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Prevalence and factors associated with poor hand hygiene practices among adult carers of children under five in Mbale District Uganda

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Short title: Poor Hand Hygiene Practices among adult caregivers of under-five-year-old children

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Abstract

Background: Proper hand hygiene reduces the risk of hygiene-related diseases among children under five years of age; however, poor hand hygiene practices remain common in many communities. This study determined the prevalence and factors associated with poor hand hygiene practices among adult caregivers of children under five years in Mbale District, Eastern Uganda, to inform context-specific interventions.

Methods: We conducted a cross-sectional study in March 2023 among 320 adult caregivers of children under five years. Participants were selected using multistage sampling from three sub-counties with the largest under-five populations. Structured questionnaires collected information on socio-demographics, household characteristics, knowledge of hand hygiene, and COVID-19 prevention information. Poor hand hygiene was defined as reporting handwashing at five or fewer of ten critical hand hygiene moments. Multivariable logistic regression was used to identify factors independently associated with poor hand hygiene.

Results: Of the 320 caregivers enrolled, 275 (85.9%) were female. The majority were aged 25–34 years (38.4%, n=123), and over half (55.6%, n=178) had primary education. Overall, 28% (n=88) of caregivers engaged in poor hand hygiene practices. In the multivariable analysis, receiving hand hygiene information from Village Health Teams (VHTs) was significantly associated with higher odds of poor hand hygiene (AOR 4.2; 95% CI 1.7-10.4). Caregivers who indicated that hand hygiene protects against COVID-19 had lower odds of poor hand hygiene (AOR 0.16; 95% CI 0.03-0.73). Additionally, inconsistent availability of soap, detergent, or sanitizer at handwashing stations was strongly associated with poor hand hygiene (AOR 8.22; 95% CI 2.03-57.16). No significant associations were observed for education level, child's age, or type of handwashing facility.

Conclusion: Nearly three in ten adult caregivers exhibited poor hand hygiene practices. Poor hand hygiene was associated with receiving information from VHTs and inconsistent access to cleansing materials, whereas knowledge of hand hygiene's protective benefits against COVID-19 was associated with better practices. Strengthening VHT training and ensuring reliable access to handwashing supplies may help improve hygiene behaviours in Mbale District.

Keywords: Hand hygiene practices, adult caregivers, children under five, Mbale District, Uganda.

Background

Hand hygiene is one of the most effective and cost-efficient measures for preventing infectious diseases, particularly diarrhoeal and respiratory illnesses among children under five years of age. It involves cleaning hands with water and soap or an alcohol-based hand rub at critical moments, such as after defecation, before eating, before feeding a child, and after contact with respiratory secretions [6]. Despite its well-established role in protecting child health, hand hygiene practices remain suboptimal in many low- and middle-income countries (LMICs).

Evidence shows that many households still lack basic handwashing facilities [8], and even where facilities exist, adherence remains low. Globally, fewer than one in five individuals wash their hands with soap after faecal contact [9], and compliance at other essential moments, such as before food preparation or child feeding, can be as low as 19.8% [10]. These low levels of adherence pose a significant risk to young children, who rely on caregivers to maintain hygiene within the home environment.

Caregivers' hand hygiene practices are influenced by multiple factors, including knowledge [11], availability of soap and water [12], perceived benefits and risks [13], emotional motivators [14], and prevailing social norms within the community [15]. Although some studies have documented these determinants, there remains limited empirical evidence specifically focused on adult

caregivers in community settings, despite their central role in preventing hygiene-related diseases among children [16],[17].

Studies evaluating hand hygiene interventions, such as behaviour change communication and improvements in access to handwashing facilities, have demonstrated improvements in handwashing behaviour [17]. However, much of the existing literature originates from hospital or institutional settings [6][21] , limiting its applicability to community contexts where primary caregiving occurs.

Given these gaps, a clearer understanding of hand hygiene practices and their associated factors among adult caregivers is essential for designing effective, context-appropriate interventions. Therefore, this study aimed to assess the prevalence and associated factors of poor hand hygiene practices among adult caregivers of children under five years in Mbale District, Eastern Uganda.

Methods

Study setting

This study was conducted in three rural sub-counties of Mbale District in Eastern Uganda, Bumbobi, Bufumbo, and Bubyangu, selected due to a high reported burden of diarrhoea (8%) and low hand hygiene compliance (43%)[24]. These sub-counties were identified based on surveillance data from the District Health Information System version 2 (DHIS2) for the year 2020, which indicated a high prevalence of acute diarrhoeal cases reported at local health facilities.

Mbale District covers an area of 538.16 km² and has a population density of 915 persons per square kilometre. It is bordered by Tororo District to the south, Manafwa to the southeast, Sironko and Bududa to the northeast, Mbale City to the north, Budaka and Pallisa to the northwest, and Butaleja to the west. Administratively, the district comprises three parliamentary constituencies, Bungokho North, Bungokho Central, and Bungokho South, alongside 16 sub-counties and three town

councils: Nabumali, Jewa, and Busiu.

There are 24 health facilities in the district, including one Health Centre IV, 17 Health Centre IIIs, and six Health Centre IIs. Agriculture is the primary economic activity, employing approximately 82% of the population. More than 90% of residents live in rural areas, with limited access to water, sanitation, and hygiene (WASH) services, factors that contribute to the persistently high incidence of diarrhoeal diseases. The district is predominantly inhabited by the Gishu ethnic group, with minority populations of Gwere, Teso, Japadhola, and Samia communities also present.

Study design

This study employed an analytical cross-sectional design to collect quantitative data to understand the prevalence and factors associated with poor hand hygiene among carers. We adopted the design because it suits our objectives and research questions.

Study population

The study targeted adult carers of children under five aged 15 years and older, as defined in the 2016 Demographic and Health Surveys, who had at least one child under five residing in households within the three selected sub-counties in Mbale District

Sample size determination

The sample size for this study was determined using the Kish-Leslie formula [25] for calculating sample sizes for cross-sectional studies given by:

$$N = \frac{Z^2 \alpha/2\, p(1-p)}{d^2}$$

Where:

N is the required sample size

Z is the value that corresponds to the set confidence level at 95%, which is 1.96.

d is the margin of error which we set at 0.05

p is the prevalence of hand hygiene of adult carers in the target population. We used a prevalence of 25% as cited in Kayiwa et al [26].

Considering these assumptions, we initially estimated the required sample size to be 288 respondents. After accounting for a 10% non-response rate, the final sample size was adjusted to 320 respondents.

Sampling procedures

Using acute diarrhea among children under five years as a proxy for hygiene-related diseases, sub-counties were ranked from the highest to the lowest number of diarrhea cases. We then selected the top three sub-counties (Bufumbo, Bubyangu, and Bumbobi) whose health facilities reported the highest number of acute diarrhoea cases in the District Health Information System (version-2) [DHIS-2] from October to December 2022/2023, as shown in **Table 1** below.

Table 1. Distribution of outpatient department attendances for acute diarrhea across different sub-counties in Mbale district, October to December 2022/2023.

Organisation unit name	Diarrhoea - Acute 29 Days-4Years, Female	Diarrhoea- Acute 29 Days-4Years, Male	Totals OPD[a]
Bubyangu Subcounty	44.0	55.0	99
Budwale Subcounty	29.0	38.0	67
Bufumbo Subcounty	46.0	48.0	94
Bukiende Subcounty	10.0	9.0	19
Bumasikye Subcounty	13.0	1.0	14
Bumbobi Subcounty	47.0	46.0	93
Bungokho Subcounty	0	0	0
Bungokho-Mutoto Subcounty	0	0	0
Busano Subcounty	37.0	33.0	70
Busiu Subcounty	26.0	28.0	54
Busiu Town Council	19.0	9.0	28
Busoba Subcounty	12.0	22.0	34
Lukhonje Subcounty	30.0	43.0	74
Nabumali Town Council	0	0	0
Nakaloke Town Council	0	0	0
Nawuyo Town Council	0	0	0
Nyondo Subcounty	7.0	13.0	20

Organisation unit name	Diarrhoea - Acute 29 Days-4Years, Female	Diarrhoea- Acute 29 Days-4Years, Male	Totals OPD[a]
Wanale Subcounty	22.0	28.0	50

[a]*OPD, Outpatient Department*

To ensure adequate representation of caregivers of children under five, we selected the parish with the largest under-five population in each sub-county (Bunamoli in Bubyangu, Bumusili in Bufumbo, and Bumbobi in Bumbobi), as shown in **Table 2.** Selection was based solely on population size, not disease frequency, and there was no evidence of any outbreak during the study period. The three parishes have a combined total of 19 villages. Following best practices from the Uganda Bureau of Statistics (UBOS, https://www.ubos.org/), which recommends interviewing approximately 20 to 25 respondents per enumeration area, a total of 16 out of 19 villages were selected using the proportion outlined below.

$$\frac{\text{Total number of participants in the study}}{\text{Total number of participants per enumeration area/village}}$$

$$=320/20$$

$$=16 \text{ villages}$$

To determine the number of villages per parish for inclusion, we calculated the proportion of villages in each parish relative to the total villages (19) and multiplied it by the target number of villages (16), as shown in the computation below.

Bunamoli Parish: $(4/19) \times 16 = 3$ villages

Bumusili Parish: $(7/19) \times 16 = 6$ villages

Bumbobi Parish: $(8/19) \times 16 = 7$ villages

Villages were then randomly selected from each parish. To do this, village names were written on pieces of paper, placed in a box, and mixed. A member of the research team randomly drew one paper at a time, and the village name on the paper was selected. This process continued until the

required number of villages was chosen in each parish. In each selected village, 20 households were randomly chosen using a list from the village chairperson. The list included households with children under five years old. Trained Village Health Teams (VHTs) assisted in identifying and listing all eligible households. The research team then used a simple random sampling method to choose 20 households for data collection. To determine the starting point for surveying, the research assistant tossed a coin at the village trading centre to decide the direction (heads for right, tails for left). The VHT guided the team along the chosen path until all selected households were surveyed, starting from the farthest end of the village. If a household had more than one eligible child, one child was selected at random using simple random sampling methods. **See Table 2.**

Table 2. Names of selected sub-counties, parishes, and their corresponding number of children below five years and the villages

Sub County	Parish name	Number of <5 children	Name of village selected for the survey
Bubyangu	Bunamoli	806	Bunamoli, Majenga, Bumasifa, Namakholo
Bufumbo	Bumusili	112	Lufunga, Bumusili, Itale, Kibembe, Lwasabubi, Mayenze, Neemba
Bumbobi	Bumbobi	247	Nabikhomwa A, Nabikhomwa B, Siira 1, Siira 2, Masalile, Luuchi, Bukhomeka 1, Bukhomeka 2

Study variables

Dependent variables

The dependent variable was poor hand hygiene practices among adult caregivers of children under five years. Poor practice was defined as performing five or fewer of the ten critical hand hygiene moments. These critical moments included: before eating; after eating; before breastfeeding or feeding a child; before cooking or preparing food; after defecation or urination; after cleaning a child who has defecated or changing a nappy; when hands are visibly dirty; after cleaning the toilet or potty; before and after caring for a sick person; and after blowing the nose, coughing, or

sneezing.

The ten items were combined into a hand hygiene scale, whose internal consistency was assessed using Cronbach's alpha. The scale demonstrated acceptable reliability, with an alpha coefficient of 0.78, indicating that the items were sufficiently correlated and measured a common underlying construct. The average inter-item covariance was 0.045, further supporting the homogeneity of the items. These results are consistent with the Stata output ($\alpha = 0.7781$; average inter-item covariance = 0.0446569; number of items = 10).

Independent variables

Independent variables in this study included socio-demographic characteristics of adult caregivers of children under five (such as age, marital status, residence, education level, and income), availability of handwashing facilities, availability of soap or alcohol-based hand rub, knowledge of critical handwashing times, and specific factors identified in the literature, including the source of hand hygiene information.

Data collection methods and procedures

Data was collected using an interviewer-administered questionnaire, completed electronically via Kobo Toolbox (Cambridge, Massachusetts, USA). The questionnaire gathered information on socio-demographic factors (age, marital status, education, income, occupation, religion), residence, water source, handwashing facilities, and other factors associated with hand hygiene among adult carers of children under five. Five trained research assistants (RAs) conducted the data collection, having received three days of training on study procedures, ethics, and tool usage. A pre-test was conducted with eight adult carers in Mooni village to assess questionnaire validity, question clarity, and time required for completion. Modifications were made based on pre-test feedback to improve the questionnaire's quality. The RAs, assisted by the village chairperson and

Village Health Teams (VHT), then proceeded with data collection in the selected households.

Measurement of variables

The primary outcome was poor hand hygiene practices, defined as engaging in five or fewer of the ten critical hand hygiene moments. The ten critical moments included six main handwashing moments [27] and four auxiliary moments. The six main moments were: (i) before eating, (ii) after eating, (iii) after defecation/urination, (iv) after cleaning a child's feces or changing a nappy, (v) before preparing food, and (vi) after coughing or sneezing. The four auxiliary moments were: (i) before breastfeeding or feeding a child, (ii) before cooking, (iii) before caring for a sick person, and (iv) after caring for a sick person.

To assess hand hygiene practices, respondents were asked, "At what critical times did you wash your hands?" The research assistant checked off each moment the respondent mentioned. Respondents were then asked whether they used soap and water, water alone, or an alcohol-based hand rub at each moment. Poor hand hygiene was defined as reporting five or fewer critical moments and not using soap with water or alcohol-based hand rub at those times.

We also collected information on factors potentially associated with poor hand hygiene practices, including socio-demographic characteristics such as the caregiver's age (categorized as 15–24, 25–34, and 35+ years), the child's age (<11 months, 12–35 months, and 36+ months), education level (no formal education, primary, post-primary), and availability of hand hygiene facilities. Data on sources of hand hygiene information were collected using multiple-choice questions.

Data management and quality control

Data were collected using Kobo Toolbox (Cambridge, Massachusetts, USA) and exported to Microsoft Excel for initial processing. The dataset was then transferred to Stata version 15 (College Station, Texas, USA)[28] for data cleaning and preparation for analysis. To ensure data quality,

daily validation checks were conducted in the Kobo Toolbox, and troubleshooting was performed as needed. All data were backed up on an external, password-protected drive located on the Principal Investigator's computer, with additional backups stored on flash drives with restricted access to ensure confidentiality.

Data analysis

Data were analyzed at three levels: univariate, bivariate, and multivariable. Descriptive statistics, including frequencies and means, were used in the univariate analysis. Logistic regression was employed for bivariate analysis to assess factors associated with poor hand hygiene practices, as this outcome was binary. Variables with a p-value <0.05 in the bivariate analysis were entered into the multivariable model. A stepwise approach was used in the multivariable analysis to select and adjust variables, and factors with a correlation greater than 0.6 were excluded due to collinearity. The final model identified significant associations with the primary outcome, defined as a p-value <0.05. Factors such as the child's age [29], caregiver's education level [30], and diarrhea prevalence[31] were included in the multivariable analysis based on their established significance in the literature, despite not being significant in the bivariate analysis.

Results

Respondents' socio-demographic characteristics

Table 3 shows the socio-demographic characteristics of adult carers. A total of 320 carers of children under five years were interviewed. The majority were female (86%, n = 275), with only 45 (14%) male carers. The mean age of respondents was 32 years (SD ±11.5), ranging from 15 to 73 years. Most carers were aged 25–34 years (38.4%), followed by those aged 15–24 years (31.6%) and those aged 35 years and older (30%). Bumbobi sub-county had the highest proportion of participants (48.9%, n = 154), followed by Bufumbo (34.7%, n = 123). Regarding religious

affiliation, most participants identified as Protestant (38.4%, n = 123) or Catholic (34.7%, n = 111). In terms of education, the majority had completed primary education (55%, n = 176), while 31.2% (n = 100) had attained post-primary education. Notably, 13.1% (n=42) had no formal education. The predominant occupation was peasant farming (70%, n = 223), followed by housewives (16.3%, n = 52). More than eighty percent of the respondents (82.5%, n = 264) were in a marital union at the time of the study. **See Table 3.**

Table 3. Description of Socio-demographic characteristics

Variable	**Frequency n=320**	**Percentage (%)**
Sub-County		
Bubyangu	55	17.2
Bufumbo	111	34.7
Bumbobi	154	48.1
Child's age category (Months)		
≤11	71	22.2
12-23	91	28.4
24-35	54	16.9
36 and above	104	32.5
Child attending school (Yes)	49	15.3
Relationship with the child		
Mother	253	79.06
Father	30	9.38
Other	37	11.6
Carer's sex		
Male	45	14.0
Female	275	85.9
Age of the carer		
15-24	101	31.6
25-34	123	38.4
35+	96	30.0
Religion of carer		
Catholic	38	11.9
Anglican/protestant	123	38.4
Moslem	111	34.7
Pentecostal /born again / evangelical	48	15.0
Highest level of education		
No formal education	42	13.1
Primary	178	55.6
Post-primary	100	31.2
Main occupation of the carer		
Peasant farmer	223	69.7
Business/commercial	20	6.3
Casual worker	15	4.7
House wife	52	16.3
Other	10	3.1
Carer's marital status		

Variable	Frequency n=320	Percentage (%)
Single /separated	47	14.7
Married/cohabiting	264	82.5
Widowed	9	2.8

Prevalence of poor hand hygiene among adult carers in Mbale District

The prevalence of poor hygiene practices was 28% (88/320) while that of good hand hygiene practices was 72% (232/320), as shown in **Figure 1** below.

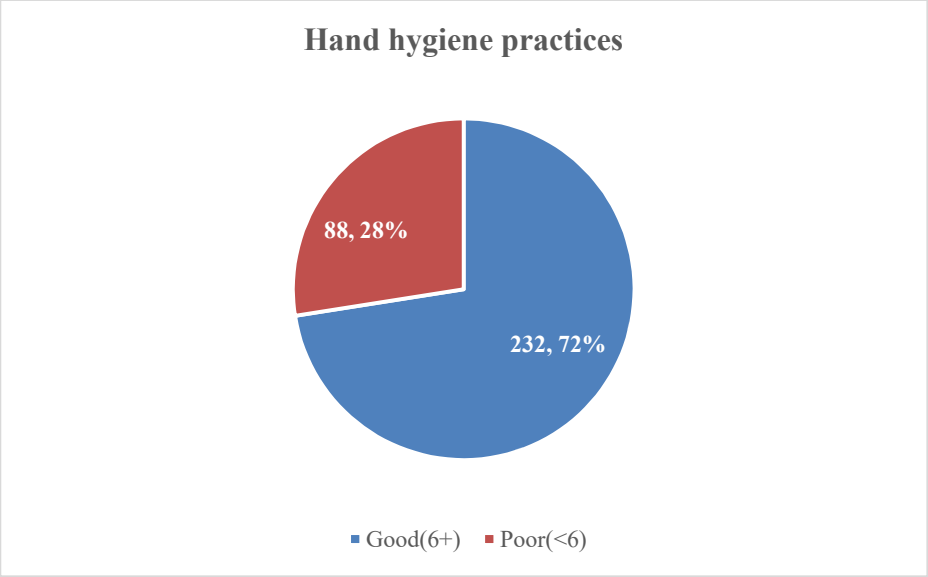

Figure 1. Prevalence of hand hygiene practices among adult carers

Distribution of hand hygiene practices across socio-demographic characteristics

Table 4 shows the prevalence of hand hygiene practices among adult carers across different socio-demographic characteristics. Though good hand hygiene practices were common among carers with children aged 12-33 months (32.3%, n=75), and carers aged 25-34 (38.8%, n=90), poor hand hygiene was common among carers whose children were aged 36+ months (39.8%, n=35) and or with the child not attending school (21.6%, n=19), carers who had attended primary education (65%, n=57) and those whose main occupation was peasant farmer (75%, n=66). In addition, poor hand hygiene was also common among carers who were mothers of the child (79.6%, n=70), Anglican (43.2%, n=38), and living in a marital relationship (81.8%, n=72). **See Table 4.**

Table 4. Distribution of hand hygiene practices across the different socio-demographic characteristics of the adult carers of children under five years in Mbale District

Variable	Hand hygiene practices		P-value
	Good n=232(%)	Poor n=88(%)	
Child's age category (Months)			0.081
≤11	50 (70.4)	21 (29.6)	
12-23	75 (82.4)	16 (17.6)	
24-35	38 (70.4)	16 (29.6)	
36+	69 (66.3)	35 (33.7)	
Child attending school (Yes)	30 (61.2)	19 (38.8)	0.055
Relationship with the child			0.268
Mother	183 (72.3)	70 (27.7)	
Father	19 (63.3)	11 (36.7)	
Other	30 (81.1)	7 (18.9)	
Age of the carer			0.829
15-24	71 (70.3)	30 (29.7)	
25-34	90 (73.2)	33 (26.8)	
35+	71 (74.0)	25 (26.0)	
Religion of carer			0.459
Catholic	28 (73.7)	10 (26.3)	
Anglican/protestant	85 (69.1)	38 (30.9)	
Moslem	80 (72.1)	31 (27.9)	
Pentecostal /born again / evangelical	39 (81.2)	9 (18.8)	
Highest level of education			0.065
No formal education	30 (71.4)	12 (28.6)	
Primary	121 (68.0)	57 (32.0)	
Post-primary	81 (81.0)	19 (19.0)	
Main occupation of the carer			0.404
Peasant farmer	157 (70.4)	66 (29.6)	
Business/commercial	17 (85.0)	3 (15.0)	
Casual worker	10 (66.7)	5 (33.3)	
Housewife	39 (75.0)	13 (25.0)	
Other (students, hairdresser)	9 (90.0)	1 (10.0)	
Carer's marital status			0.432
Single/separated	32 (68.1)	15 (31.9)	
Married/cohabiting	192 (72.7)	72 (27.3)	
Widowed	8 (88.9)	1 (11.1)	

P-values calculated using Pearson's Chi-square or Fisher's exact test

Prevalence of diarrhea among children under five against the adult carers' hand hygiene practices

Figure 2 shows the number of children who experienced a diarrheal episode two weeks prior to the study as reported by their adult carers, which was slightly higher in households with poor hand hygiene practices as compared to those with good hand hygiene (29.5% vs. 25.9%) however, this difference was not statistically significant (P=0.51). **See Figure 2**.

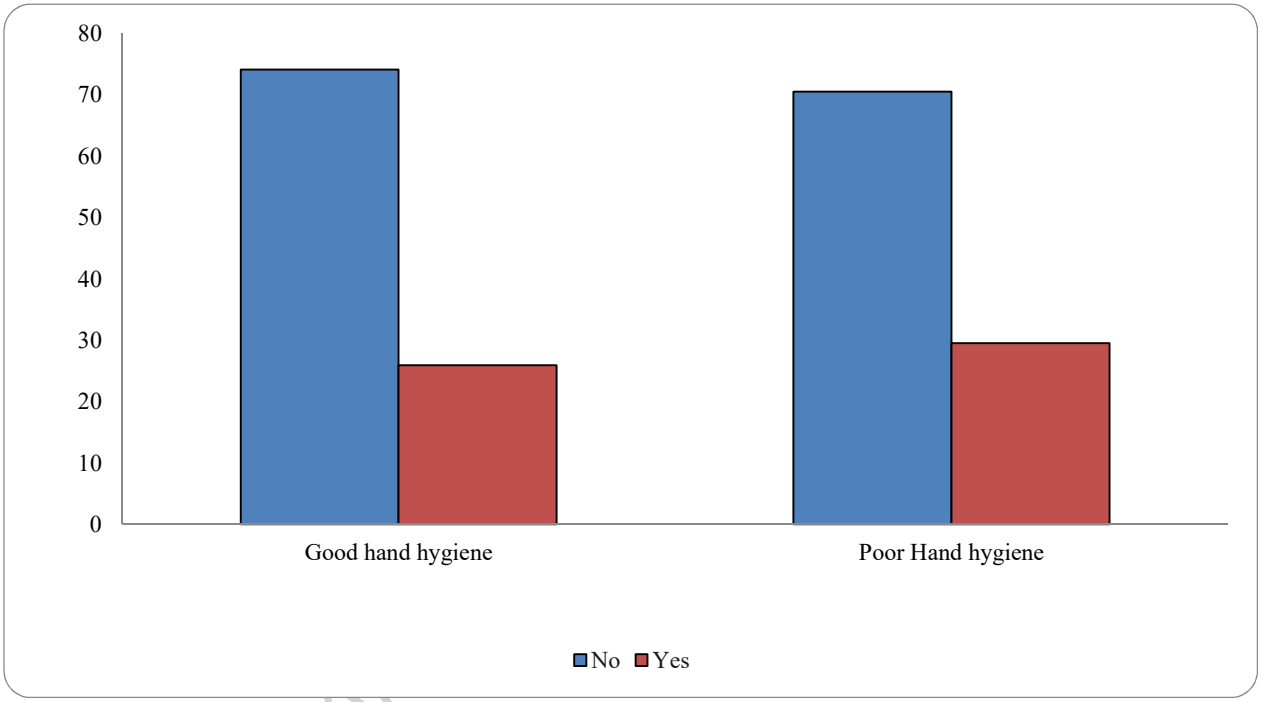

Figure 2. Prevalence of diarrhea among children under five against the carers' hand hygiene practices

Factors associated with poor hand hygiene practices among adult carers of children under five years in Mbale district

Table 5 presents the factors associated with poor hand hygiene among adult caregivers. In the multivariable model, receiving hand hygiene information from Village Health Teams (VHTs) was significantly associated with higher odds of poor hand hygiene. Caregivers who heard information from VHTs had over four times higher odds of practising poor hand hygiene compared to those who did not (AOR 4.2; 95% CI 1.7–10.4; p = 0.002).

Knowledge of hand hygiene as protective against COVID-19 was strongly associated with better hand hygiene practices. Caregivers who reported that hand hygiene protects against COVID-19 had 84% lower odds of poor hand hygiene (AOR 0.16; 95% CI 0.03-0.73; p = 0.0182).

Caregivers who sometimes had soap, detergent, or sanitiser at the handwashing station had significantly higher odds of poor hand hygiene compared to those who always had these supplies available (AOR 8.22; 95% CI 2.03-57.16; p = 0.0098). **See Table 5.**

Discussion

This study investigated the factors influencing hand hygiene practices among adult caregivers of children under five in eastern Uganda, aiming to identify key determinants that could inform targeted interventions. We examined the role of health information sources, availability of handwashing materials, and awareness of COVID-19 related preventive measures in shaping hygiene behaviours. Our findings highlight important associations between these factors and engagement in poor hand hygiene, demonstrating both progress and persisting gaps in hygiene practices within this setting.

We found that 28% of adult caregivers engaged in poor hand hygiene practices. Prior to the COVID-19 pandemic, the prevalence of poor hand hygiene in Mbale District was reported at 57% according to the DHIS2 report of 2020 (Uganda). The lower prevalence observed in our study likely reflects the timing of data collection, which occurred after the pandemic. Intensified promotion of hand hygiene during COVID-19 may have contributed to improved practices and a reduction in poor hygiene among adults.

Our findings indicated that receiving hand hygiene information from Village Health Teams (VHTs) was associated with a significantly higher likelihood of poor hand hygiene practices. This unexpected association may reflect limitations in VHTs' understanding of critical hand hygiene

concepts or inadequacies in the communication of appropriate technique and timing. While VHTs are an important and cost-effective frontline resource for preventive health education, previous studies have noted that their knowledge and capacity may be constrained by insufficient or irregular training [32][33]. Our results reinforce the need to strengthen VHTs' capacity to deliver accurate and comprehensive hand hygiene messaging.

We also found that inconsistent availability of soap, detergent, or sanitizer at the household handwashing station was strongly associated with poor hand hygiene. This aligns with previous evidence showing that households in low-resource settings frequently lack materials essential for effective handwashing, which can undermine even strong behavioural intentions [6]. Ensuring a consistent supply of soap or other cleansing agents appears to be a critical enabling factor for good hygiene.

Caregivers who were aware that hand hygiene protects against COVID-19 demonstrated significantly better hygiene practices. Awareness of the protective role of handwashing, emphasized globally during the pandemic, may have improved recognition of when and how to wash hands effectively. This finding is consistent with evidence from Bangladesh, showing that knowledge of the preventive benefits of hand hygiene is associated with improved practice [35], and similar results from Burundi and Zimbabwe, where understanding the health benefits of handwashing was linked to better hygiene adherence [36].

Study limitations and strengths

This study has several limitations. First, the phrasing of the question, "At what critical times did you wash your hands?" may have introduced social desirability bias by presuming the behaviour occurred, potentially resulting in over-reporting. However, recent experiences during the COVID-19 pandemic likely kept these behaviours salient, increasing recall accuracy. Second, although we

used unvalidated tools, pretesting ensured alignment with study objectives. Third, the study faced interviewer bias due to the unexpected replacement of trained research assistants, which was mitigated through on-site orientation and daily review meetings. Finally, the sample size was not adjusted for design effect, which may have influenced the precision of estimates, although the enrolment of 320 participants provided adequate statistical power.

Conclusion

Nearly three in ten adult caregivers of children under five exhibited poor hand hygiene practices. Poor hygiene was significantly associated with receiving hand hygiene information from VHTs and with inconsistent availability of soap or detergent, while awareness of hand hygiene's protective role against COVID-19 was associated with better hygiene practices. These findings underscore the need to strengthen hand hygiene promotion efforts by improving the quality of VHT training, ensuring consistent access to cleansing materials, and sustaining behaviour-change messaging introduced during the COVID-19 era. Application of behavioural frameworks such as the RANAS model, incorporating risk perception, attitudes, norms, ability, and self-regulation, may help guide the development of more effective and contextualized interventions to improve hand hygiene and reduce hygiene-related disease risk in Mbale District.

List of abbreviations

COVID-19	Coronavirus Disease 2019
DHIS2	District Health Information System Version 2
HMIS	Health Management Information System
WSP	Water Safety Plans

Declarations

Ethics approval and consent to participate

Ethical clearance was obtained from the Busitema University Faculty of Health Sciences Research and Ethics Committee (BUFHS-REC) under reference number BUFHS-2023-53. Permission was secured from the relevant community leaders and the District Health Office. Informed consent was obtained from all study participants. All study procedures were done in accordance with the ethical guidelines of the 1975 Declaration of Helsinki. Confidentiality and anonymity of the participants' information were strictly maintained throughout the study. Data were de-identified to protect personal information, and access to the data was restricted to the research team.

Consent for publication

Not Applicable

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request

Competing interests

The authors declare that they have no competing interests.

Funding

There was no funding for this study

Authors' contributions

JN was responsible for conceptualization, proposal development, methodology, data collection, data analysis, report writing, and manuscript writing. POO, RN, OC and DM contributed to the conceptualization, methodology, and manuscript writing. DW, AO, and JPA analyzed data, drafted, reviewed, and revised the manuscript for clarity and accuracy. JKBM supervised the authors and was involved in conceptualization, proposal development, methodology, data collection, data analysis, report writing, and manuscript writing.

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Table 5. Multivariable analysis shows factors associated with poor hand hygiene practices among adult carers of children under five years

Variable	Poor hand hygiene N (%)	COR (95% CI)	p-value	AOR (95% CI)	p-value
Child's Age (Months)					
<11	21 (29.6)	1		1	
12-23	16 (17.6)	0.51 (0.24–1.06)	0.0737	0.61 (0.26–1.40)	0.2450
24-35	16 (29.6)	1.00 (0.46–2.17)	0.9950	1.09 (0.44–2.66)	0.8470
36+	35 (33.7)	1.21 (0.63–2.34)	0.5705	1.12 (0.51–2.48)	0.7821
Highest level of education					
No formal education	12 (28.6)	1		1	
Primary	57 (32.0)	1.18 (0.57–2.55)	0.6648	1.84 (0.57–6.19)	0.3101
Post-primary	19 (19.0)	0.59 (0.26–1.38)	0.2105	0.76 (0.21–2.77)	0.6723
Location of the water source					
Elsewhere	59(26.9)	0.92 (0.54–1.56)	0.7415	1.70 (0.68–4.44)	0.2659
In own yard/plot	29(28.7)	1		1	
How often one engaged in hand hygiene to reduce the risk of contracting COVID-19					
Not all	7 (8.0)	1		1	
More often	50(56.8)	1.30 (0.56–3.41)	0.5603	1.88 (0.40–9.39)	0.4287
Often	10(11.4)	1.68 (0.56–5.30)	0.3633	3.09 (0.51–19.73)	0.2241
Not often	21(23.9)	2.38 (0.91–6.81)	0.0868	3.01 (0.77–12.76)	0.1199
Heard information on hand hygiene from;					
Television	4(16.0)	0.47 (0.13–1.29)	0.1820	1.2(0.3, 8.9)	0.833
Radio	70(28.0)	1.11 (0.57–2.28)	0.7730	2.0(0.7, 5.3)	0.179
Family member	27(36.5)	1.74 (0.99–3.05)	0.0522	1.3(0.6, 2.8)	0.426
VHTs	69(34.o)	3.05 (1.66–5.97)	0.0006	4.2(1.7, 10.4)	0.002
Information heard about hand hygiene					
Protects one from getting COVID-19	77(26.4)	0.30 (0.09–1.03)	0.0539	0.16 (0.03–0.73)	0.0182
Protects one's child from getting diarrhea	42(29.2)	1.15 (0.70–1.92)	0.5770	0.88 (0.39–1.96)	0.7601
Have a hand washing facility					
No	31(33.7)	1		1	
Yes	57(25.0)	0.66 (0.39–1.12)	0.1161	1.14 (0.36–3.70)	0.8274
Where the household often wash hands from					
Fixed place	6(17.7)	1		1	
Mobile	57(25.9)	1.63 (0.68–4.54)	0.3030	0.53 (0.15–1.93)	0.3228
Not observed	25(37.9)	2.85 (1.09–8.46)	0.0429	1.68 (0.36–8.26)	0.5142
What one uses for hand washing					
Soap and water	54(23.2)	1		1	
Water alone	33(39.3)	2.14 (1.25–3.65)	0.0050	1.77 (0.71–4.44)	0.2167
Others	1(33.3)	1.66 (0.08–17.62)	0.6823	1.79 (0.07–27.55)	0.6816
There are times household lacks soap (Yes)	83(30.0)	3.25 (1.35–9.70)	0.0169	1.18 (0.29–6.04)	0.8241
Always have soap or detergent or sanitizer at the place for hand washing					
Always	3(4.5)	1		1	
Sometimes	85(33.6)	10.79 (3.86–45.05)	0.0001	8.22 (2.03–57.16)	0.0098

COR- Crude Odds Ratio, AOR- Adjusted Odds Ratio, CI- Confidence Interval