)	09 (45.00)	0.90 (0.52-1.57)	0.710
≥4	24 (66.67)	12 (33.33)	0.67 (0.39-1.14)	0.137
Place of Birth				
Home	30 (65.22)	16 (34.78)	Reference	
Health Facility	98 (63.64)	56 (36.36)	1.05 (0.67-1.64)	0.846
Introduction of Supplementary food				
<6 months	40 (74.07)	14 (25.93)	Reference	
≥6 months	88 (60.27)	58 (39.73)	1.53 (0.93-2.51)	0.091
Vaccination for Rota Virus				
Yes	63 (76.83)	19 (23.17)	Reference	
No	65 (55.08)	53 (44.92)	1.94 (1.24-3.02)	0.003

CI = Confidence Interval, cPR = Crude Prevalence Ratio, P Value is Significant at 0.05 level

Maternal Related Factors

Table 18 shows the results of a modified Poisson regression run to establish maternal related factors associated with diarrhea among children under 5 years of age. Maternal education was found to be the only maternal related factor associated with diarrhea among children under 5 years of age. Children born to mothers with primary level of education

were 66% protected from having diarrhea compared to children born to illiterate mothers (cPR0.34, 95%CI 0.19-0.62, P<0.001) and children born to mothers who had secondary level of education were 76% less likely to suffer from diarrhea than children born to illiterate mothers (CPR 0.24, 95%CI 0.12-0.47, P<0.001).

Table 8: Maternal Related Factors Associated with Diarrhea among Children under 5 Years of Age

Variables	Diarrhea		cPR (95% CI)	P Value
	No Count, (%)	Yes Count, (%)		
Age of the Mother in years				
16 - 23	58 (63.04)	34 (36.96)	Reference	
24 - 30	47 (66.20)	24 (33.80)	0.91 (0.60-1.39)	0.679
31 - 37	18 (62.07)	11 (37.93)	1.03 (0.60-1.76)	0.924
≥38	05 (62.50)	03 (37.50)	1.01 (0.40-2.59)	0.976
Marital Status				
Divorced	16 (69.57)	07 (30.43)	Reference	
Married	58 (62.37)	35 (37.63)	1.24 (0.63-2.42)	0.536
Single	48 (61.54)	30 (38.46)	1.26 (0.64-2.50)	0.500
Widowed	06 (100.00)	00 (00.00)	1.24 (0.66-2.32)	0.513
Religion				
Catholic	55 (64.71)	30 (35.29)	Reference	
Protestant	53 (63.10)	31 (36.90)	1.05 (0.70-1.56)	0.828
Muslim	14 (63.64)	08 (36.36)	1.03 (0.55-1.92)	0.925
Born Again	06 (66.67)	03 (33.33)	0.94 (0.36-2.49)	0.908
Education				
Illiterate	13 (36.11)	23 (63.89)	Reference	
Primary	36 (78.26)	10 (21.74)	0.34 (0.19-0.62)	<0.001
Secondary	45 (84.91)	08 (15.09)	0.24 (0.12-0.47)	<0.001
Tertiary	34 (52.31)	31 (47.69)	0.75 (0.52-1.06)	0.106
Occupation				
Government Employee	17 (65.38)	09 (34.62)	Reference	
Self Employed	23 (63.89)	13 (36.11)	1.04 (0.53-2.07)	0.904
Housewife	26 (74.29)	09 (25.71)	0.74 (0.34-1.61)	0.452
Merchant	33 (60.00)	22 (40.00)	1.16 (0.62-2.15)	0.648
Farmer	29 (60.42)	19 (39.58)	1.14 (0.61-2.16)	0.679
Family Size				
<5 members	66 (66.00)	34 (34.00)	Reference	
≥5 members	62 (62.00)	38 (38.00)	1.12 (0.77-1.62)	0.557
Average Monthly Income				
<500,000	101 (62.35)	61 (37.65)	Reference	
500,000 - 1 Million	23 (71.88)	09 (28.13)	0.75 (0.41-1.35)	0.332
> 1 Million	04 (66.67)	02 (33.33)	0.89 (0.28-2.80)	0.836

CI = Confidence Interval, cPR = Crude Prevalence Ratio, P-Value is Significant at 0.05 level

Water, Sanitation and Hygiene Related Factors Associated with Diarrhea among Children under 5 years in Nakaloke Town Council

Regarding Water, Sanitation and Hygiene Related Factors, Source of drinking water and availability of hand washing facility besides the toilet were found to be statistically associated with Diarrhea. Children who drank water from Protected wall spring were 2.82 times more likely to have diarrhea than children who drank water from piped

source (cPR2.82, 95%CI 1.25-6.37, P=0.013). Children who drank water from unprotected wall spring were 6.50 times at risk of suffering from diarrhea than children who drank water from piped source (cPR6.50, 95%CI 3.30-12.80, P<0.001). Children from families which had no hand washing facilities besides the toilet were 2.51 times at risk of having diarrhea than children are were in families with hand washing facilities besides the toilet (cPR2.51, 95%CI 1.70-3.71, P=0.010).

Table 9: Water, Sanitation and Hygiene Related Factors Associated with Diarrhea among Children under 5 years

Variables	Diarrhea		PR (95% CI)	P Value
	No Count, (%)	Yes Count, (%)		
Availability of Latrine				
Yes	113 (63.84)	64 (36.16)		Reference
No	15 (65.22)	08 (34.78)	0.96 (0.53-1.74)	0.898
Type of Toilet Facility				
Flush connected to municipal sewer	23 (74.19)	08 (25.81)		Reference
Flush connected to septic tank	10 (50.00)	10 (50.00)	1.94 (0.92-4.07)	0.081
Ventilated improved pit latrine	06 (75.00)	02 (25.00)	0.97 (0.25-3.72)	0.963
Pit latrine made from concrete slab	68 (62.39)	41 (37.61)	1.46 (0.76-2.78)	0.253
Shared latrine	06 (66.67)	03 (33.33)	1.29 (0.43-3.89)	0.649
Disposal of Household Solid Waste				
Privately prepared pit - hole	82 (67.21)	40 (32.79)		Reference
Refuse pit collected by municipality	12 (75.00)	04 (25.00)	0.76 (0.31-1.85)	0.550
Dumped in street/open space	13 (59.09)	09 (40.91)	1.25 (0.71-2.19)	0.442
Garbage can	12 (52.17)	11 (47.83)	1.46 (0.89-2.40)	0.137
Collected by private establishment	09 (52.94)	08 (47.06)	1.44 (0.81-2.53)	0.211
Household Liquid Waste Disposal				
In septic tank/latrine pit	32 (72.73)	12 (27.27)		Reference
In seepage pit	25 (65.79)	13 (34.21)	1.25 (0.65-2.42)	0.498
Anywhere in open space	71 (60.17)	47 (39.83)	1.46 (0.86-2.49)	0.163
Source of drinking water				
Pipe	71 (89.87)	08 (10.13)		Reference
Protected wall spring	30 (71.43)	12 (28.57)	2.82 (1.25-6.37)	0.013
Unprotected wall spring	27 (34.18)	52 (65.82)	6.50 (3.30-12.80)	<0.001
Water Source Far from Home				
Yes	42 (64.62)	23 (35.38)		Reference
No	86 (63.70)	49 (36.30)	1.03 (0.69-1.53)	0.900
Hand Washing facility beside the toilet				
Yes	77 (71.30)	31 (28.70)		Reference
No	36 (52.17)	33 (47.83)	2.51 (1.70-3.71)	0.010
Disposal of under-five waste				
In the toilet	61 (58.65)	43 (41.35)		Reference
Left it open everywhere	36 (72.00)	14 (28.00)	0.68 (0.41-1.18)	0.127
Covered by soil	31 (67.39)	15 (32.61)	0.79 (0.49-1.27)	0.328

CI = Confidence Interval, cPR = Crude Prevalence Ratio, P Value is Significant at 0.05 level

Multivariate Analysis to Show Factors Independently Associated with Diarrhea among Children under 5 years in Nakaloke Town Council

To identify factors independently associated with diarrhea, factors which p-values less than 0.20 at bivariate analysis were added to the model for multivariate analysis. Through a stepwise regression with removal of least significant variables in each step, Age of the child, Birth Order of the child, Rota virus vaccination status, Maternal education, Source of drinking water and availability of handing facility near the toilet remained independently

associated with diarrhea among children under 5 years in Nakaloke Town Council. The Magnitude of risk and level of significance of the associated factors were as follows: Child's age of ≥ 45 versus 6 - 18 months (aPR0.59, 95%CI 0.37-0.93, P=0.024), Birth order of 2 versus birth order of 1 (aPR0.52, 95%CI 0.36-0.78, P=0.001), Non vaccination against Rota virus versus vaccination against Rota virus (aPR1.63, 95%CI 1.07-2.47, P=0.023), Maternal secondary education versus illiteracy (aPR0.42, 95%CI 0.23-0.74, P=0.003). Drinking water from Unprotected wall spring (aPR4.03, 95%CI 1.90-8.58, P<0.001) and

having no hand washing facility besides the toilet (aPR2.49, 95%CI 1.51-4.11,

P=0.024).

Table 10: Multivariate Analysis to Show Factors Independently Associated with Diarrhea among Children under 5 years

Variables	Diarrhea		aPR (95% CI)	P Value
	No Count, (%)	Yes Count, (%)		
Age of the Child in months				
6 - 18	38 (55.07)	31 (44.93)		Reference
19 - 31	13 (48.15)	14 (51.85)	1.30 (0.76-2.25)	0.340
32 - 44	21 (60.00)	14 (40.00)	1.15 (0.75-1.78)	0.517
≥45	56 (81.16)	13 (18.84)	0.59 (0.37-0.93)	0.024
Birth Order				
1	27 (50.00)	27 (50.00)		Reference
2	66 (73.33)	24 (26.67)	0.52 (0.36-0.78)	0.001
3	11 (55.00)	09 (45.00)	0.95 (0.61-1.48)	0.830
≥4	24 (66.67)	12 (33.33)	0.70 (0.45-1.09)	0.114
Introduction of Supplementary food				
<6 months	40 (74.07)	14 (25.93)		Reference
≥6 months	88 (60.27)	58 (39.73)	1.18 (0.71-1.94)	0.525
Vaccination for Rota Virus				
Yes	63 (76.83)	19 (23.17)		Reference
No	65 (55.08)	53 (44.92)	1.63 (1.07-2.47)	0.023
Education				
Illiterate	13 (36.11)	23 (63.89)		Reference
Primary	36 (78.26)	10 (21.74)	0.53 (0.26-1.09)	0.084
Secondary	45 (84.91)	08 (15.09)	0.42 (0.23-0.74)	0.003
Tertiary	34 (52.31)	31 (47.69)	0.74 (0.49-1.11)	0.144
Type of Toilet Facility				
Flush connected to municipal sewer	23 (74.19)	08 (25.81)		Reference
Flush connected to septic tank	10 (50.00)	10 (50.00)	1.34 (0.70-2.58)	0.387
Ventilated improved pit latrine	06 (75.00)	02 (25.00)	0.59 (0.22-1.54)	0.280
Pit latrine made from concrete slab	68 (62.39)	41 (37.61)	1.32 (0.82-2.11)	0.257
Shared latrine	06 (66.67)	03 (33.33)	2.14 (0.82-5.55)	0.116
Disposal of Household Solid Waste				
Privately prepared pit - hole	82 (67.21)	40 (32.79)		Reference
Refuse pit collected by municipality	12 (75.00)	04 (25.00)	1.07 (0.47-2.43)	0.866
Dumped in street/open space	13 (59.09)	09 (40.91)	1.19 (0.76-1.86)	0.448
Garbage can	12 (52.17)	11 (47.83)	1.45 (0.82-2.56)	0.205
Collected by private establishment	09 (52.94)	08 (47.06)	1.60 (0.88-2.91)	0.124
Household Liquid Waste Disposal				
In septic tank/latrine pit	32 (72.73)	12 (27.27)		Reference
In seepage pit	25 (65.79)	13 (34.21)	1.19 (0.57-2.49)	0.649
Anywhere in open space	71 (60.17)	47 (39.83)	1.25 (0.73-2.13)	0.412
Source of drinking water				
Pipe	71 (89.87)	08 (10.13)		Reference
Protected wall spring	30 (71.43)	12 (28.57)	1.95 (0.80-4.79)	0.144
Unprotected wall spring	27 (34.18)	52 (65.82)	4.03 (1.90-8.58)	<0.001
Hand Washing facility beside the toilet				
Yes	77 (71.30)	31 (28.70)		Reference
No	36 (52.17)	33 (47.83)	2.49 (1.51-4.11)	0.024
Disposal of under-five waste				
In the toilet	61 (58.65)	43 (41.35)		Reference
Left it open everywhere	36 (72.00)	14 (28.00)	0.83 (0.50-1.40)	0.489
Covered by soil	31 (67.39)	15 (32.61)	0.80 (0.45-1.41)	0.438

CI = Confidence Interval, aPR = Adjusted Prevalence Ratio, P Value is Significant at 0.05 level

DISCUSSION

The Prevalence of Diarrhea among Children under 5 years in Nakaloke Town Council

This study showed that the prevalence of diarrhea in the 2 weeks preceding the study was 36.00% (72/200) with a 95% CI of 29.29 - 42.71. This is in agreement with the result of a study done in Khartoum State which reported that

Diarrhoeal cases occurring within the 2 weeks preceding the interview were giving an overall prevalence of 35.0%[1]. The prevalence found in the present study is slightly consistent with the result of a study done in rural parts of Burundi which revealed that the overall diarrhea prevalence was 32.6%[24]. Furthermore, the result of the present

study is comparable to the results of a study done in Ethiopia which revealed that the prevalence of diarrhea was 31.00% [25]. The prevalence of diarrhea found in the present study is higher than what was found in a study done in Nigeria which showed that prevalence of diarrhea in the two weeks preceding the study was 7.47%[11]. Approximately 20% of children had diarrhea within 2 weeks in a study conducted from Malawai [2], this prevalence is lower than what was found in the present study. Also, the finding of the present study is not consistent with the results of a study conducted from Senegal reported that the prevalence of diarrhea among children under the age of five during the 2 weeks preceding the survey was 26%[26]. The disparity in prevalence rates may be due to seasonal variation. The data of the present study was collected in a rainy season. During this period water sources are easily polluted, these sources of water are mostly utilized by households for washing of hands, household activities and even drinking especially for those using streams or boreholes. Contrary to the results of the present study, the results of a study done from Ethiopia showed that the two week prevalence of diarrhea among children under-five was 16.4% (69/351)[27]. This prevalence is almost half of the figure found in the present study. Furthermore, [6] in their study found that The overall prevalence of diarrheal disease among under-five children was 22.1% (163/743) which is lower than what was found in the present study. The discrepancy in the study findings can be attributed to the variation in the geographical settings where the studies were conducted as well as the variation in sampling techniques used to recruit the study participants.

Maternal and Childhood Related Factors Associated with Diarrhea among Children under 5 years in Nakaloke Town Council.

Results of the present study revealed that Age of the child, Birth Order of the child, Rota virus vaccination, Maternal education were independently associated with diarrhea among children under 5 years of age sampled from the study area. Age of the Child: The

present study showed that age of 45 months or more is a protective for diarrhea. This is expected as infants aged more than 45 months and above have better understanding of what to eat compared to those aged 6 to 18 months who most probably have are being weaned and complementary foods are being introduced to them. Thus, the latter group is prone to consuming complementary foods; that may contain diarrhea-causing pathogens [28, 29]. Result of the present study is consistent with findings from a study done in Ethiopia which showed that age of 7-11 months (adjusted odds ratio (AOR): 4.2, 95% confidence interval (CI): 1.2-15.3) was a significant predictor of diarrhea[27]. Similar to the finding of the present study, [6] found that children less than or equal to one year [AOR=1.82, 95% CI= (1.39, 4.63)] were at risk of suffering from diarrhea. The high prevalence of diarrhea at 6 to 18 months could be due to the low immunity of children, and crawling starting at this age. Birth Order of the child: This study indicated that birth order of 2 was protective form diarrhea as opposed to birth order of 1. Contrary to what was found in the present study, [27] in their study conducted from Ethiopia found that birth order of 2 was instead a risk factor for diarrhea meanwhile the present study found birth order of 2 to be protective. Rota virus vaccination: According to this study, not being vaccinated against Rota virus is a risk factor for diarrhea among children under five years. The result suggests that a major contributor to the diarrheal burden in children less than 5 years in the town is in fact rotavirus. The result of the present study is consistent with the results of a study done in Ethiopia which revealed that not being vaccinated against rotavirus (AOR: 10.3, 95%CI: 3.2-91.3) was a risk factor for diarrhea [27]. The result of the current study is in agreement with study done in FartaWoreda, Northwest Ethiopia [30]. The result of the present study is in agreement with the results of a study conducted from Rwanda which revealed that children who had not vaccinated for Rota virus where at risk of suffering from Diarrhea with odds of 8.11 [31]. The current study found that children

who had not vaccinated for Rota virus were more likely to develop diarrheal diseases than those who were vaccinated. This finding is similar to a cross-sectional study undertaken during 2012-2013 to determine the prevalence, strains and factors associated with rotavirus infection among under-5-year-old children hospitalized with acute diarrhea in Uganda which found that Rotaviruses are the most cause of diarrhea in children [32]. Rotavirus is the most common cause of severe childhood gastroenteritis worldwide [33]. Rotavirus vaccine resulted in a large decline in diarrhea mortality and concluded that vaccination is the best way to prevent severe rotavirus disease and the deadly, dehydrating diarrhea that it causes [34]. Maternal Education: This study showed that children born to mothers with secondary education were protected from having diarrhea. This suggests that, as maternal educational levels increase the less likely it is for their children to experience diarrhea. Similar to what was found in the present study, the results of a study conducted in Rwanda revealed that children whose mothers/caretakers had never attended school were at risk of having diarrhea by odds of 3.76 [31]. The ability to read and understand or hear and appropriately apply information are, perhaps, key for mothers to better cater for their children. As indicated by related literature, maternal education is a predictor of diarrhea among children [29, 35]. This may be due to the fact that education is likely to enhance household health and sanitation practices. Education can increase awareness about the transmission and prevention methods of diarrhea. It also encourages changes in behavior at the household level. This may be due to the fact that education is likely to enhance household health, good feeding and weaning practices and hygiene and sanitation practices. Education can also increase awareness about the transmission and prevention methods of diarrhea. It also encourages changes in behavior at the household level.

Water, Sanitation and Hygiene Related Factors Associated with Diarrhea among Children under 5 years in Nakaloke Town Council.

Source of Drinking water: Results of the present study indicated that which who drink from unprotected wall spring were 4.03 times at risk of having diarrhea compared to those who drink water from piped sources. The result of the present study is consistent with results of a study conducted from Ethiopia which revealed that source of drinking water was independently associated with the occurrence of childhood diarrhea with children who drink from unimproved source of water being 3.7 times at risk [36]. The finding of the current study is in agreement with the results of a study done by [37] who found that the wider confidence interval is because the number of households who have access to improved water source were few (23%) compared to those who don't have (77%). Similar to the results of the present study, the results of a study done from Gaza Strip showed that using desalinated water sources for drinking purposes, were inversely associated with the incidence of acute diarrhea among children under five [38]. The source of drinking water determines whether water is contaminated or not. Tap water is considered a safe source of water but in a slum, this water might be contaminated due to breakage of pipes especially where pipes are laid along sewer lines. Water vendors and kiosks may also contaminate water in the process of drawing and delivering domestic water. Containers used to carry and store water are rarely cleaned which might store germs that can cause diarrhea especially to under five years. Availability of hand washing facility near the toilet: The finding of the present study is consistent with the results of a study conducted in Malawi which showed that lack of hand washing facilities with water and soap (AOR, 1.180; 95% CI, 1.010-1.379) increased the odds of diarrhea [2]. Furthermore, the finding of the present study is in line with the results of a study conducted in Nigeria which showed that washing hands with soap or ash and water and after using the toilet [0.16

(95% CI 0.04-0.55)] protected against diarrhea [11]. The result of this study is also consistent with a study in Northwest Ethiopia which reported that cleansing hands with soap and water can reduce more effectively the

CONCLUSION

Childhood diarrhea is a significant public health concern in the study area, with prevalence surpassing most African studies. Factors predicting diarrhea occurrence include child's age, birth order, Rotavirus vaccination status, and maternal education. Water, sanitation, and hygiene are independent risk factors, with drinking water sources and hand washing facilities near toilets being independent risk factors. These factors contribute to the prevalence of diarrhea among children under 5 years

Okongo likelihood of diarrhea [39]. A possible explanation of this result is that handwashing with soap reduced the presence of bacteria than washing hands with water alone [40, 41].

in Nakaloke town council. To reduce diarrhea among children in Uganda, health organizations should implement educational programs targeting mothers and children aged 6-18 months. Mothers should closely monitor their children and be cautious about their dietary habits. The Ugandan government should also procure adequate doses of the Rota virus vaccine through the Ministry of Health. This will help reduce diarrhea episodes among children in the country

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