

Knowledge, Attitudes, and Practices of Handwashing among Mothers with Children Under Five Years of Age in Gasabo District in 2026, Rwanda

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Abstract: This research study assessed knowledge, attitudes, and practices (KAP) regarding handwashing among mothers of children under five attending health centers in Gasabo District in 2026, Rwanda. Although handwashing is a simple and effective measure for preventing diarrhea and respiratory infections, gaps in proper handwashing practices remain. Using a cross-sectional design and systematic sampling, 385 mothers participated through structured face-to-face interviews. Results showed that 81.2% had good knowledge and 77.7% held positive attitudes toward handwashing, while 76.4% demonstrated adequate handwashing practices. Mothers with higher education were significantly more likely to practice proper handwashing, whereas those aged 25–39 years, those without household handwashing facilities, and those with negative attitudes were less likely to demonstrate adequate practices. Despite generally good knowledge and positive attitudes, important barriers to optimal handwashing behavior persisted. The study concludes that strengthening hygiene education, improving household access to handwashing facilities, and promoting positive behavioral change are essential to enhance handwashing practices and reduce preventable childhood infections in Gasabo District, Rwanda.

Keywords: Handwashing, Knowledge, Attitude, Practice, Under-five Children, Rwanda.

I. INTRODUCTION

Handwashing is one of the most effective and affordable public health interventions for preventing communicable diseases, particularly among children under five years of age (Pham et al., 2022; Wolde et al., 2022a). Mothers, as the primary caregivers, play a critical role in protecting children from infectious diseases through appropriate hand hygiene practices (Abdul et al., 2020). Despite the proven effectiveness of handwashing with soap in reducing childhood illnesses, adherence to recommended handwashing practices remains inadequate in many low- and middle-income countries, including Rwanda (Pham et al., 2022; National Institute of Statistics of Rwanda (NISR), 2021). Although considerable efforts have been made to promote hand hygiene, gaps in knowledge, attitudes, and practices (KAP) continue to limit the effectiveness of these interventions. This study aimed to assess the knowledge, attitudes, practices, and determinants of handwashing among mothers with children under five attending health centres in Gasabo District, Rwanda.

Diarrheal diseases remain one of the leading causes of morbidity and mortality among children worldwide. In 2019, approximately 1.5 million people died from diarrheal diseases, exceeding the number of deaths caused by all forms of violence combined. Nearly one-third of these deaths occurred among children, with about half a million children under five losing their lives due to diarrhea (Dattani et al., 2023). Although global diarrheal mortality has declined by more than 85% since 1990, childhood diarrhea continues to pose a significant public health challenge, particularly in low- and middle-income countries (Karambizi et al., 2021). Beyond its health consequences, childhood diarrhea also imposes a substantial economic burden on households and healthcare systems in low- and middle-income countries, due to costs associated with

treatment, hospitalization, caregiver time, and loss of productivity (Baral et al., 2020). The burden remains disproportionately high in South Asia and sub-Saharan Africa, where almost 90% of global childhood diarrheal deaths occur (Karambizi et al., 2021).

Most diarrheal diseases are preventable through simple and cost-effective public health interventions. Improved access to safe water, adequate sanitation, and proper hand hygiene has been recognized as one of the most effective approaches for reducing the transmission of disease-causing microorganisms (Dattani et al., 2023). Besides preventing diarrhea, proper handwashing also contributes significantly to reducing respiratory infections, neonatal sepsis, meningitis, and other infectious diseases among young children (Perin et al., 2022). Handwashing with soap is considered one of the simplest and most economical interventions capable of interrupting the transmission of infectious pathogens (Pham et al., 2022). For example, a community-based intervention conducted in Ethiopia demonstrated that improving maternal handwashing practices reduced diarrheal incidence among children under five by 41% (Solomon et al., 2021). Similarly, research conducted in Spain reported that improved hand hygiene among caregivers and daycare staff significantly reduced respiratory infections and antibiotic use among children aged between zero and three years (Azor-Martinez et al., 2018).

Despite increasing global awareness regarding the importance of hand hygiene, knowledge, attitudes, and practices toward handwashing remain inadequate in many settings. In Bangladesh, regarding handwashing at critical times, the study found that only 37% of mothers practiced handwashing before preparing meals, while 44% reported washing their hands before feeding children (Abdul et al., 2020). Similar challenges have been documented in several African countries that continue to report poor compliance with recommended handwashing practices. In Nigeria, only 17.3% of mothers practiced proper handwashing with soap at critical times (Ogwezzy-Ndisika & Solomon, 2019). In Ethiopia, only 19.8% of caregivers practiced handwashing with soap at the five recommended critical moments, while 24.8% washed their hands before feeding children, 23.8% before preparing food, and only 17.1% after defecation (Adane et al., 2018). Likewise, Mekonen et al. (2021) observed that the overall prevalence of appropriate handwashing practices among mothers remained low at 21.5%. In Uganda, only 14.6% of mothers reported inadequate handwashing practice with soap (Byamukama, 2019).

Globally, studies indicate that mothers generally possess adequate knowledge regarding handwashing. Research conducted in India and Malaysia reported high levels of maternal knowledge concerning the importance of hand hygiene for preventing infectious diseases (Katkuri, 2021; Ramli et al., 2023). However, despite adequate knowledge, actual handwashing practices remain relatively low, with fewer than 70% of mothers consistently demonstrating good hand hygiene behaviours (Zowini's et al., 2023). Similarly, positive attitudes toward handwashing have been reported in several countries, where more than 70% of mothers expressed favourable perceptions regarding hand hygiene (Ramli et al., 2022; Zowini's et al., 2023). Nevertheless, studies conducted in Saudi Arabia and Ethiopia reported substantially lower proportions of positive attitudes, with only 37.5% and 9.1% of mothers demonstrating favourable attitudes toward handwashing, respectively (Agaro et al., 2022; Alghadeer et al., 2021). Furthermore, systematic reviews have consistently shown that although knowledge regarding handwashing is generally adequate, less than half of mothers consistently practice proper hand hygiene at recommended critical times (Maqbool et al., 2021; Taddese et al., 2020).

Several studies have further identified factors associated with appropriate handwashing practices. Maternal education, knowledge, positive attitudes, socioeconomic status, urban residence, access to improved water sources, and availability of handwashing facilities at home have consistently been reported as important predictors of proper hand hygiene behaviour (Agaro et al., 2022; Wolde et al., 2022b). These findings suggest that improving knowledge alone may not be sufficient to achieve sustained behaviour change unless accompanied by favourable attitudes and supportive household environments.

Locally, the Government of Rwanda, through the Ministry of Health in collaboration with the United Nations Children's Fund (UNICEF), developed the National Handwashing Sub-Strategy (2019–2024) to strengthen handwashing with soap among all Rwandans (MOH & UNICEF, 2019). Despite these efforts, poor hand hygiene and diarrheal diseases continue to affect many children under five years of age in Rwanda (Wolde et al., 2022b; Claudine et al., 2021). According to the Rwanda Demographic and Health Survey 2019–20, approximately 14% of children under five experienced diarrheas during the two weeks preceding the survey. Although many households reported having designated places for handwashing, a substantial proportion lacked either water or soap at the handwashing location, which may hinder effective hand hygiene practice (National Institute of Statistics of Rwanda [NISR], Ministry of Health [MOH], & ICF, 2021).

Previous studies conducted in Rwanda have also demonstrated that inadequate maternal handwashing remains an important contributor to childhood illnesses, including diarrhea and stunting (Habimana et al., 2023; NISR, MOH, & ICF, 2021). Although several studies in Rwanda have examined child nutrition, diarrheal diseases, and household water, sanitation, and

hygiene (WASH) conditions, limited evidence exists regarding mothers' knowledge, attitudes, and practices (KAP) related to handwashing, particularly among mothers with children under five years of age in Gasabo District. Existing studies have largely focused on child nutritional outcomes, diarrhea prevalence, and household sanitation conditions rather than comprehensively assessing maternal handwashing behavior and its associated determinants (National Institute of Statistics of Rwanda (NISR), 2021; Claudine et al., 2021; Habimana et al., 2023).

Therefore, understanding mothers' knowledge, attitudes, and practices regarding handwashing is essential for designing evidence-based interventions that promote appropriate hygiene behaviours and reduce preventable childhood illnesses. This study aimed to assess the knowledge, attitudes, practices, and determinants of handwashing among mothers with children under five attending health centres in Gasabo District, Rwanda. The findings are expected to provide evidence that can guide public health interventions, strengthen hygiene promotion programs, and contribute to improving child health outcomes in Rwanda.

II. METHODOLOGY

Research Design

For this study, we chose a cross-sectional research design using a quantitative approach. This design involves collecting data from a diverse group of participants at a single point in time, enabling the assessment of knowledge, attitudes, and practices regarding handwashing without manipulating any variables (Setia, 2016). Demographic characteristics and distance to water sources were categorized according to the National Institute of Statistics of Rwanda (NISR) classification framework, while a designated handwashing station was defined based on the World Health Organization (WHO) guidelines (NISR, 2021; WHO & UNICEF, 2021).

Research Area

This study was conducted at selected health centers in Gasabo District, Kigali City, Rwanda. Gasabo District, one of the three districts that make up Kigali City, covers an area of 430.30 km² and comprises 15 administrative sectors, 73 cells, and 501 villages. The district is predominantly rural, with approximately 90% of its area classified as rural, and was selected because of its large population of mothers with children under five years of age and the need to assess handwashing knowledge, attitudes, and practices.

Target Population

The study was conducted among mothers of children under five years of age attending selected health centers in Gasabo District, Kigali City, Rwanda. The participants were mothers visiting the health centers for child healthcare services and were residents of Gasabo District. Mothers who declined to provide informed consent or had severe physical illness or mental health conditions that could interfere with participation were excluded from the study.

Sample Design

Determination of Sample Size

The calculation of the sample size was based on the single population proportion formula, which is expressed as:

$$n = \frac{Z^2 \cdot p \cdot (1-p)}{d^2} \quad n = \frac{(1.96)^2 \cdot 50\% \cdot (1-50\%)}{(0.05)^2} =$$

where $n = 385$ mothers of children under five years. In this formula, n is the required sample size, Z is the Z-score associated with the desired 95% confidence level (1.96, representing the critical value for a 95% confidence interval), p is the estimated proportion of the population (assumed to be 50% due to the absence of a prior estimate), and d is the acceptable margin of error (0.05 for a 5% margin of error). Based on these parameters, the calculated sample size used in the study was 385 participants.

Sampling Technique

In this study, a probability-based sampling technique was employed to ensure a representative sample. The selection of health centers was conducted using a simple random sampling method among all sixteen health centers in Gasabo District. Specifically, five health centers were randomly selected, and participants were recruited using a systematic sampling technique with a sampling interval of five. Eligible mothers of children under five years attending the selected health centers were chosen at regular intervals until the required sample size of 385 participants was achieved.

Data Collection Methods**Data Collection Instruments**

Data were collected and responses were obtained from the participants using a structured questionnaire composed of closed-ended questions. The questionnaire was translated into Kinyarwanda, and participants who were unable to read or write Kinyarwanda were assisted during the interview. The structured questionnaire was used to assess socio-demographic characteristics, knowledge, attitudes, and practices regarding handwashing, as well as other factors influencing handwashing behavior, such as access to water and household handwashing facilities. The questionnaire was adapted from the World Health Organization (WHO) hand hygiene guidelines and other relevant literature, with slight modifications to suit the Rwandan context

Procedures of Data Collection

Data were collected from mothers of children under five years who attended selected health centers in Gasabo District during the data collection period. A structured questionnaire was administered through face-to-face interviews, and participants' responses were recorded on the same questionnaire. Before participation, each respondent provided informed consent and was assigned a confidential identification code to ensure privacy and confidentiality.

III. RESEARCH FINDINGS**Description of Socio-demographic Characteristics**

Respondents were requested to provide their socio-demographic profile, and the characteristics are summarized in Table 1. These included age, marital status, education level, occupation, child's age, parity, source of drinking water, distance to the water source, availability of a household handwashing facility, and other selected household characteristics.

Table 1: Social- Demographic Data of Mothers(N=385)

Variables	Frequency (n=385)	Percentage (%)
Age (in years)		
18-24	60	15.6
25-29	94	24.4
30-34	101	26.2
35-39	59	15.3
40 & above	71	18.4
Marital status		
Separate	50	13
Union	335	87
Education level		
Illiterate	77	20
Primary	167	43.4
Secondary	82	21.3
Tertiary	59	15.3
Employment		
Self employed	134	34.8
Employed	137	35.6
Unemployed	114	29.6
Child's age (in years)		
(0-1)	129	33.5
(2-3)	155	40.3
(4-5)	101	26.2
Parity		
1	24	6.2
2	19	4.9
3	330	85.7
4 and above	12	3.1

Source of water used at home

Well	3	0.8
Ta pe (pipe) water	382	99.2

Distance to the water source

Near (0-4 minutes)	185	48.1
Middle (0-14 minutes)	184	47.8
Far (Above 14 minutes)	16	4.2

Presence of household handwashing facility

Yes	19	4.9
No	366	95.1

Source: Primary data

As shown in Table 1, the socio-demographic characteristics of the 385 participants indicate that the majority of mothers were aged 25–34 years (50.6%), with the largest proportion aged 30–34 years (26.2%). Most participants had attained primary education (43.4%), while 35.6% were formally employed and 34.8% were self-employed. Regarding household characteristics, 40.3% of the children were aged 2–3 years, and the majority of mothers (85.7%) had three children. Nearly all participants (99.2%) reported using piped water, with almost equal proportions living near (48.1%) or at a moderate distance (47.8%) from the main water source. However, most households (95.1%) lacked a designated handwashing facility, highlighting the need to improve household handwashing infrastructure

Presentation of Findings

This section presents the levels of knowledge, attitudes, and practices regarding handwashing among mothers of children under five attending selected health centres in Gasabo District

Level of Knowledge Regarding Handwashing

The distribution of knowledge regarding handwashing among mothers of children under five is presented in Table 2

Table 2: Level of Knowledge Regarding Handwashing (N=385)

Variables	Frequencies (n=385)	Percentages (%)
It is enough to wash hands with water alone		
Yes	332	86.2
No	18	4.7
Don't Know	35	9.1
It is necessary to wash hands with clean water and soap		
Yes	337	87.5
No	40	10.4
Don't Know	8	2.1
In absence of clean water and soap, use of alcohol-based products such as hand sanitizers can make your hands clean.		
Yes	351	91.2
No	2	0.5
Don't Know	32	8.3
It is necessary to wash hands when it is visibly dirty.		
Yes	360	93.5
No	21	5.5
Don't Know	4	1.0
It is necessary to wash hands before eating and after using toilet		
Yes	342	88.8
No	7	1.8
Don't Know	36	9.4

It is necessary to wash hands after handling garbage or animals /pets.

Yes	332	86.2
No	2	0.5
Don't Know	51	13.2

It is necessary also to always wash hands before feeding or breastfeeding the child.

Yes	342	88.8
No	7	1.8
Don't Know	36	9.4

It is necessary to wash hand after changing a child's diapers.

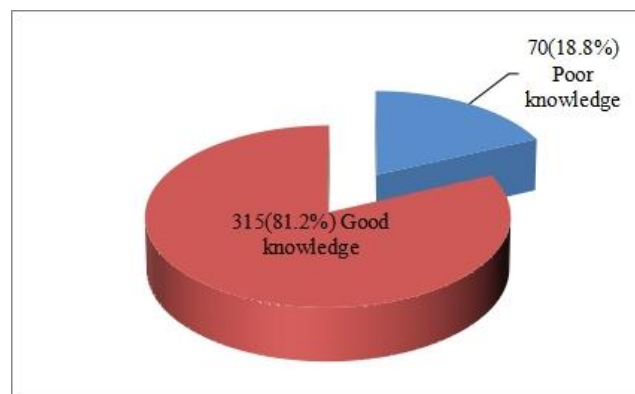
Yes	337	87.6
No	24	6.2
Don't know	24	6.2

Proper hand hygiene is the most efficient way of reducing the spread infectious diseases such as diarrhea, colds & flu in community.

Yes	337	87.5
No	36	9.4
Don't Know	12	3.1

Source: Primary data

As shown in Table 2, the level of knowledge regarding handwashing among participants demonstrates a generally high understanding of appropriate hand hygiene practices. The majority of respondents (93.5%) recognized the importance of washing hands when visibly dirty, while 86.2% knew that handwashing is necessary after handling garbage or animals. Most participants (87.5%) acknowledged the need to use soap and clean water, and 91.2% understood the use of alcohol-based hand rubs when soap and water are unavailable. Furthermore, 88.8% recognized the importance of handwashing before feeding or breastfeeding, and 87.5% knew that hands should be washed after changing diapers. Similarly, 87.5% understood that proper hand hygiene helps prevent infectious diseases. However, gaps in knowledge were observed, particularly regarding the use of water alone, as 86.2% believed that washing hands with water alone is sufficient, indicating the need for targeted health education to address misconceptions about effective handwashing practices.

Level of Knowledge Regarding Handwashing (N= 385)**Figure 1: The level of knowledge of handwashing**

As indicated in Figure 1, the majority of the participants had good knowledge (81.2%), while 18.8% had poor knowledge regarding handwashing.

Level of attitude regarding the Handwashing

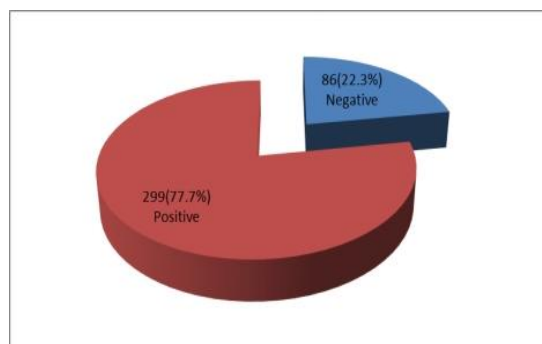
Table 3 shows the levels of attitude related to Handwashing

Table 3: Level of attitude regarding the Handwashing (N=385)

Variables	Strongly Disagree n, (/%)	Disagree n, (/%)	Neutral n, (/%)	Agree n, (%)	Strongly Agree n, (%)
Hand washing is important when water alone is used to wash hands.	4(1.0)	3(0.8)	5(1.3)	218 (56.6)	155(40.3)
Hand washing is important when clean water and soap are used to wash hands.	4(1.0)	3 (0.8)	5 (1.3)	202 (52.5)	171(44.4)
It is necessary to wash hands when it is visibly dirty.	4(1.0)	3(0.8)	5(1.3)	222(57.7)	151(39.2)
Hand washing practice is also performed well when alcohol-based product such as hand sanitizer are used to sanitize hands in the absence of clean water and soap.	4(1.0)	3 (0.8)	5(1.3)	203(52.7)	170(44.2)
Hand washing practice should be done always before feeding or breastfeeding the child.	4(1.0)	3(0.8)	5(1.3)	216(56.1)	157(40.8)
Hand washing practice is important after using toilet.	4 (1.0)	3(0.8)	5(1.3)	179 (46.5)	194(50.4)
It is necessary to practice hand washing after changing a child's diapers.	8(2.1)	7(1.8)	9(2.3)	202(52.5)	159(41.3)
Hand washing practice is necessary after handling garbage or animal/pets.	4(1.0)	5(1.3)	5(1.3)	204(53.0)	167(43.4)
Hand washing practice at critical times is the primary way to prevent infectious diseases.	4(1.0)	3(0.8)	5(1.3)	217(56.4)	156(40.5)

Source: Primary Data

The Table 3, describing mothers' positive attitudes toward handwashing practices across various scenarios, with widespread agreement on its importance. Most of the mothers (56.6%) agreed that handwashing is important even when only water is used. More than half of the respondents (52.5%) agreed that washing hands with clean water and soap is essential for maintaining proper hygiene. An equal proportion (52.5%) also recognized the importance of washing hands after changing a child's diapers. A majority of mothers (57.7%) recognized that handwashing is necessary when hands are visibly dirty, additionally more than half agreed that using alcohol-based products such as hand sanitizers is an effective alternative in the absence of clean water and soap. In addition, 56.1% agreed that handwashing should always be practiced before feeding or breastfeeding a child, and 50.4% affirmed its importance after using the toilet. Furthermore, 53.0% emphasized the need to wash hands after handling garbage or animals, whereas 56.4% of the mothers agreed that handwashing at critical times is the primary means of preventing infectious diseases.

Level of attitude regarding the handwashing (N=385)

Figure 2: The Overall Score Level of attitude toward Handwashing

The majority of mothers 299 (77.7%) had a positive attitude towards handwashing as demonstrated in Figure 2.

Level of Practice Regarding Hand washing

Table 4: Level of Practice Regarding Hand washing (N=385)

Variables	Frequency (n)	Percentage (%)
Practice of hand washing.		
Yes	370	96.1
No	15	3.9
Washing your hands with clean water and soap		
Yes	360	93.5
No	25	6.5
Washing your hands before handling food.		
Yes	361	93.8
No	24	6.2
Washing your hands before feeding or breastfeeding the child.		
Yes	371	96.4
No	14	3.6
Always wash your hands after changing your child's diapers.		
Yes	339	88.1
No	46	11.9
Prompting your children to wash their hands before and after eating.		
Yes	352	91.4
No	33	8.6
Washing your hands when they are visibly dirty.		
Yes	344	89.4
No	41	10.6
Washing your hands after handling garbage and animals/pet.		
Yes	336	87.3
No	49	12.7
Washing your hands after using toilet.		
Yes	361	93.8
No	24	6.2
Washing hand using alcohol-based product such hand sanitizer in absence of clean water and soap.		
Yes	321	83.4
No	64	16.6

Source: primary data

The Table 4 highlights respondents' adherence to various hand washing practices. A high percentage (96.1%), while 3.9% do not. Among those practicing 93.5% use clean water and soap, though 6.5% do not. A high number of mothers 93.8% wash hands before handling food, but 6.2% neglect this. Similarly, 96.4% wash hands before feeding or breastfeeding, while 3.6% do not. After diaper changes, 88.1% practice hand washing, but 11.9% fail to. When hands are visibly dirty, 89.4% wash them, while 10.6% do not. Additionally, 87.3% wash hands after handling garbage or animals, though 12.7% do not. After using the toilet, 93.8% wash hands, but 6.2% neglect this essential practice. Finally, 83.4% use hand sanitizers when clean water and soap are unavailable, yet 16.6% do not.

Level of Practice Regarding Hand washing

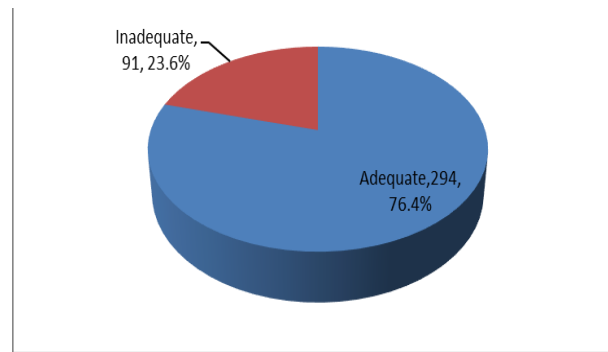


Figure 3: The Overall Score of Handwashing Practice

In Figure 3 to summarize the level of practice toward hand washing, most of mothers 294 (76.4%) had adequate practice of handwashing.

Determinants of Handwashing Practices

Bivariate Analysis among Key Variables Affecting Handwashing Practices

Table 5. Shows the Bivariate Analysis among Key Variables Affecting Handwashing Practices

Table 5: Bivariate Analysis Among Key Variables Affecting Practices (N= 385)

Variables / Categories	Level of practices		P-Values
	Good (%)	Poor (%)	
Age in years of mothers			
18-24	43(71.7)	17(28.3)	0.038
25-29	74(78.7)	20(21.3)	
30-34	87(86.1)	14(13.9)	
35-39	40(67.8)	19(32.2)	
40 and above	50(70.4)	21(29.6)	
Marital status			
Single	50(100.0)	0(0.00)	0.001
Married	244(72.80)	91(27.20)	
Education			
Illiterate	47(61.0)	30(39.00)	0.001
Primary	140(83.80)	27(16.20)	
Secondary	52(63.40)	30(36.60)	
Tertiary	55(93.20)	4(6.80)	
Employment			
Self employed	101(75.40)	33(24.60)	0.873
Employed	104(75.90)	33(24.10)	
Unemployed	89(78.10)	25(21.90)	
Child's age (years)			
0-1	97(75.20)	32(24.80)	0.863
2-3	118(76.10)	37(23.90)	
4 -5	79(78.20)	22(21.80)	
Parity			
1	18(75.00)	6(25.00)	0.291
2	18(94.70)	1(5.30)	
3	249(75.50)	81(24.50)	
4	9(75.00)	3(25.00)	

Source of water used at home			
Well	50(70.40)	21(29.60)	0.192
Tap (pipe) water	244(77.70)	70(22.30)	
Distance to the water source			
Near	139(75.10)	46(24.90)	0.805
Middle	142(77.20)	42(22.80)	
Far	13(81.30)	3(18.80)	
Presence of household handwashing facility			
Yes	10(52.60)	9(47.40)	0.013
No	284(77.60)	82(22.40)	
Total knowledge			
Adequate	294(93.30)	21(6.70)	0.001
Inadequate	0(0.00)	70(100.00)	
Total attitudes			
Positive	278(93.00)	21(7.00)	0.001
Negative	16(18.60)	70(81.40)	

Source: Primary Data

As shown in Table 5, the results of the Chi-square test indicated that several factors were significantly associated with adequate handwashing practices. These included age ($p = 0.038$), marital status ($p < 0.001$), education level ($p < 0.001$), the presence of household handwashing facilities ($p = 0.013$), knowledge ($p < 0.001$), and attitudes ($p < 0.001$). Employment status, child age, and number of children were not significantly related to adherence, as similar rates were observed across these categories. Likewise, household water source and distance to the source did not show a significant effect. Overall, these findings highlight that age, marital status, education, household facilities, knowledge, and attitudes are the main determinants of handwashing adherence.

Multivariable Analysis of Associated Factors with KAP of hand washing Practice

Table 6 shows the analysis of the associated factors with KAP of hand washing

Table 6: Multivariable Logistic Regression Analysis of Factors Associated with Handwashing Practices Among Mothers with Children Under Five Years in Gasabo District (N= 385)

Variables	AOR (95% CI)	P-value
Age in years of mothers		
18–24	Ref	–
25–29	0.12 (0.02–0.65)	0.02
30–34	0.08 (0.01–0.55)	0.01
35–39	0.05 (0.01–0.40)	0.002
40 and above	1.10 (0.30–3.95)	0.89
Education		
Illiterate	Ref	–
Primary	6.85 (1.63–28.80)	0.009
Secondary	5.54 (1.36–22.50)	0.017
Tertiary	6.47 (1.55–27.00)	0.011
Presence of household handwashing facility		
Yes	Ref	–
No	2.95 (1.21–7.18)	0.016
Total attitudes		
Positive	Ref	–
Negative	0.017 (0.004–0.073)	0.001

Note. AOR = Adjusted Odds Ratio; CI = Confidence Interval; Ref = Reference category. Statistical significance was considered at $p < 0.05$.

Table 6 presents the multivariable logistic regression analysis of factors associated with handwashing practices. The analysis showed that maternal age, education level, availability of a household handwashing facility, and attitude were significant predictors of handwashing. Mothers aged 25–29 years (AOR = 0.12, 95% CI: 0.02–0.65, $p = 0.020$), 30–34 years (AOR = 0.08, 95% CI: 0.01–0.55, $p = 0.010$), and 35–39 years (AOR = 0.05, 95% CI: 0.01–0.40, $p = 0.002$) were significantly less likely to adhere to proper handwashing practices compared to mothers aged 18–24 years. However, mothers aged 40 years and above did not differ significantly from the reference group (AOR = 1.10, 95% CI: 0.30–3.95, $p = 0.890$).

Education level was also a significant predictor of handwashing adherence. Mothers with primary education were significantly more likely to practice proper handwashing than illiterate mothers (AOR = 6.85, 95% CI: 1.63–28.80, $p = 0.009$). Similarly, mothers with secondary education (AOR = 5.54, 95% CI: 1.36–22.50, $p = 0.017$) and tertiary education (AOR = 6.47, 95% CI: 1.55–27.00, $p = 0.011$) demonstrated significantly better handwashing practices compared to those with no formal education.

Household handwashing facilities also played a significant role in handwashing practices. Mothers without a household handwashing facility were more likely to have poor handwashing practices than those with access to such a facility (AOR = 2.95, 95% CI: 1.21–7.18, $p = 0.016$). In addition, attitude was a strong predictor of handwashing adherence, with mothers who had negative attitudes being significantly less likely to practice proper handwashing compared to those with positive attitudes (AOR = 0.017, 95% CI: 0.004–0.073, $p = 0.001$).

IV. DISCUSSION

The present study assessed the knowledge, attitudes, and practices regarding handwashing among mothers with children under five years of age attending health centres in Gasabo District, Rwanda. Based on the findings, the study demonstrated that knowledge, attitudes, and practices related to handwashing were generally above average. The majority of mothers possessed adequate knowledge, expressed positive attitudes, and reported good handwashing practices. Furthermore, multivariate analysis revealed that maternal age, educational level, availability of household handwashing facilities, and attitudes toward handwashing were significantly associated with good handwashing practices.

Findings showed that the majority of mothers had a good level of knowledge regarding handwashing practice, which is consistent with findings from previous studies conducted in different settings. In the present study, 81.2% of mothers demonstrated good knowledge of handwashing practices. Similarly, studies conducted in Pakistan and India reported that 93% and 89% of mothers, respectively, possessed good knowledge regarding the importance of handwashing in preventing infectious diseases (Maqbool et al., 2021; Rajalakshmi et al., 2020). Likewise, a study conducted in Malaysia found that 99.4% of mothers correctly understood the principles and benefits of proper handwashing (Ramli et al., 2022). Comparable findings have also been reported in Africa, where studies conducted in Nigeria and Ethiopia revealed that 89% and 78% of mothers, respectively, recognized hand hygiene as an important preventive measure against communicable diseases (Ogwezzy-Ndisika & Solomon, 2019; Dagne et al., 2019). These consistent findings suggest that health education initiatives and community awareness programs have played an important role in improving mothers' knowledge regarding hand hygiene and disease prevention.

Moreover, the study demonstrated that mothers had positive attitudes toward handwashing, further reinforcing appropriate hygiene behaviour. In the current study, 77.7% of mothers exhibited positive attitudes toward handwashing. Several studies revealed similarities, a comparable study conducted by Mohammad et al. (2023), reported that approximately a positive attitude and 80% of mothers in Pakistan viewed hand hygiene as a routine habit. However, the current study showed a higher proportion of positive attitudes than Maqbool et al. (2021), who reported 60%, representing a difference of 17.7 percentage points. This variation may be due to differences in study settings, participants' characteristics, exposure to hygiene education, and the tools and sampling techniques used to assess attitudes. Overall, positive attitudes toward handwashing may encourage better hygiene practices and help reduce the spread of infectious diseases (Pham et al., 2022).

Likewise, studies from Malaysia and Saudi Arabia reported that more than 90% of mothers acknowledged handwashing as an essential measure for preventing diarrhea and other childhood infections (Ramli et al., 2022; Alghadeer et al., 2021). Similar observations have also been reported in studies conducted in Nigeria and Ethiopia found that 93.2% and 72.9% of mothers, respectively, demonstrated positive attitudes toward handwashing (Ogwezzy-Ndisika & Solomon, 2019; Dagne et al., 2019). These findings emphasize that favourable attitudes, together with adequate knowledge, play an essential role in encouraging proper handwashing behaviours and improving child health outcomes.

The present study further revealed that the majority of mothers of under-five age demonstrated good handwashing practices. Overall, 76.4% of respondents reported practicing appropriate hand hygiene at recommended critical times. These findings are comparable with those reported in several previous studies. For instance, studies conducted in Malaysia and rural India documented very high compliance with recommended handwashing practices among mothers caring for young children (Ramli et al., 2022; Katkuri, 2021). Likewise, almost all mothers in these studies reported washing their hands after defecation, reflecting strong adherence to hygiene recommendations. In Rwanda, previous studies have reported varying levels of handwashing practice, with 74.1% of mothers in western Rwanda demonstrating good hand hygiene practices compared to only 39.6% in Kicukiro District (Habimana et al., 2023; Nindenshuti & Rutayisire, 2020). The relatively high prevalence of good practices observed in the current study may be attributed to continuous hygiene promotion campaigns and increased public awareness following the COVID-19 pandemic, which strengthened health education and encouraged behavioural change.

Study findings showed that maternal age was significantly associated with handwashing practices. Mothers aged between 25- 39 years were less likely to practice proper handwashing compared to mothers aged 18–24 years. These findings are comparable with results reported in other studies. For example, Taddese et al. (2020) conducted a study in Ethiopia and found that younger mothers were more likely to practice appropriate hand hygiene because they were more actively involved in community health education programs and maternal health interventions. The authors suggested that younger mothers may be more receptive to newly introduced hygiene messages and preventive health information than older mothers. In contrast, older mothers may continue relying on long-established traditional practices, highlighting the need for continuous health education across all age groups. The study further showed that mothers aged 40 years and above did not significantly differ from younger mothers, suggesting that accumulated life experience and repeated exposure to health promotion campaigns may contribute to maintaining appropriate hygiene practices.

Education level also emerged as a significant predictor of good handwashing practices. Mothers who had attained primary, secondary, and tertiary education were significantly more likely to practice proper handwashing than mothers without formal education. These findings are consistent with previous studies conducted in different countries. For instance, Wolde et al. (2022b) reported that mothers with higher educational attainment were more likely to understand health promotion messages and apply recommended hygiene practices consistently. Similarly, evidence from studies conducted in Ethiopia, Pakistan, and India indicates that maternal educational attainment is an important factor influencing handwashing behavior. Mothers with higher levels of education were generally more likely to follow recommended hand hygiene practices than those with limited formal education (Taddese et al., 2020; Katkuri, 2021; Maqbool et al., 2021). These studies concluded that education enhances health literacy, enabling mothers to better understand disease prevention measures and translate health knowledge into everyday hygienic practices that protect both themselves and their children.

Concerning the availability of household handwashing facilities, the present study showed that mothers without handwashing facilities at home were significantly more likely to have poor handwashing practices than those who had accessible facilities. These findings are consistent with previous studies. For example, Dagne et al. (2019) conducted a study in Debarq Town, Ethiopia, and found that the presence of water and soap within households significantly improved maternal handwashing behaviour. Similarly, Wolde et al. (2022b) reported that the availability of conveniently located handwashing facilities encouraged regular hand hygiene, particularly after toilet use and before food preparation. Likewise, Macleod et al. (2023) emphasized that access to water and soap reduces structural barriers to handwashing and facilitates the development of consistent hygiene habits. In addition, Pham et al. (2022) demonstrated that strengthening hand hygiene interventions can reduce the transmission of infectious diseases, emphasizing the broader public health importance of promoting effective handwashing practices. These findings demonstrate that improving household access to handwashing facilities remains an essential strategy for strengthening hygiene practices among mothers.

The present study found that mothers with children of under-five years with positive attitudes toward handwashing were more likely to practice proper hygiene compared with those with negative attitudes. These findings are consistent with previous studies. For example, Agaro et al. (2022) found that mothers with favourable attitudes toward handwashing were approximately twice as likely to practice appropriate hand hygiene compared to mothers with negative attitudes. This study agrees with previous studies showing that favorable attitudes, adequate knowledge, and access to supportive resources are important determinants of appropriate handwashing behavior (Agaro et al., 2022; Taddese et al., 2020; Wolde et al., 2022b; Aydamo et al., 2024). Furthermore Taddese et al. (2020) reported that mothers who perceived handwashing as an important health behavior were more likely to adhere to recommended hygiene practices. Similarly, Ramli et al. (2022) and Macleod et al. (2023) emphasized that improving knowledge, shaping positive perceptions, and ensuring access to handwashing

resources are essential for promoting sustained hygiene practices. These findings highlight the close relationship between knowledge, attitudes, and practices, emphasizing that improving mothers' perceptions of handwashing is essential for sustaining appropriate hygiene behaviours and reducing childhood infections.

Study strengths and limitations.

This study has several strengths, including the use of primary data collected directly from mothers attending health centres and the application of standardized data collection procedures to obtain comprehensive information on knowledge, attitudes, practices, and associated factors related to handwashing. However, the study also has limitations since it was conducted only among mothers attending health centres in Gasabo District. Therefore, the findings may not be generalizable to mothers residing in other districts or regions of Rwanda.

V. CONCLUSION

In conclusion, this study evaluated the knowledge, attitudes, practices, and factors associated with handwashing among mothers of children under five years attending health centers in Gasabo District, Rwanda. The findings showed that most mothers demonstrated good knowledge, positive attitudes, and generally adequate handwashing practices. However, important gaps remained in some aspects of hand hygiene, indicating that adequate knowledge does not always translate into consistent practice. The study also revealed that behavioral and socioeconomic factors, particularly maternal attitudes and educational attainment, had a greater influence on handwashing practices than the mere availability of infrastructure.

Furthermore, maternal age, level of education, access to household handwashing facilities, and positive attitudes toward hand hygiene were identified as significant predictors of appropriate handwashing practices. Mothers with higher levels of education, those who had access to functional handwashing facilities at home, and those who held favourable attitudes toward hand hygiene were more likely to consistently adopt recommended handwashing behaviours. These findings emphasize the need for comprehensive interventions that extend beyond the provision of facilities alone. Strengthening maternal health education, promoting behaviour change communication, and improving access to household handwashing facilities should remain public health priorities. Such integrated strategies have the potential to enhance adherence to recommended hand hygiene practices, reduce the transmission of infectious diseases, and ultimately contribute to lowering the burden of preventable illnesses among children under five years of age.

VI. ETHICAL CONSIDERATION

This study adhered to fundamental ethical principles, including respect for persons, beneficence, non-maleficence, justice, voluntary participation, and confidentiality. Ethical approval was obtained from the Mount Kenya University Rwanda Ethical Review Board, while authorization to conduct the study was granted by the relevant health authorities in Gasabo District. Written informed consent was obtained from all participating mothers of children under five after providing a clear explanation of the study objectives, procedures, potential risks, and expected benefits. Mothers who declined to participate or wished to withdraw at any stage were excluded from the study without any consequences. The study involved minimal risk, as data were collected solely through a structured questionnaire without any invasive procedures. Participant selection was conducted fairly and without discrimination, and strict confidentiality was maintained throughout the research process. An information sheet describing the purpose of the study was provided to each participant, and all information collected was treated as confidential and used exclusively for research purposes. Participants were further informed that the study findings would be shared with the administrative departments of the participating health centers. Finally, all completed questionnaires and research data were securely stored by the researcher to ensure privacy and prevent unauthorized access.

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