



Mother's Handwashing Practices and Health Outcomes of Under-Five Children in Northwest Ethiopia

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Background: Improving handwashing practices of mothers is important in developing countries to reduce child morbidity, mortality, and hygiene-related illnesses. This study aimed to assess mothers handwashing practice and the health effects on under-five children in northwest Ethiopia.

Methods: The study was an institution-based cross-sectional study conducted from November 2018 to January 2019 at the University of Gondar comprehensive specialized hospital. Four hundred and twenty two randomly selected mothers who have had under-five children were included in the study. Structured questioners were developed to assess handwashing practices and sociodemographic characteristics of mothers, and medical history related data of children were extracted from medical charts. Data entry and clearance were performed by Epi-infoTM version-7 software and exported for analysis to SPSS 22. Adjusted odds ratio with a 95% confidence interval was used to declare statistically significant variables on the basis of p-value < 0.05.

Results: The proportion of mothers who practiced good handwashing was 39.1% [95% CI: (34.8–43.9)]. More than half (54.3% and 53.6%) of the mothers indicated that they always remind their children to wash their hands before and after eating, respectively. However, 28% of under-five children were admitted to hospital with a diarrheal disease which may have been due to the poor hand washing practices of their mother. The odds of having good knowledge of handwashing practices were 0.26 times lower. Being married increased the handwashing practices of mothers by 2.62 times.

Conclusion: The majority of mothers who were knowledgeable about handwashing were not executing it accurately. Diarrheal admissions among under-five children have been influenced by their mother's poor hand washing practices. Therefore, it is imperative to improve the understanding of proper handwashing practices of mothers at every level in the community.

Keywords: handwashing practice, under-five children, health outcome

Introduction

Globally, death of under-five children has declined from 12.6 million in 1990 to 5.4 million in 2017.¹ Today, in the developing world, the main killer diseases among under-five children were diarrheal disease and respiratory tract infections,^{2–6} which were responsible for more than 1.6 million deaths and accounted for 21% of all deaths.^{7,8}

Evidence has indicated that effective handwashing practices can reduce the burden of global infectious disease transmission, especially diarrheal diseases.^{2,3,9–19} Around 2.4 million deaths could be prevented annually by good hygiene practices, reliable sanitation, and drinking water.²⁰ In addition, hand washing can reduce the occurrence

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of diarrheal diseases by 14-40%,^{10,21,22} and educating mothers about personal hygiene can lead to a 27% decrease in the risk of infectious disease.²³

Mothers are the immediate and reliable caregivers of children in many countries, and they play a central role in children's health.^{24,25} Mothers' knowledge, attitudes, and practices have a significant effect on the maintenance of child health.²⁶ About 88% of diarrhea-associated deaths are attributable to unsafe water, inadequate sanitation, and insufficient hygiene.^{27,28}

Sustainable Development Goals (SDGs) have focused on the development of healthy lives and well-being for all children and to reduce the number of under-five children deaths by 10 million between 2017 and 2030.²⁹ To achieve this goal, improving the hand hygiene of mothers and children is essential because hands are central to our day-to-day operations and working with hands that may be contaminated for cooking and eating increases the transfer of contaminants which may cause ill health. Mothers play a dual role in the infant care, they are responsible for child hygiene (treating their faces, blowing their nostrils, etc.) and general housekeeper (preparing meals for the family, feeding children), and poor hygiene practices can increase the risk of disease spread to children. However, good handwashing practices are rare in low-income countries like Ethiopia,³⁰ and findings suggested that hand washing at critical times such as after defecation or cleaning an infant's perineum are not common practice.^{31,32} Therefore, the aim of this study was to assess the handwashing practices of mothers of under-five children at the University of Gondar comprehensive-specialized hospital.

Methods

Study Design, Period, and Setting

An institution-based cross-sectional study design was conducted from November 2018 to January 2019 at the University of Gondar comprehensive-specialized hospital in northwest Ethiopia. The selected hospital has more than a 500-bed capacity which is used as the referral center for more than seven million catchment populations where more than 8000 mothers delivered children and 38,058 live infants are born annually.³³

Sample Size Determination and Sampling Procedure

Four hundred and twenty-two mothers and their under-five children were included in the study and estimated by using

single population proportion formula with the assumptions of proportion of mothers with good hand washing practice=50%, 95% confidence interval, 5% margin of error (d), and 10% oversampling to account for any unpredictable events. Mothers and their under-five children who visited the University of Gondar comprehensive-specialized hospital in the study period were selected at random.

Eligibility Criteria

All mothers and under-five children at the University of Gondar comprehensive-specialized hospital were the source population and mothers and their under-five children who visited the hospital during the data collection period were the study population.

Data Collection Tools and Procedures

Primary data were collected from mothers using structured questionnaires which were developed after reviewing literature and the medical history related data of children were extracted from medical records. The socio-demographic characteristics of mothers and their under-five children were included and handwashing practices were evaluated using self-reported responses.

The questionnaire was pretested among 15 mothers in the poly health center in Gondar city and revisions were made. The English version questionnaire was converted to local Amharic language and then retranslated to English by a third party to ensure consistency and sentence appropriateness to get more accurate feedback. Three female nurse professionals collected the data during the study. Data collectors and supervisors were trained for 1 day on the purpose of study, techniques of data collection and extraction, and ethical issues throughout the data collection process. Data completeness and consistency were observed by the supervisors every day and necessary corrections were undertaken.

Data Processing and Analysis

Descriptive statistics like mean, frequency, percentage, and cross-tabulation were presented and binary logistic regression analysis was computed to demonstrate the strength of association. Epi-infoTM version-7 software was used to enter the data and exported into SPSS 22 for further analysis. Factors with $p < 0.05$ in the final model were declared as significantly associated with handwashing practice. Hosmer- and Lemeshow goodness-of-fit test was tested to check model fitness at $p > 0.05$.

Results

Socio-Demographic Characteristics of Respondents'

The study included a total of 422 mothers. The mean age of mothers was $35.6 \pm (11.75 \text{ SD})$ years and the mean age of children was $34.5 \pm (13.10 \text{ SD})$ months. Two hundred and sixty-four (62.6%) of mothers were orthodox Christian followers. An equal proportion of male and female under-five children was included and 26.1% of the children were in the age range of 37–46 months. More than half of the study earned less than 500 ETB monthly income and only 28.9% of mothers were illiterate ([Additional file 1](#)).

The proportion of mothers reporting good handwashing practices was 39.1% [95% CI: (34.8–43.9)] ([Figure 1](#)). The top three sources of information on good handwashing practices for mothers were mass media (25.89%), health facilities (25.61%), and health extension workers (24.25%) ([Additional file 2](#)).

Two hundred and seventy-four (64.9%) mothers always washed their hands after using a toilet, whereas only 0.5% never washed their hands after using the toilet. The majority (86.3%) of the study participants always washed their hands before eating a meal. 26.8% of mothers always used chemical disinfectants (alcohols, iodine) for handwashing and 32.2% never used chemicals. More than half (54.3% and 53.6%) of the mothers always reminded their children to wash hands before and after eating, only a few (0.9% and 0.5%) never reminded their children, respectively. Only 19.9% of mothers always washed their hands after interacting with sick individuals. Even though few participants (20.6%) washed hands using only water, the majority (72.0%) used water and soap/detergent ([Additional file 3](#)).

From the total mothers ($n=422$) who have had under-five children in the study area, 28% of their children were admitted with diarrheal disease, 25% were admitted with acute respiratory infection, 10% were



Figure 1 The proportion of hand washing practice of mothers in the study area, 2019.

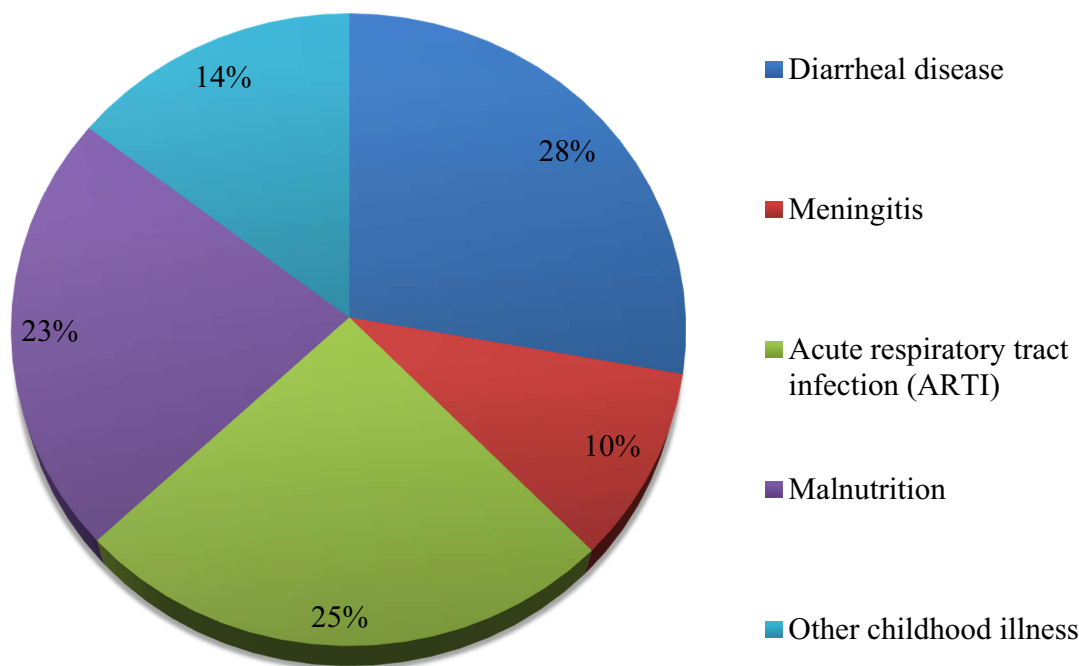


Figure 2 The health outcomes of under-five children in the study area, 2019.

admitted with meningitis, 23% were admitted with malnutrition and the remaining were with other childhood illness (Figure 2).

Health Outcomes of Children and Mothers Handwashing Practice

As indicated in the chi-square table, poor hand washing practices of mothers was associated with diarrheal disease among under-five children ($P=0.00$), other illnesses were not associated with the handwashing practices of mothers in this study ([Additional file 4](#)).

Determinants of Handwashing Practice of Mothers

In the bi-variable logistic regression analysis age of mothers, place of residence, marital status, average monthly incomes, handwashing knowledge of the mother and attitude of mother towards handwashing were statistically significant. However, in multivariable binary logistic regression, educational status of mothers ($p=0.00$), marital status ($p=0.02$) (Table 1) and handwashing knowledge ($P=0.01$) were statistically significant at $p<0.05$ (Table 2).

Discussion

This study sought to assess the health outcomes of under-five children and their mother's handwashing practices in north-west Ethiopia. In this study, the proportion of handwashing practices of mothers was 39.1% [95% CI: (34.8–43.9)]. This is lower than the study conducted in Lagos, Nigeria (73.8%),³⁴ Hosanna, Ethiopia (71.97%)³⁰ and India (43.6%).³⁵ The difference might be due to the socio-demographic nature of the study areas in this study, 60.9% of mothers had less than 500 ETB net monthly family incomes.

In our study, 64.9% and 86.3% of mothers always washed their hands after using toilet and before eating meals, respectively. Other studies also indicate mothers handwashing practices after defecating (38.7%), before preparing meal (37.0%), and before feeding child (24.5%),³⁶ 34% after defecation and 35% after cleaning up a child.³⁷ This may be an indication of raising awareness levels among the mothers over the years.^{38,39} This finding in the study area shows that the local authorities, health extension workers, and NGOs, who have invested significantly in disease prevention, have been absent in creating awareness as a resource for controlling sanitation-related illnesses. In the study area, the majority of women had reported being informed of handwashing practices through mass media.

Table 1 The Binary Logistics Regression Outputs of Factors Which Affect the Handwashing Practice of Mothers in Northwest Ethiopia, 2019

Characteristics		Mothers handwashing practice		COR(95% CI)	AOR(95% CI)
		Good (%)	Poor (%)		
Age of mothers	16–27	48(29.1)	58(22.6)	1	1
	28–33	44(26.7)	65(25.3)	1.22(0.71,2.10)	0.91(0.48,1.69)
	34–42	32(19.4)	75(29.2)	1.94(1.10,3.40)*	1.34(0.69,2.69)
	≥43	41(24.8)	59(23.0)	1.19(0.68,2.06)	0.83(0.41,1.69)
Residence	Rural	55(33.3)	129(50.2)	1	1
	Urban	110(66.7)	128(49.8)	0.49(0.33,0.74)**	0.60(0.34,1.07)
Marital status	Currently unmarried	92(55.8)	87(33.9)	1	1
	Married	73(44.2)	170(66.1)	0.40(0.27,0.60)**	2.62(1.62,4.23)**
Mothers educational status	Illiterate	42(25.5)	80(31.1)	1	1
	Literate	123(74.5)	177(68.9)	0.75(0.48,1.17)	2.12(1.11,4.04)*

Notes: **Variables significant at the 0.01 level (2-tailed). *Variables are significant at the 0.05 level (2-tailed).

Table 2 The Binary Logistics Regression Outputs of Factors Which Affect the Handwashing Practice of Mothers in Northwest Ethiopia, 2019

Characteristic		Mothers Handwashing Practice		COR(95% CI)	AOR(95% CI)
		Good (%)	Poor (%)		
Average monthly income (ETB)	<500	90(54.5)	167(65)	1	1
	500–2500	19(11.5)	28(10.9)	0.79(0.42,1.50)	1.09(0.54,2.17)
	2501–3500	13(7.9)	23(8.9)	0.95(0.46,1.97)	0.99(0.44,2.22)
	3501–5000	20(12.1)	21(8.2)	0.56(0.29,1.09)	0.63(0.28,1.40)
	≥5001	23(13.9)	18(7.0)	0.42(0.21,0.82)*	0.48(0.21,1.08)
Mothers handwashing knowledge	Poor	6(3.6)	34(13.2)	1	1
	Good	159(96.4)	223(86.8)	4.04(1.65,9.85)**	0.26(0.09,0.73) *
Mothers handwashing attitude	Poor	55(33.3)	117(45.5)	1	1
	Good	110(66.7)	140(54.5)	0.59(0.39,0.89)*	0.68(0.43,1.07)

Notes: **Variables significant at the 0.01 level (2-tailed). *Variables are significant at the 0.05 level (2-tailed).

In our findings the educational status of mothers, marital status and handwashing knowledge of mothers were the determinants associated with the handwashing practices of mothers.

Having knowledge about hand washing are 0.26 times reduce the hand washing practice of mothers in this study. This indicates that knowledge alone is not enough for practicing good handwashing, other factors may have an influence for example, it might be the matter of behavior,^{40,41} changing the habit is difficult,^{42–44} their negative attitude towards the tangible effect of proper handwashing practice to control and prevent various communicable diseases,⁴⁵ and income.^{39,46,47} A high-income family may live a higher quality of life because they have access to hygiene products unless they exhibit forgetfulness and laziness towards handwashing practices.

However, the study conducted in southwest Ethiopia agreed that mothers who have had good hand washing knowledge also have good hand washing practice.⁴⁸

Being married can increase the odds of handwashing practice of mothers by 2.62 times. Our results showed a significant difference in marital status of mothers, where the hand hygiene practice scores were higher among married mothers. However, it is not supported by another study done in Bangladesh.⁴⁹

This study found that the level of education had a significant impact on handwashing practices and that literate mothers regularly performed handwashing practices 2.12 times more than illiterate mothers, suggesting that hygiene education at the local health extension is also essential to lower rates of transmissible diseases. The result was consistent with similar studies.^{36,50,51}

Limitations

Even though mothers are a major contributor to child health, other partners like fathers may play a significant role in the transmission of disease and child health. Therefore, future researchers should better assess the health of under-five children with fathers, guardians and carers other than their mothers.

Conclusion

The study shows that mothers handwashing practices are not acceptable and hygiene-related (diarrhea and acute respiratory infection) illness of under five children is high.

The majority of mothers who knew about handwashing were not practicing it properly. Only a few mothers washed hands after defecation and before and after eating a meal. However, a lot of mothers use substances other than soap for cleaning hands like ash, mud, etc., which could act as a potential source of contamination.

Poor handwashing practices of mothers were associated with diarrheal disease in under-five children. It is better to increase awareness of proper handwashing methods at all levels in the community. The international agenda of the individual country including Ethiopia should focus on increasing the handwashing practices of individuals to influence the hygienic behavior of mothers of children under-five years.

Abbreviations

AOR, adjusted odds ratio; ARTI, acute respiratory tract infection; CI, confidence interval; COR, crude odds ratio; ETB, Ethiopian birr; NGO, non-governmental health organizations; SDG, sustainable development goal; SPSS, statistical package for social science.

Ethics Approval and Consent to Participate

Ethical clearance was approved and obtained from the Institutional Review Board of the University of Gondar (Ref No. EOHS/769/2011). Then, the official permission letter was obtained from the Department of Environmental and Occupational Health and Safety to University of Gondar Comprehensive Specialized Hospital and permission was secured from the medical director. Written informed consent was obtained from the mothers of each study participant. The purpose of the study was explained to study participants before securing consent. The ethical statement was carried out in accordance with the principles of the Declaration of Helsinki.

Data Sharing Statement

The dataset of the current study is available from the corresponding author upon reasonable request.

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Author Contributions

All authors contributed to data analysis, drafting or revising the article, gave final approval of the version to be published, and agree to be accountable for all aspects of the work.

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Disclosure

The authors declare that they have no conflict of interest.

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