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Factors associated with diarrhoeal diseases among children under 5 years in Buhoma Town Council, Kanungu District, Uganda.

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Abstract

Introduction

This study assesses the association between caretaker and household environmental characteristics and the prevalence of diarrhoeal diseases among U5s in Buhoma Town Council, Kanungu District, Uganda.

Methodology

A cross-sectional study was carried out between October and November 2025. It involved 322 adult caretakers aged 18 years and above, selected by simple random sampling. The data were analysed using the Stata Version 18 SE package. Generalised linear modelling was used to assess the strength of association between variables, and statistical significance was assessed at the 95% confidence level and p-value < 0.05.

Results

Most caretakers (44.1%) were aged 20–28 years, and over 50% of children were aged 24–59 months. Diarrhoea prevalence was 24.2% (95% CI: 0.19–0.29) in the previous two weeks. Higher prevalence was associated with having 2 (aPR=1.65, p=0.03) or 3 (aPR=3.40, p=0.03) under-five children**,** caretakers aged 29–35 years (aPR=2.43, p=0.04), caretaker history of diarrhoea (aPR=2.02, p=0.01), and movable handwashing facilities (aPR=1.76, p=0.02). Lower prevalence was associated with fourth income quartile (aPR=0.36, p=0.01), ever breastfeeding (aPR=0.39, p=0.02), age 12–23 months (aPR=0.51, p=0.04), uncovered water containers (aPR=0.36, p=0.001), and having a latrine/toilet in the dwelling (aPR=0.27, p<0.001).

Conclusion

Approximately 20% of under-five children had diarrhoea in the previous two weeks. Having multiple under-five children, older caretakers, a caretaker history of diarrhoea, and movable handwashing facilities were associated with higher diarrhoea prevalence. Higher household income, breastfeeding, age 12–23 months, uncovered water containers, and having a toilet within the dwelling were associated with lower diarrhoea prevalence.

Recommendations

There is a need to strengthen targeted interventions for the prevention and control of childhood diarrhoea, particularly through improved hygiene and sanitation practices, appropriate breastfeeding, safe water handling, and health education for caretakers.

Keywords: *Diarrhoeal diseases, children under 5 years, caretakers, water sanitation and hygiene, WASH knowledge, WASH practices.*
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Introduction

Globally, diarrhea is the third leading cause of death and a major cause of malnutrition in children under 5 years old (U5s), causing around 443,832 deaths and nearly 1.7 billion cases annually (WHO, 2024a). Over 1.4 million, or 69% [35% (water), 38% (sanitation), and 26% (hygiene)] of all diarrheal deaths in 2019 were attributed to unsafe water, sanitation, and hygiene (WASH) services and led to 55 million disability-adjusted life years (DALYs) (WHO, 2023). Diarrhea mostly results from contaminated food and

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water sources, yet globally, 780 million and 2.5 billion individuals lack access to improved drinking water and sanitation, respectively (WHO, 2024a).

In low-income countries (LICs), especially in sub-Saharan Africa (SSA) and South Asia, the burden of diarrhea among U5s is disproportionately high (Melese et al., 2023; Bado et al., 2016; Tareke et al., 2022; Keita et al., 2023; UNICEF, 2024). In LICs, children under 3 years old experience three episodes of diarrhea on average annually. There is a cyclic relationship between diarrhoea and malnutrition where each episode of diarrhoea deprives the child of nutrients, making diarrhoea a major cause of malnutrition, and malnourished children are more likely to fall ill from diarrhoea (WHO, 2024a). Other than malnutrition, diarrhoea is also often accompanied by other health issues, such as stunting, which further exacerbate the burden on children and their families (Buzigi, 2018; Comandini et al., 2019).

In Eastern Africa, recent evidence from demographic health surveys (DHS) shows that the overall prevalence of diarrhoea among U5s was 15.86%, with the highest rates in Burundi (22.84%), Uganda (22.10%), and Malawi (21.57%), and the lowest in Madagascar (8.16%), Ethiopia (11.33%), and Tanzania (12.33%) (Tareke et al., 2022). In 2022, the prevalence seemed to have slightly reduced in Uganda, as 19% of U5s had experienced diarrhoea in the past 2 weeks, with the highest (30%) prevalence among the 12-24 months (UBOS, 2023). However, diarrhoeal cases remained high, with an increase from 7.1-7.6% between July 2022 - July 2024 (MoH, 2024). Diarrhoea is one of the top five causes of under-five (U5) mortality in Uganda, leading to over 140,000 deaths annually and accounting for 7.1% of all deaths in this age group (Nantege et al., 2022).

Diarrhoea was the third leading cause of admission at the paediatric ward at Bwindi Community Hospital (BCH) in the 2022-2023 financial year, accounting for 10% of the admissions (BCH, 2023). Additional anecdotal information indicates that there were 168 cases of gastrointestinal diseases (including forty-two cases of acute diarrhoea) recorded at BCH from March to May 2024. Though the hospital serves a wider geographic area, previous research focused on the Buhoma community has shown high cases of diarrhoea among under-five children (Patterson et al., 2020; Busch et al., 2019).

Factors associated with the high prevalence of diarrhoea in Uganda include maternal education, household wealth, and access to improved water and sanitation facilities (Kakama and Basaza, 2022; Terfa et al., 2022). Additionally, seasonal variations have been shown to influence the prevalence of diarrhoea, with higher rates during the rainy seasons (Mengistie et al., 2022). Furthermore, proper hygiene practices (Chan et al., 2021), socioeconomic status (Quattrochi et al., 2015; Murtaza et al., 2021; Ngatho Samuel et al., 2018), household size, maternal age, and feeding practices can also influence the risk of diarrhoeal diseases among U5s (Woldeamanuel and Tesfaye, 2019). For instance, a larger number of U5s in a household has been linked to an increased risk of stunting, wasting, and underweight, which can exacerbate the impact of water-borne diseases (Woldeamanuel and Tesfaye, 2019).

It is believed that access to safe drinking water and adequate sanitation and hygiene can help prevent a significant proportion of diarrhoeal disease (WHO, 2024a). Without any improvements, Uganda will remain behind on the Sustainable Development Goals (SDG) 3.9.2 indicator on mortality rate attributable to unsafe WASH (WHO, 2024b). Therefore, maintaining a safe water chain, proper disposal of waste, including faecal matter, and appropriate handwashing at critical times can help reduce the burden of diarrhoea. Many interventions have been implemented to address the issue, including water and sanitation improvements (BMCT, 2014) and the use of ready-to-use therapeutic food (RUTF) for malnourished children (BCH, 2024). But diarrhoea remains among the top causes of admission at BCH (BCH, 2023). Efforts aimed at improving these indicators requires context evidence. However, there is limited evidence on the association between caretaker and household environmental characteristics and the prevalence of diarrhoeal diseases among U5s in Buhoma Town Council, Kanungu District. This study assessed these associations to inform preventative strategies.

Methods

Study area

This study was conducted in Buhoma Town Council, a new town council formerly in Kayonza Sub-County, Kanungu District in Southwestern Uganda. It has four wards and borders Bwindi Impenetrable National Park to the East and North, Kayonza Sub-County in the west, and Kyeshero Sub-County in the South. The town council is located about twelve hours drive from Kampala, the capital city of Uganda. Its estimated population is 7800 people, with estimated equal proportions of males and females (UBOS, 2024). Most of the population are farmers, and most families survive on less than $1 a day (Sessions et al., 2017). The main health facility serving the population is Bwindi

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Community Hospital, which is a private not-for-profit (PNFP) facility.

Research design

This was an analytical cross-sectional study and employed quantitative data collection methods. This is because of the single-time exposure and outcome measurement afforded by the cross-sectional design (Grimes and Schulz, 2002).

Study population

The study population comprised of care takers of children under five years of age.

Sample size

The sample size was calculated using Kish Leslie formula for prevalence studies (Kish, 1965) with a single proportion. Considering a 5% precision, z at a 95% confidence interval and a prevalence of diarrhoea among U5s in Kigezi region in 2022 estimated at 23.3% (UBOS, 2023), the sample size was 275 and 306 after adjusting for 10% non-response. However, the sampling yielded 322 households.

Sampling

We used random sampling to select the households to include in this study. Working with village health team members (VHTs), we generated a list of households with under-fives. The homes were assigned numbers, and then a computer-based random number generator was used to select the 322 households for the study. In households with more than one child under five years, the one aged 6-24 months was considered for indexing, given that these exhibit the highest risk for diarrhoea (UBOS, 2023). Where more than one was within that age range, simple random sampling using lottery ballot selection (Arpita Lakhre, 2024) was used to select the child for indexing.

Inclusion criteria

Only adult caretakers (above 18 years) were considered in this study. The participants were those who had lived in Buhoma Town Council for at least 3 months before the study time.

Exclusion criteria

Clients who were below 18 years old or had not lived in Buhoma TC for three months or more were not considered. In addition, those who met the criteria but, for any reason they could not give full consent were not considered.

Data collection

Face-to-face interviews using a pre-coded Open Data Kit (ODK) based structured questionnaire with closed-ended questions were administered by the data collector. The questionnaire was adapted from several previously used questionnaires (Alphonsus O et al., 2017, Ndou et al., 2021, USAID, 2016). The interviews were conducted at the homes of the participants or any other preferred place. The questionnaire was translated into the local language - Runyankore/Rukiga for easy administration.

Study variables and variable measurements.

The dependent variable was a self-reported episode of diarrhoea among U5s in the previous two weeks before the study, measured as a binary categorical outcome [Yes (1)/No (0)]. Independent variables included socio-demographic characteristics, caretaker's WASH knowledge, caretaker's WASH practices, and household environmental characteristics.

Good WASH knowledge was measured by demonstration of knowledge on i) the importance of hand washing (hw); ii) diseases that can be contracted by not washing hands; iii) materials needed for effective hand washing hw; iv) at least 4/6 critical times that require hand washing w; v) at least 5 different ways to keep food safe to eat for infants and children vi) at least 3 ways to keep drinking water safe and viii) at least 3 ways to keep the environment safe.

Good WASH practices were measured by i) self-reported frequency of hw with soap (always or most times); ii) self-reported frequency of how (always or most times) after key critical activities; iii) self-reported water treatment to make it safer for drinking; iv) at least one thing done to make water safer for drinking; v) observed narrow-mouthed container(s) for water storage covered vi) safe disposal of child excreta and vi) not giving cold left-over food to the child.

Data quality control

Most of the questions adapted to the questionnaire had been previously validated (Alphonsus O et al., 2017, Ndou et al., 2021, USAID, 2016). To ensure quality in data collection, data collection was done by the researcher. Questionnaire development was based on previous context-related literature. Back translation from English to Runyankore/Rukiga and back to English was carried out for the tool to maintain consistency. Ten participants who were later not considered to participate in the study were interviewed using the questionnaire to ascertain the accuracy and consistency of the questionnaire before actual

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interviews. During data collection, completed records were monitored for completeness, clarity, and consistency.

Data analysis

Data files were downloaded from ODK as CSV and checked for consistency. Cleaning of the data was carried out using Stata Version 18 SE package. Frequencies and cross-tabulations were used to check for missing values and variables. The data were then analysed using Stata Version 18 SE. Proportions, measures of central tendency and measures of variation were used to describe the study participants. The strength of association between variables was determined using generalised linear modelling in terms of prevalence ratios, given that the outcome was so prevalent (24%) and ordinary logistic regression would overestimate the association (Thompson et al., 1998; Tamhane et al., 2016). Statistical measures were carried out at a 95% confidence level, and statistical significance was judged at a p-value < 0.05. To proceed to multivariate analysis, only variables with a p value of $p \leq 0.2$ were considered.

Ethical consideration

Ethical clearance was acquired from the Bishop Stuart University Research Ethics Committee BSU-REC-2025-684. Administrative clearance to conduct the study was obtained from the town council on 23rd/09/2025. Only participants who gave full informed consent were involved in the study. Participation in the study was voluntary, and maximum privacy was ensured. We used codes instead of names to ensure anonymity of the participants, and no possible identifiers were collected. The data were stored under password-controlled systems for confidentiality.

Results

Household and sociodemographic characteristics

Of the 322 households surveyed, slightly more than half (51.2%) had 5 to 8 people. Regarding U5s, most households (73.60%) had only one U5 child. A high proportion of U5s were aged 24-59 months (59.57%), and the sample was composed of slightly more males (55.32%) than females (44.68%). Within two weeks before the study, 24.2% of all the U5 children experienced diarrhoea. Most caretakers were aged 20 to 28 years (44.10%). A high percentage (85.40%) were mothers of the child, married (81.06%), and in a monogamous union (79.19%). 54% of caretakers had no formal education, and most of them were housewives (61.18%), while fathers were mostly casual labourers (51.25%). The average monthly income was highly skewed, with a mean of 85,841 and a median of 30,000 (range:0–2,500,000). The income distribution by quartiles indicated that the income of the majority (40.37% of caretakers) was in the first quartile.

Table 1: Household and sociodemographic characteristics (n=322)

Variable		Frequency	Percentage
Number of people in household	2-4	131	40.68
	5-8	165	51.24
	9+	26	8.07
Number of U5s	1	237	73.60
	2-3	85	26.40
Ages of all U5s (months)	0-5	48	14.91
	6-11	37	14.49
	12-23	47	14.60
	24-59	190	59.01
Sexes of all U5s	Male	172	53.42
	Female	150	46.58
Diarrhoea in two weeks for all U5s	Yes	78	24.22
	No	244	75.80
Caretaker age	11-19 yrs	35	10.87
	20-28 yrs	142	44.10
	29-35 yrs	63	19.57
	36-45 years	53	16.46
	45+ years	29	9.01
Relation of the respondent to the child	Mother	275	85.40
	Caretaker	20	6.21

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	Grandmother	13	4.04
	Sister	11	3.42
	Aunt	3	0.93
Marital Status	Married	261	81.06
	Divorced	17	5.28
	Single	30	9.32
	Widowed	14	4.35
	Monogamy	255	79.19
Marital Union	Polygamy	43	13.35
	Not yet married	24	7.45
Religion	Catholic/Anglican	308	95.65
	Others (Muslim, Faith of Unity and Pentecostal)	14	4.35
	PLE	85	26.40
Education level	O'level	37	11.49
	A' level and above	26	8.07
	None	174	54.04
	Housewife	197	61.18
Occupation of caretaker/mother	Private gainful work	36	11.18
	Peasant	69	21.43
	Others*	20	6.21
Occupation of the father	Causal labourer	164	51.25
	Farmer/peasant	29	9.06
	No job	62	19.38
	Others*	65	20.31
Mother's/care takers' monthly income in UGX	1st Quartile (≤20,000UGX/ USD 5.5)	130	40.37
	2nd Quartile (20001-30,000/5.6-8.5)	34	10.56
	3rd Quartile (30001-100,000/ USD 8.6-28.5)	90	27.95
	4th Quartile (100001-2,500,000/ USD 28.6plus)	68	21.12
Family owns radio	Yes	220	68.32
	No	102	31.68

* Teacher, Student, Works in Hospitality Business, Engineer, Driver, Business, Plumber, Manson, Fisherman, Security, Welding, Boda-boda rider

Characteristics of the index child

Most of the index children were aged 24–59 months (54.66%), 53.42% were male, and 97.2% were born in a health institution. Most children (94.72%) had ever been breastfed, but only 12.7% were on exclusive breastfeeding, with the majority (59.01%) having been weaned. At the time of the study, 9.01% of the index children had diarrhoea. For those with diarrhoea, the episode lasted for less than 14 days for 82.76%, and 100% of cases were watery diarrhoea.

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Table 2: Information on the index child (n=322)

Variable		Frequency	Percentage
Age of the index child	0-5	40	12.42
	6-11	42	13.04
	12-23	64	19.88
	24-59	176	54.66
Sex of the index child	Male	172	53.42
	Female	150	46.58
Where the child was born	Health institution	313	97.20
	Home	9	2.80
Birth order	First	102	31.68
	Second	77	23.91
	Third	56	17.39
	Fourth plus	87	27.02
Caretaker/mother's two-week history of diarrhoea	Yes	24	7.45
	No	298	92.55
Child ever breastfed	Yes	305	94.72
	No	17	5.28
Breastfeeding status	Exclusive	41	12.73
	Partial	91	28.26
	None	190	59.01
Diarrhoea during study day	Yes	29	9.01
	No	293	90.99
Length of diarrhoea episode	<14 days	24	82.76
	>14 days	5	17.24
Stool times a day if presently had diarrhoea	3 times	17	58.62
	More than 3 times	10	34.48
	Don't know	2	6.90
Type of diarrhoea	Watery	29	100.00
Action taken	Taken to health facility	17	62.96
	Taken to traditional healer	2	7.41
	Given ORS	2	7.41
	Homemade Treatment	6	22.22

Caretaker WASH knowledge

Nearly all caretakers (97.5%) reported having heard about handwashing. The most common sources of this information were school (34.7%) and radio (24.2%). Most caretakers understood the importance of handwashing, primarily stating it "helps prevent diseases" (72.36%). Diarrhoea was the most frequently cited disease contracted by not washing hands (73%). Water and soap were mainly identified as the materials needed for effective handwashing (96.27%). Critical times for handwashing mainly mentioned included after defecating (46.89%) and before eating (39.44%).

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Table 3: Caretaker WASH knowledge (n=322)

Variable		Frequency	Percentage
Ever heard about handwashing	Yes	314	97.52
	No	8	2.48
Source of information about handwashing	School	109	34.71
	Church	58	18.47
	Radio	76	24.20
	Friend/neighbour	42	13.38
	Others	29	9.24
Importance of hand washing	Helps prevent diseases	233	72.36
	Helps protect children from infections	30	9.32
	Community infection transmission	52	16.15
	Do not know	7	2.17
Diseases contracted by not washing hands	Malaria	18	5.59
	Diarrhoea	235	72.98
	Airway infections	21	6.52
	Dysentery/Typhoid/Cholera	48	14.91
Materials are needed for effective handwashing	Water only	5	1.55
	Water and soap	310	96.27
	Ash, water, hand towel/clean cloth	7	2.17
When supposed to wash hands	After defecating	151	46.89
	Before eating	127	39.44
	After handling waste	35	10.87
	Before food preparation or return from farm or market	9	2.80

Figure 1 illustrates the reported knowledge of practices of caretakers regarding water safety (a) and environmental hygiene (b). As shown in (a), a large majority of caretakers reported performing water treatment before drinking it (88.82%). Specifically, water boiling (76.4%) was a highly reported method. Regarding water handling and storage, 56.52% reported storing water in a covered container, and 89.13% reported using a separate container to pick water from the storage container. As seen in (b), the most highly reported environmental practices were slashing/mowing (98.76%) and sweeping (95.96%). Most respondents (86.34%) reported proper disposal of faeces/use of latrines, while proper refuse disposal was reported by only 59.01%.

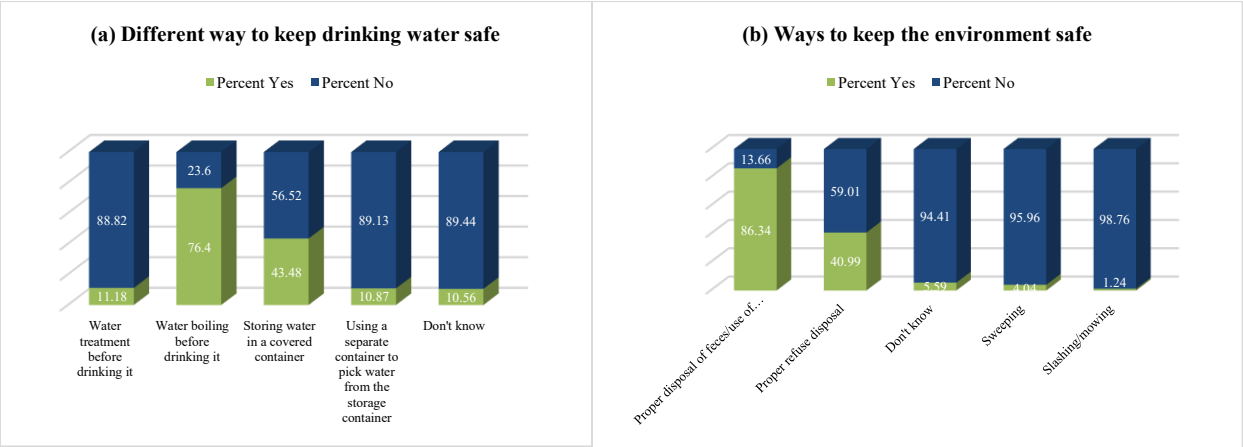

Figure 1: Knowledge on ways to keep the environment and water safe

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Figure 2 presents the reported knowledge on food safety practices among caretakers. Low knowledge was observed for washing/cleaning utensils (2%) and covering food (11%), while over half reported cooking food thoroughly (60.5%). Knowledge of hand hygiene related to food preparation was moderately reported, including hand washing before cooking (21.4%) and hand washing before eating (48.4%). However, good knowledge of leftover food handling was over 50%.

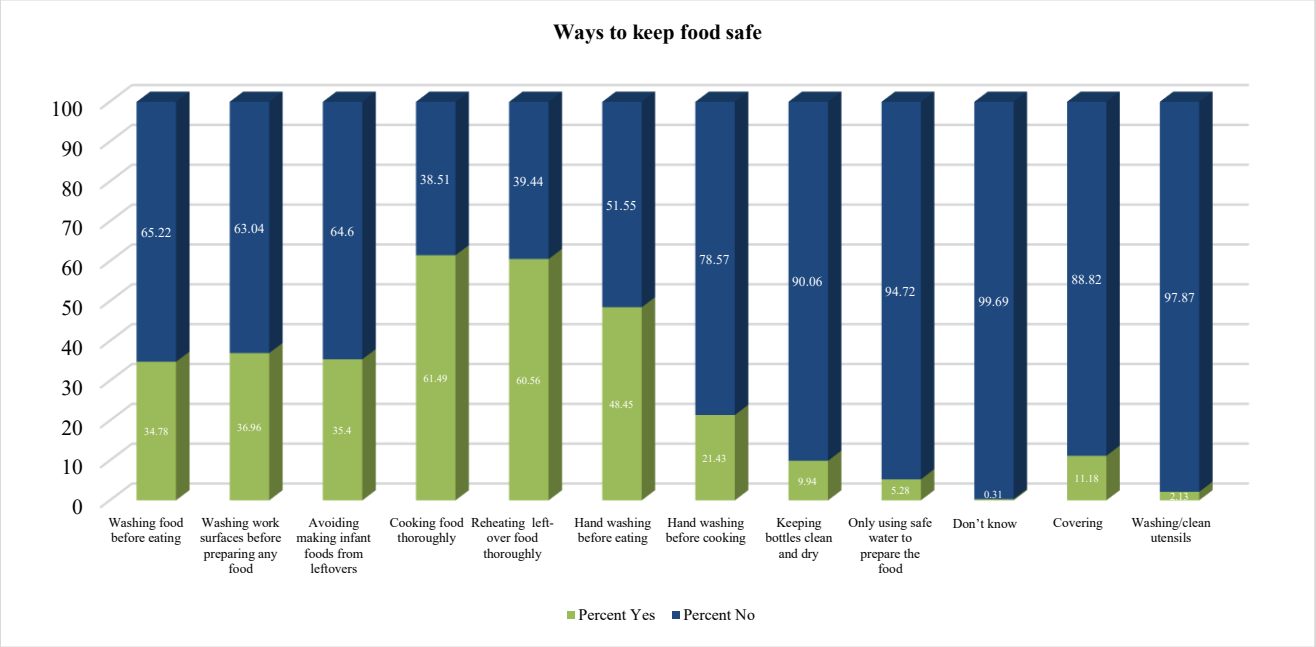

Figure 2: Knowledge on ways to keep food safe

Figure 3 details the self-reported frequency of handwashing across various critical activities. Washing hands before feeding the child was the activity most often done (46.3%). Compliance was lower for other critical activities. For example, handwashing after defecating was reported as "rarely" or "never" by approximately 29.8% of respondents. Similarly, after handling the child's faeces, urine, diapers, or napkins, a large proportion (over 20%) reported handwashing "rarely" or "never". The lowest reported proportion of "never" washing hands was after urinating (60%).

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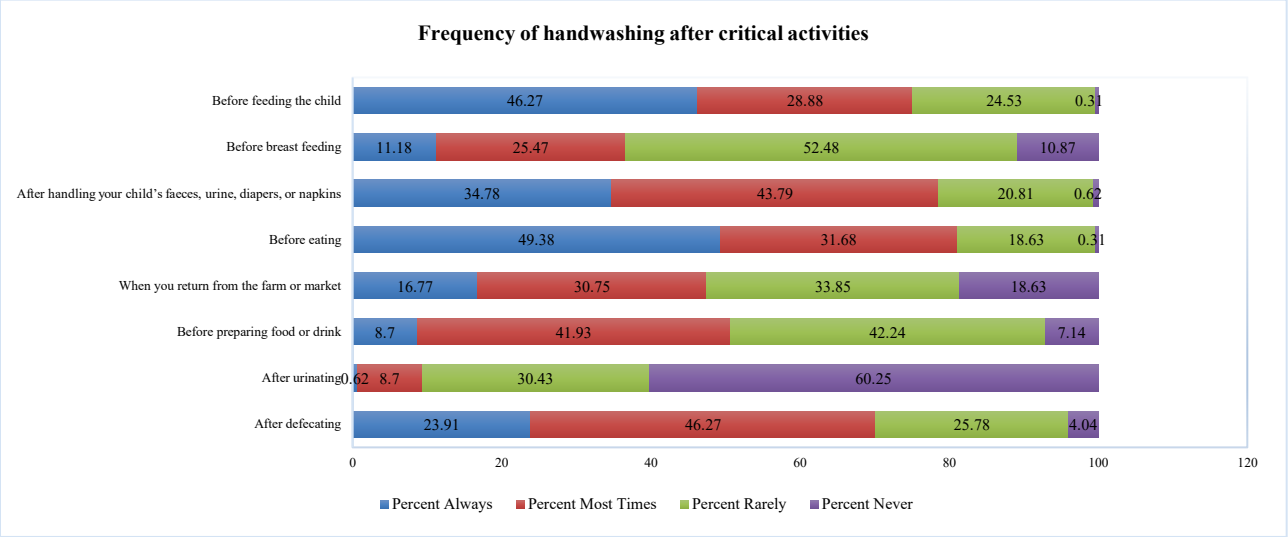

Figure 3: Frequency of handwashing after critical activities

Environmental conditions

Figure 4 presents the observational data collected by interviewers on handwashing facilities, items, and the status of the toilet facility. Handwashing stations and items: Of the observed handwashing devices, the basin was the most prevalent (86.3%). The most observed handwashing item was water (88.51%), followed by soap (67.4%). The Pit latrine (91.9%) was the most frequently observed toilet facility type. Observations revealed significant hygiene challenges, including flies present inside the toilet facility (48.8%), strong odour inside the facility (34.7%), and visible faeces on the floor (34.4%), all of which were all prevalent issues, indicating poor maintenance of sanitation facilities.

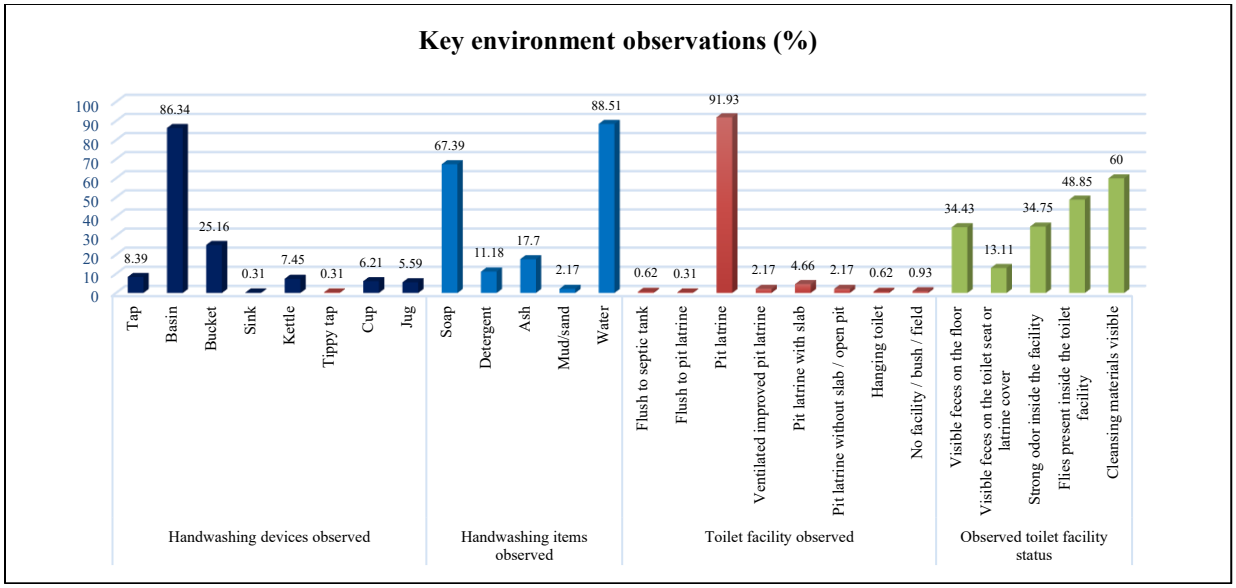

Figure 4: Key environment observations

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Factors independently associated with diarrhoea prevalence after adjustment.

In the multivariable model, several factors remained independently associated with diarrhoea prevalence (Table 3). Among household and demographic characteristics, having two (aPR=1.65, p=0.03) or three (aPR=3.40, p=0.03) U5s remained significantly associated with a higher prevalence. Caretakers aged 29–35 years showed a higher prevalence (aPR=2.43, p=0.04) compared to the reference group (11–19 years). Caretakers in the 4th income quartile had a significantly lower prevalence (aPR=0.36, p=0.01) than those in the 1st quartile. In terms of health and practices, caretaker history of diarrhoea remained a strong predictor of higher prevalence (aPR=2.02, p=0.01). Children who had ever been breastfed had a significantly lower prevalence (aPR=0.39, p=0.02). Among index child characteristics, children aged 12–23 months had a lower prevalence (aPR=0.51, p=0.04) compared to those under 12 months. For environmental factors, transporting water in an uncovered container was associated with a significantly lower prevalence (aPR=0.36, p=0.001) compared to covered containers. Having a movable handwashing facility was associated with a higher prevalence (aPR=1.76, p=0.02). A latrine/toilet located in one's own dwelling was associated with a lower prevalence (aPR=0.27, p<0.001), while one located in one's own yard/plot was associated with a higher prevalence (aPR=1.83, p=0.05).

Table 4: Factors associated with diarrhoea prevalence at the multivariable level (n=322)

Variable		Diarrhoea		cPR [95%CI]	p-value	aPR [95%CI]	p-value
		No	Yes				
Ward	Central	72(29.5)	34(43.6)	Ref			
	Northern	55(22.6)	9(11.5)	0.44 [0.22-0.85]	0.01*	0.41 [0.16–1.03]	0.06
	Southern	63(25.8)	14(18.0)	0.57 [0.33-0.98]	0.04*	0.90 [0.42–1.92]	0.78
	Eastern	54(22.1)	21(26.9)	0.87 [0.55-1.38]	0.56	1.08 [0.63–1.85]	0.80
No. of U5s	1	189(77.5)	48(61.6)	Ref			
	2	49(20.0)	27(34.6)	1.75 [1.18-2.60]	0.005**	1.65 [1.04–2.60]	0.03
	3	6(2.5)	3(3.8)	1.65 [0.63-4.29]	0.31	3.40 [1.11–10.28]	0.03
Relationship of caretaker	Mother	212(86.9)	63(80.8)	Ref			
	Others	32(13.1)	15(19.2)	1.39 [0.87-2.23]	0.17	0.74 [0.33–1.68]	0.47
Caretaker age	11-19 yrs	25(10.3)	10(12.8)	Ref			
	20-28 yrs	115(47.0)	27(34.6)	0.66 [0.36-1.25]	0.20	1.10 [0.48–2.42]	0.86
	29-35 yrs	40(16.4)	23(29.5)	1.28 [0.69-2.37]	0.44	2.43 [1.05–5.61]	0.04
	36-45 years	44(18.0)	9(11.5)	0.59 [0.27-1.31]	0.20	0.85 [0.33–2.20]	0.73
	45+ years	20(8.2)	9(11.5)	1.09[0.51-2.31]	0.83	1.66 [0.68–4.03]	0.26
Caretaker education	A level plus	25 (10.3)	1 (1.3)	Ref			
	None	121 (49.6)	53 (68.0)	7.92 [1.14-54.99]	0.04*	4.12 [0.62–27.36]	0.14

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	O'level	28 (11.5)	9 (11.5)	6.32 [0.85-47.10]		0.07	5.03 [0.78–32.38]		0.09
	PLE	70 (28.7)	15 (19.2)	4.59 [0.63-33.20]		0.13	2.54 [0.38–17.07]		0.34
Caretaker income quartile	1st	86 (35.3)	44 (56.4)	Ref					
	2nd	25 (10.3)	9 (11.5)	0.78 [0.42-1.44]		0.43	0.57 [0.28–1.17]		0.12
	3rd	73 (29.9)	17 (21.8)	0.56 [0.34-0.91]		0.02*	0.76 [0.43–1.35]		0.35
	4th	60 (24.6)	8 (10.3)	0.35 [0.17-0.69]		0.003**	0.36 [0.16–0.80]		0.01
Caretaker diarrhoea in 2 weeks	No	231 (94.7)	67 (85.9)	Ref					
	Yes	13 (5.3)	11 (14.1)	2.04 [1.26-3.31]		0.004**	2.02 [1.15–3.55]		0.01*
Daily per-capita water available	<15 litres	22 (9.0)	11 (14.1)	Ref					
	15+ litres	222 (91.0)	67 (85.9)	0.69 [0.41-1.18]		0.18	0.93 [0.46–1.86]		0.83

Table 4: Factors associated with diarrhoea prevalence, multivariable level (n=322) (Continuation)

Variable		Diarrhoea		cPR [95%CI]	p-value	aPR [95%CI]	p-value
		Yes	No				
Overall WASH practices	Poor	121 (49.6)	54 (69.2)	Ref			
	Better	123 (50.4)	24 (30.8)	0.53 [0.34-0.81]	0.004**	0.78 [0.50–1.23]	0.29
Age in months	<12 months	27 (11.1)	13 (16.7)	Ref			
	12-23	46 (18.9)	18 (23.1)	0.86 [0.48-1.57]	0.63	0.51 [0.27–0.96]	0.04
	24-59	137 (56.2)	39 (50.0)	0.68 [0.41-1.15]	0.15	0.76 [0.43–1.34]	0.35
	6-11	34 (13.9)	8 (10.3)	0.59 [0.29-1.26]	0.17	0.67 [0.29–1.57]	0.36
Where the child was born	Health facility	239 (98.0)	74 (94.9)	Ref			
	Home	5 (2.1)	4 (5.1)	1.88 [0.89-4.01]	0.10	0.83 [0.34–2.04]	0.69
Ever been breastfed	No	9 (3.7)	8 (10.3)	Ref			
	Yes	235 (96.3)	70 (89.7)	0.49 [0.28-0.84]	0.01*	0.39 [0.18–0.85]	0.02
Complementary feeding age	<6 Months	88 (36.1)	35 (44.9)	Ref			
	6+ Months	156 (63.9)	43 (55.1)	0.76 [0.52-1.12]	0.16	1.26 [0.83–1.92]	0.28
Drinking water source	Piped water	129 (52.9)	34 (43.6)	Ref			
	Protected spring/well	85 (34.8)	32 (41.0)	1.31[0.86-1.99]	0.21	0.77 [0.42–1.41]	0.40
	Rainwater/tank	16 (6.6)	9 (11.5)	1.73[0.94-3.15]	0.08	2.04 [0.29–14.34]	0.47
	Unprotected spring/well	14 (5.7)	3 (3.9)	0.85[0.29-2.47]	0.76	1.09 [0.24–4.91]	0.91

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Time to the water source	1-4 minutes	221 (90.6)	67 (85.9)	Ref			
	5-8 minutes	23 (9.4)	11 (14.1)	1.39 [0.82-2.36]	0.22	0.42 [0.07–2.47]	0.34
How water is transported	Covered	142 (58.2)	54 (71.1)	Ref			
	Uncovered	102 (41.8)	22 (28.9)	0.64 [0.41-1.00]	0.05	0.36 [0.19–0.67]	0.001**
Flooring in living house	Cement/tiles	74 (31.2)	15 (22.1)	Ref			
	Mud/wood	163 (68.8)	53 (77.9)	1.46 [0.87-2.44]	0.15	1.15 [0.65–2.02]	0.63
Hand-washing facility movable	No	184 (75.4)	52 (66.7)	Ref			
	Yes	60 (24.6)	26 (33.3)	1.37 [0.92-2.05]	0.12	1.76 [1.09–2.85]	0.02
Shared latrine/toilet	No	142 (58.2)	40 (51.3)	Ref			
	Yes	102 (41.8)	38 (48.7)	1.23 [0.84-1.82]	0.28	0.71 [0.31–1.62]	0.41

Table 4: Factors associated with diarrhoea prevalence, multivariable level (n=322) (Continuation)

Variable		Diarrhoea		cPR [95%CI]	p-value	aPR [95%CI]	p-value
		Yes	No				
Latrine/toilet location	Elsewhere	15 (6.2)	13 (16.7)	Ref			
	Own dwelling	16 (6.6)	6 (7.7)	0.59 [0.27-1.29]	0.19	0.27 [0.13–0.57]	0.000**
	Own yard/plot	213 (87.3)	59 (75.6)	0.47 [0.29-0.74]	0.001**	1.83 [1.00–3.37]	0.05
Sharing shelter with animals	No	220 (90.2)	66 (84.6)	Ref			
	Yes	24 (9.8)	12 (15.4)	1.4 [0.87-2.40]	0.16	0.65 [0.38–1.10]	0.11
Faeces seen around the house	No	195 (79.9)	57 (73.1)	Ref			
	Yes	49 (20.1)	21 (26.9)	1.33 [0.87-2.03]	0.19	0.65 [0.38–1.10]	0.11
Flies seen around the house	No	172 (70.5)	47 (60.3)	Ref			
	Yes	72 (29.5)	31 (39.7)	1.40 [0.95-2.07]	0.09	1.21 [0.69–2.13]	0.50

*p=0.01, **p<0.001

Discussion

This study focused on assessing the association between caretakers' WASH knowledge, practices, household environmental characteristics and diarrhoeal diseases among U5s in Buhoma Town Council, Kanungu District. Less than 9% of the index children had diarrhoea, while 24.2% had had diarrhoea in the previous two weeks. This overall prevalence was higher than the 19% national average, close to 23.3% for Kigezi region (UBOS, 2023).

Households with 2 or 3 U5s had a significantly higher prevalence of diarrhoea. This finding is similar to what has been reported in other studies (Thiam et al., 2017; Guillaume et al., 2020). This could be attributed to the fact that more children come with a bigger burden of care

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(Guillaume et al., 2020). Such a burden may compromise the attention paid to the children, thus higher chances of diarrhoea. Efforts aimed at diarrhoea prevention need to prioritize such households. Other caretaker-related factors that were significantly associated with higher diarrhoea prevalence included being aged 29–35 years, and caretaker history of diarrhoea while being in the fourth income quartile was associated with a significantly lower prevalence of diarrhoea. The finding about younger caretakers is not isolated, as many other studies have reported the same (Gali et al., 2021; Omona et al., 2020). Younger caretakers and parents may lack childcare experience, increasing the risk of diarrhoea in children. Regarding caretaker history of diarrhoea, with the low reported usage of soap in handwashing, this would be expected, as less than half of the participants washed their hands before feeding children. The association of low-income status and diarrhoea is not surprizing because caretakers of low-income status may have other challenges, including safe water access, buying soap, and other resources (Kattula et al., 2015, Kondapalli and Yalavarthy, 2017, Nannan et al., 2022). Other studies have reported the same results, for instance, younger caretakers (Gali et al., 2021, Omona et al., 2020), caretaker history of diarrhoea (Shaaban et al., 2022), and low-income status (Lohakpure and Vedpathak, 2019, Kattula et al., 2015, Kondapalli and Yalavarthy, 2017, Ssekandi et al., 2023). These results underscore the need to prioritise improvement of handwashing practices, especially among younger caretakers and those of low-income status.

Children who had ever been breastfed and those aged 12–23 months had a lower prevalence compared to those under 12 months. This would be expected given that breastfeeding is a known protective factor against childhood diarrhoea. Other studies have reported the same relationship between breastfeeding and age (Bitew et al., 2023; UBOS, 2023). For children above one year, given their exposure to alternative feeding after 6 months (Melese et al., 2019), they may develop immunity compared to those below one year, given the fact that those are novices to alternative feeding (Ferede, 2020), and it is the age when crawling begins, thus more environmental exposure (Sangma et al., 2019).

Nearly all caretakers reported having heard about handwashing, with the common sources of this information being school and radio. Most caretakers understood the importance of handwashing, especially for preventing diseases, especially diarrhoea. Water and soap were mainly identified as the materials needed for effective handwashing, though less than half of the participants did not mention the critical times for handwashing. This indicates a high level of WASH knowledge among the participants and important channels for knowledge improvement. A large majority of caretakers knew how to make water safe for drinking, especially water treatment, as well as knowledge of food safety practices, especially washing/cleaning utensils, cooking food thoroughly, and covering food. Though knowledge was not associated with lower diarrhoea prevalence, it is considered an important driver for better practices (Alebel et al., 2018; Diouf et al., 2014; Edward et al., 2019). It should still be considered an important factor in the prevention and control of diarrhoea (Mekonnen et al., 2018; Ohamaeme et al., 2018).

In terms of practices, slightly more than half reported washing their hands, but only 8.39% reported always washing with soap. Close to half of the participants washed their hands before feeding the child. Water was treated by more than 60% of respondents, especially by boiling. With respect to child faeces disposal, more than half of the respondents disposed of it safely in a latrine/sanitation facility. Though overall better WASH practices were not independently associated with a lower diarrhoea prevalence, key practices including handwashing, food and water safety are known to be associated with lower diarrhoea prevalence (Getahun and Adane, 2021; Melese et al., 2019). The controversy in our findings could be related to the fact that there were few differences between those whose children had suffered diarrhoea or not. In addition, these were self-reported practices. Furthermore, the way we measured better WASH practices by combining many factors could have affected the results. More surprising is that one of the practices independently assessed, i.e., transporting water in an uncovered container, was associated with a significantly lower prevalence compared to covered containers. Many other studies have indicated that transporting water in covered containers is associated with lower diarrhoea prevalence. This controversy could have resulted from the fact that most of the participants accessed water from sources considered safe, and water can get contaminated along the water chain beyond transportation.

More than 80% reported either piped water or a protected spring/well as their main sources of drinking water. This is a large proportion for safe water access, and once safety is maintained across the chain, it would be important in diarrhoea prevention (Afitiri et al., 2020). About half had a handwashing station, and having a movable handwashing facility was associated with a higher prevalence. A movable handwashing facility may lead to some people not locating

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it after every movement, thus poor handwashing practices (Essuman, 2023; Overbey et al., 2019) and thus the observed higher prevalence of diarrhoea. Over 80% of those who had a toilet/latrine facility, the facility located in their own yard/plot and a latrine/toilet located in own dwelling was associated with a lower prevalence (Majorin et al., 2019, Overbey et al., 2019, Ntshangase et al., 2022) while one located in own yard/plot was associated with a higher prevalence compared to those located elsewhere. The observed lower prevalence with latrine/toilet located in the own dwelling may be because those are likely to be flushing toilets, which are much safer given their waterborne nature, fly infestation prevention, and easy access for use, handwashing, and child faeces disposal as compared to those located in the yard or elsewhere. Those located elsewhere may include those that are shared, which are also known to be associated with higher diarrhoea prevalence.

Conclusions

This study found a higher two-week prevalence of diarrhoea compared to the national average but similar to the prevalence for Kigezi region. Factors which were significantly associated with a higher prevalence of diarrhoea included having two or three U5 children, caretakers aged 29–35 years, caretaker history of diarrhoea, and having a movable handwashing facility. Those which were associated with a lower prevalence of diarrhoea included caretakers in the fourth income quartile, children who had ever been breastfed, children aged 12–23 months, transporting water in an uncovered container, and a latrine/toilet located in the own dwelling. These findings call for targeted interventions to prevent and control childhood diarrhoeal diseases.

Recommendations

Buhoma Town Council

- Intensify health education focused on high-risk caretaker groups with focused campaigns on hygiene and sanitation using platforms like Village Health Team (VHT) meetings and community gatherings.
- Establish a community-level surveillance/support system for households where caretakers have a history of diarrhoea to ensure diarrhoea case history vigilance.
- Promote safe water transport and storage by enforcing covered water transport with community drives and education sessions.
- Encourage early and exclusive breastfeeding through clinics and community groups.
- Water, Sanitation, and Hygiene (WASH) Improvement through promotion of fixed handwashing facilities, e.g., tippy taps or designated stations with soap and water.
- Infant feeding hygiene improvement with specific messages on proper food preparation, safe complementary feeding practices, and good hygiene.
- WASH monitoring for WASH practices using VHTs or other local structures to track progress and identify non-compliant households for follow-up.

District/regional level

- Acknowledge the regional burden and allocate more WASH and health resources to regions with the highest rates to close the gap.
- Socio-economic interventions to support lower-income families through parish development model focused on financial access and livelihood improvement.
- Integrate family planning into diarrhoea prevention efforts, explicitly highlighting the increased risk associated with having two or three under-five children.

National level

- Review national WASH strategy to address regional disparities through designating regions like Kigezi with persistently high diarrhoea prevalence as priority intervention zones in national health and WASH strategies, ensuring a higher per capita investment in sanitation and hygiene infrastructure.
- Issue guidance on optimal handwashing station design and maintenance to ensure functionality and safe usage, emphasizing fixed, dedicated structures.
- Integrate safe water handling and storage into national guidelines or standards from source to consumption, focusing on covered containers and point-of-use treatment, supported by mass media campaigns.
- Provide Information, Education, and Communication (IEC) materials to key regions to improve targeted messaging on WASH and child feeding and breastfeeding.

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