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# Assessment of Water, Sanitation and Nutrition Factors Associated with Diarrhea among Children under Five Years of Age in Kijumo Village, Bushenyi District.

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**ABSTRACT**

Diarrhea is among the top ten killers and causes 11% of child deaths globally. According to WHO, diarrhea deaths in children under five reach 525,000 and children global diarrhea cases was 1.7 billion every year. In Uganda, diarrhea is among the top four leading direct causes of morbidity and mortality in infants and under five children following malaria, neonatal diseases and pneumonia. The objectives of this study were to assess water, sanitation and nutrition factors associated with diarrhea among children under five years of age in Kijumo Village, Bushenyi District. This study employed a descriptive cross sectional study design that employed quantitative approach for data collection. A semi-structured questionnaire was used to collect information from 130 respondents. Data was analyzed using EPI info (exe) version 7 computer statistical package in order to give a statistical meaning to the data. Out of 130 children under five years, 38 had diarrhea two weeks before the interview, given a prevalence of 29.2%. The factors associated with diarrhea among children under five years. The results indicates that age of respondents was associated ($p<0.001$) with diarrhea; education level ($p<0.002$) and the child's age ($p<0.001$) was also associated with diarrhea. Drinking water source ($p<0.002$), drinking water treatment ($p<0.001$), refuse disposal ($p<0.002$) and stool disposal ($p<0.002$) were associated with diarrhea. Exclusive breastfeeding ($p<0.001$), age of introduction of complementary feeding ($p<0.003$) and mode of feeding the child ($p<0.002$) were associated with diarrhea. The health care stakeholders should train, encourage and empower community health workers to provide continuous health education to mothers on diarrhea prevention and control.

**Keywords:** water, sanitation, nutrition factors, diarrhea and children

## INTRODUCTION

Diarrheal disease is any disease by which a person experiences passage of loose or watery stools at least three times a day [1-5], characterized by increase in volume, fluidity or frequency of bowel movement relative to the usual pattern for a particular person [6]. Diarrhea is among the top ten killers worldwide and causes 11% of child deaths globally. In 2015, UNICEF reported that global diarrhea mortality in children under five years old accounted for 9% [7]. According to WHO, diarrhea deaths in children under five reach 525,000 and children global diarrhea cases was 1.7 billion every year [8]. In the last decade, global diarrhea was responsible for 1.7 million deaths per year among children under 5 years and many of these cases are from low- and middle-income countries of Africa and part of Asia [9, 10]. Diarrheal disease remains one of the major causes of child morbidity and mortality in the world [11, 12]. Globally, diarrhea kills an estimated 2.5 million people each year, with about 60-70% of them being under five children [13]. Diarrhea is the second leading killer of children as nearly one in five children under the age of five dies as a result of dehydration, weakened immunity or malnutrition associated with diarrhea [14]. Most recently, it was reported that about 10% of children with diarrheal illness become severely dehydrated and 0.5% of them end up

dying [13]. In India, diarrhea is the third most common cause of death in under-five children being responsible for 13% deaths in this age-group as it kills an estimated 300,000 children each year [15, 16]. In the Sub Saharan Africa, pediatrics deaths due to diarrhea exceed that of malaria, HIV/AIDS and Measles combined accounting for 37% [17, 18]. In Ethiopia where diarrhea illness prevalence is about 37%, an estimated 95,000 childhood deaths thought to be due to diarrhea illness occur every year [13].



## Methodology

### Research design

The study was a descriptive cross-sectional community-based study that employed quantitative approach to collect data [19].

### Study Area

The study was conducted in Kijumo village located in kabaare parish of Kakanju Sub County in Igara County, Bushenyi district [20].

### Study Population

The study population comprised of mother and care givers whose children were aged 1-59 months of age.

### Inclusion criteria

Mothers/caregivers of children 1– 59 months who have or had diarrhea 2 weeks prior to the start of the survey and consented to participate in the study.

### Exclusion criteria

i. Mothers/caregivers of children 1– 59 months who have or had diarrhea 2 weeks prior to the start of the study who did not give consent to participate in the study.
ii. Mothers/caregivers whose children are is above 59 months.

### Sample size Determination

The sample size was determined using Kish Leslie statistical formula, $n= Z^2P (1-P)/d^2$.

Where:
n = desired sample size
Z = standard normal deviate at confidence level of 95% or 1.96,
p = the estimated proportion of mothers that is present in the population (10%)
q=1-P,
d=degree of accuracy desired at (0.05)

$$n= \frac{Z^2. p.q}{d^2} \qquad n= \frac{1.96^2 \text{ x}0.10\text{x}(1-0.10)}{(0.05)^2}$$

n = 138 participants

### Sampling Procedure

The participants were sampled from one household to the other based on the inclusion criteria, the data were collected. Mothers/caregivers of children 1– 59 months were consecutively sampled in order to get the required or at least 70% of sample size.

### Data collection Methods

A structured self-administered questionnaire was used to obtain information.

### Data Analysis

The coded data were entered and analyzed using SPSS version 20 and summarized into frequency tables. Significance was considered when P value ≤0.05. Insignificance was considered when P value > 0.05. Descriptive statistics, such as mean, frequency, cross-tabulation, and percentage was used where necessary. The results were presented in tables as appropriate. Using chi square the existence of the relationship between variables (if any) were determined, while multiple logistic regression was used to explain how the independent variables affect the dependent variable and odds ratios of 95% confidence intervals was calculated.

### Ethical considerations

An introductory letter to carry out the study was obtained from the Faculty of Clinical Medicine & Dentistry and approved by the focal person in the Village that allowed the research team to access the households. Individual permission was sought from respondents before the interviews or questionnaires were administered. In order to ensure confidentiality of the information obtained, codes other than names were used during the data collection processes.

## RESULTS

A total of 130 mothers or caregivers participated in the study. Almost half 78 (60%) of the respondents were in the age bracket of 23-27 years with majority 96 (73.8%) being married. Most 65 (50%) of the participants had primary education who are peasants (37.7%) and have one child (59.2%). Most 71 (54.6%) of the children of respondents were 6-24 months old and were mostly 80 (61.5%) males (Table 1).

**Table 1: Demographic characteristics of mother/caregiver and index child**

| Variable | Category | Frequency (n=130) | Percentage (%) |
|---|---|---|---|
| **Mother/caregiver's age (years)** | 13-17 | - | 0.0 |
| | 18-22 | 5 | 3.8 |
| | 23-27 | 78 | **60.0** |
| | > 27 | 47 | 36.2 |
| **Marital status** | Married | 96 | **73.8** |
| | Single | 23 | 17.7 |
| | Cohabiting | 11 | 8.5 |
| **Education level** | No formal education | 46 | 35.4 |
| | Primary | 65 | **50.0** |
| | Secondary and above | 19 | 14.6 |
| **Occupation of mother/caregiver** | Housewife | 37 | 28.5 |
| | Self employed | 23 | 17.7 |
| | Peasant | 49 | **37.7** |
| | Employed | 21 | 16.1 |
| **Number of children** | 1 | 77 | **59.2** |
| | 2 | 43 | 33.1 |
| | >2 | 10 | 7.7 |
| **Child's age** | < 6months | 48 | 36.9 |
| | 6 -24 months | 71 | **54.6** |
| | 25 – 59 months | 11 | 8.5 |
| **Gender of child** | Male | 80 | **61.5** |
| | Female | 50 | 38.5 |

Result in table 2 shows that out of 130 children, 38 of them were reported to have had diarrhea two weeks before the survey given a prevalence of 29.2%.

**Table 2: Distribution of diarrhea among children under five years old**

| Variable | Category | Frequency (n=130) | Percentage (%) |
|---|---|---|---|
| **Had diarrhea in the past 2 weeks** | **Yes** | 38 | 29.2 |
| | **No** | 92 | 70.8 |

The results on water and sanitation characteristics as presented in table 3 indicates that the respondents reported that their source of drinking water was mostly 52(40%) from public tap while 45 (34.6%) said their source of drinking water is from spring. Majority 52 (83.9%) of the respondents whose source of drinking water is from sources other than tap, said the sources were protected. Majority 78 (60%) of the respondents stated that they boil their water before drinking and 67 (66.9%) do not frequently boil their water before drinking. Regarding sanitation, majority, 111(85.4%) of the respondents reported that the have latrines in their homesteads and the type of latrine is one with pit (69.2%). Majority, 96(73.8%) of respondents said their hand washing facilities were not close to the latrines or toilets. Majority, 86 (66.2%) of the respondents their mode of refuse disposal was its used for manure while stool disposal is mostly 113(86.9%) via the use of toilets and latrines.

**Table 3: Showing Water and Sanitation Characteristics**

| Variable | Category | Frequency (n=130) | Percentage (%) |
|---|---|---|---|
| **Drinking water source** | Spring | 45 | 34.6 |
| | Home Tap | 16 | 12.3 |
| | Public tap | 52 | **40.0** |
| | Others | 17 | 13.1 |
| **Nature of water source (n=62)** | Protected | 52 | **83.9** |
| | Unprotected | 10 | 16.1 |
| **Drinking water treatment** | Boiling | 78 | **60.0** |
| | Adding chlorine | 2 | 1.5 |
| | Filtration | 20 | 15.4 |
| | None | 30 | 23.1 |
| **Frequency of boiling drinking water** | Not at all | 87 | **66.9** |
| | Often | 28 | 21.4 |
| | Sometimes | 15 | 11.5 |
| **Presence of latrine in homestead** | Yes | 111 | **85.4** |
| | No | 19 | 14.6 |
| **Type of latrine** | Sewer | 28 | 21.6 |
| | Latrine with pit | 90 | **69.2** |
| | Traditional latrine | 12 | 9.2 |
| **Hand washing facilities close to latrine /toilet** | **Yes** | 34 | 26.2 |
| | **No** | 96 | **73.8** |
| **Refuse disposal** | Waste Pit/burning Open dumping | 12 | 9.2 |
| | | 32 | 24.6 |
| | Used for manure | 86 | **66.2** |
| **Stool disposal** | Used toilet/latrine | 113 | **86.9** |
| | Put /rinsed into drain | - | 0.0 |
| | Throw into garbage | - | 0.0 |
| | Buried | 10 | 7.7 |
| | Others | 7 | 5.4 |

Table 4 shows the findings of water and sanitation factors associated with diarrhea among children under five years. The results indicate that drinking water source ($p<0.002$), drinking water treatment ($p<0.001$), refuse disposal ($p<0.002$) and stool disposal ($p<0.002$) were associated with diarrhea. The result of multiple logistic regression analysis to evaluate the risk factors associated with diarrhea shows that children of respondents whose source of drinking water was spring are more at risk to have diarrhea (OR=1.54; $p<0.002$), children of respondents whose mode of refuse disposal is open dumping are three times at risk of having diarrhea (OR= 2.78; $p<0.002$) and children of respondents who dispose stool by burying are at risk of having diarrhea (OR= 1.03; $p<0.005$).

**Table 4: Bivariate and Multivariate analysis between diarrhea and water and sanitation characteristics**

| Variable | Ever had diarrhea Yes (n=38) | No (n=92) | P-value | OR | CI (95%) |
|---|---|---|---|---|---|
| **Drinking water source** | | | **0.002** | | |
| Spring | 16 (42.1%) | 29 (31.5%) | | **1.54** | 0.14-3.67 |
| Home Tap | 4 (10.5%) | 12 (13.0%) | | 0.93 | 0.31-2.87 |
| Public tap | 6 (15.8%) | 46 (50.0%) | | 0.44 | 0.21-1.88 |
| Others | 12 (31.6%) | 5 (5.4%) | | 1 | 0.43 |
| **Drinking water treatment** | | | **0.001** | | |
| Boiling | | | | | |
| Adding chlorine | 9 (23.7%) | 69 (75.0%) | | 1 | 0.23 |
| Filtration | 0 (0.0) | 2 (2.2%) | | 0.57 | 0.17-3.57 |
| None | 9 (23.7%) | 11 (12.0%) | | 0.88 | 0.28-1.82 |
| | 20 (52.6%) | 10 (10.8%) | | 0.46 | 0.11-2.00 |
| **Frequency of boiling drinking water** | | | 0.211 | | |
| Not at all | 26 (68.4%) | 61 (66.3%) | | 1 | 0.42 |
| Often | 6 (15.8%) | 22 (23.9%) | | 0.46 | 0.15-2.34 |
| Sometimes | 6 (15.8%) | 9 (9.8%) | | 0.89 | 0.23-2.97 |
| **Presence of latrine in homestead** | | | 0.013 | | |
| Yes | 20 (52.6%) | 91 (99.0%) | | 0.43 | 0.14-1.67 |
| No | 18 (47.4%) | 1 (1.0%) | | 1 | 0.23 |
| **Hand washing facilities close to latrine /toilet** | | | 0.113 | | |
| Yes | | | | | |
| No | 6 (15.8%) | 28 (30.4%) | | 0.88 | 0.42-1.90 |
| | 32 (84.2%) | 64 (69.6%) | | 1 | 0.45 |
| **Refuse disposal** | | | **0.002** | | |
| Waste Pit/burning | 8 (21.1%) | 4 (4.3%) | | 1 | 0.48 |
| Open dumping | 21 (55.2%) | 11 (12.0%) | | **2.78** | 0.21-4.35 |
| Used for manure | 9 (23.7%) | 77 (83.7%) | | 0.66 | 0.19-2.11 |
| **Stool disposal** | | | **0.005** | | |
| Used toilet/latrine | 27 (71.1%) | 86 (93.4%) | | 1 | 0.22 |
| Buried | 4 (10.5%) | 6 (6.6%) | | **1.03** | 0.34-2.55 |
| Others | 7 (18.4%) | 0 (0.0) | | 0.44 | 0.19-2.06 |

Table 5 indicates that majority, 92 (70.8%) of the respondents-initiated breast feeding early (within one hour of delivery). Only, 42 (32.3%) of the respondents reported that they practiced exclusive breast feeding with their index or last child, among respondents who did not practice exclusive breastfeeding, 48 (54.5%) reported that cow's milk was the most food substance did you introduced within 6 months of this baby. Ninety-seven (74.6%) of the respondents said they introduced complementary foods on time and most 87 (67%) reported that they introduced complementary feeding when their children were in the age bracket 6-12 months. Sixty-two (47.7%) of the respondents stated that Cow milk, porridge and gruel was the complementary foods they gave to their children and 74 (56.9%) fed their children with hands. The total duration of breastfeeding was encouraging (80%).

**Table 5: Breastfeeding Practices Associated with Diarrhea among Children under five in Kijumo Village**

| Variable | Category | Frequency | Percentage |
|---|---|---|---|
| **Time of breastfeeding initiation** | 30 minutes | - | 0.0 |
| | Within 1 hour after birth | 92 | **70.8** |
| | After 1hour of birth | 30 | 23.1 |
| | Can't remember | 8 | 6.1 |
| **Did you introduce other foods other than breast milk within 6 months of this baby?** | Yes | 88 | **67.7** |
| | No | 42 | 32.3 |
| **Which food substance did you introduce most within 6 months of this baby? (n=88)** | Cow's milk | 48 | **54.5** |
| | Porridge | 27 | 30.7 |
| | Juice | 2 | 2.3 |
| | Sugar water | 5 | 5.7 |
| | Others | 6 | 6.8 |
| **Introduction of complementary foods** | Early | 26 | 20.0 |
| | On time | 97 | **74.6** |
| | Late | 7 | 5.4 |
| **Age of introduction of complementary feeding** | Before 4 months | 15 | 11.5 |
| | 4-6 months | 28 | 21.5 |
| | 6-12 months | 87 | **67.0** |
| | After 1 year | - | 0.0 |
| **Complementary Food** | Cow milk, porridge and gruel | 62 | **47.7** |
| | Cow milk alone | 28 | 21.5 |
| | Mashed food | 13 | 10.0 |
| | Milk & gruel | 20 | 13.4 |
| | Mixed feeding | 7 | 5.4 |
| **Mode of feeding the child** | With hands | 74 | **56.9** |
| | Plate/spoon | 35 | 26.9 |
| | Cup | 21 | 16.2 |
| **Duration of breastfeeding** | < 1year | 8 | 6.2 |
| | 1 year | 18 | 13.8 |
| | ≥ 1year | 104 | **80.0** |

Results in table 6 shows that exclusive breastfeeding ($p<0.001$), age of introduction of complementary feeding ($p<0.003$) and mode of feeding the child ($p<0.002$) were associated with diarrhea. The result of multiple logistic regression analysis to evaluate the risk factors associated with diarrhea shows that children of respondents who were not breastfed exclusively are two times at risk of having diarrhea (OR=2.18; $p<0.001$), children of age bracket, 4-6 months who were introduced complementary foods (OR=1.67; $p<0.001$) and fed with hands (OR=1.45; $p<0.001$) were at risk having diarrhea.

**Table 6: Bivariate analysis between diarrhea and breastfeeding Practices of children under five years**

## DISCUSSION

Findings of this study show that, out of 130 children, 38 had diarrhea two weeks before the interview, given a prevalence of 29.2%. This prevalence reported in this study was higher when compared to previous studies of 23% in Uganda [21], 7.7% in the Gambia [22], 5% in India [23], 6.1% in Tanzania [24], 22.5% in Ethiopia [25] and 22.4% in rural community in Somalia [26]. However, the prevalence of the present study was lower when compared with 30.5% reported in Ethiopia [27]. The findings of this study showed that drinking water source, drinking water treatment, refuse disposal and stool disposal were associated with diarrhea. Children of respondents whose source of drinking water was spring are more at risk to have diarrhea, children of respondents whose mode of refuse disposal is open dumping are three times at risk of having diarrhea and children of respondents who dispose stool by burying are at risk of having diarrhea. The current study agrees with previous studies which reported that mode of refuse disposal was associated with diarrhea [28, 29, 25]. This is expected because refuse may contain different pathogens which can cause diarrheal diseases and creates a suitable site for insects breeding. So, improper refuse disposal increases the chance of contact of insect vectors from refuse to food items worsening sanitation and hygiene of the

family. This present study also aligns with a study in rural community in Somalia which reported that hand washing before preparing baby's food and source of water for household use were associated with diarrhea disease [26].

In this study, exclusive breastfeeding, age of introduction of complementary feeding and mode of feeding the child were associated with diarrhea [30-35]. Children of respondents who were not breastfed exclusively were more likely to have diarrhea. This study findings concurs with a study in Nigeria which reported that predominantly-and partially-breastfed infants were more likely to have reported diarrhea than exclusively-breastfed infants [30-35]. Children of age bracket, 4-6 months who were introduced complementary foods (OR=1.67; p<0.001) and fed with hands (OR=1.45; p<0.001) were at risk having diarrhea.



## CONCLUSION

Exclusive breastfeeding, age of introduction of complementary feeding and mode of feeding the child were associated with diarrhea of children under five. Children of respondents who were not breastfed exclusively are two times at risk of having diarrhea and children of age bracket, 4-6 months who were introduced complementary foods and fed with hands were at risk having diarrhea.

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