



# Mothers' Handwashing Knowledge as a Predictor of Diarrheal Disease Among Under-Five Children Visiting Pediatric Ward in University of Gondar Comprehensive Specialized Hospital, Northwest Ethiopia, 2019

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Zewudu Andualem <sup>1</sup>  
Henok Dagne<sup>1</sup>  
Asefa Adimasu Taddese<sup>2</sup>  
Baye Dagnew <sup>3</sup>

<sup>1</sup>Department of Environmental and Occupational Health and Safety, Institute of Public Health, College of Medicine and Health Sciences, University of Gondar, Gondar, Ethiopia; <sup>2</sup>Department of Epidemiology and Biostatistics, Institute of Public Health, College of Medicine and Health Sciences, University of Gondar, Gondar, Ethiopia; <sup>3</sup>Department of Human Physiology, Sciences School of Medicine, College of Medicine and Health Sciences, University of Gondar, Gondar, Ethiopia

**Background:** Diarrheal disease is one of the leading causes of mortality and morbidity among under-five children in the world and often results from contaminated food and water. The aim of this study was to assess the prevalence of diarrheal disease among under-five children visiting the pediatric ward in University of Gondar Comprehensive Specialized Hospital and its association with their mothers' handwashing knowledge.

**Methods:** An institutional-based cross-sectional study was conducted from May to July 2019 among under-five children visiting the pediatric ward in University of Gondar Comprehensive Specialized Hospital. An interviewer-administered questionnaire was used to collect the data. Chart review was undertaken using a data abstraction form. A simple random sampling technique was used to select the study participants. Data were entered using Epi Info version 7 and analyzed using STATA version 14.0. A binary logistic regression analysis was employed between dependent and independent variables to determine association. The statistical significance was declared at  $P < 0.05$ .

**Results:** In this study, the prevalence of diarrheal disease among under-five children visiting the pediatric ward in University of Gondar Comprehensive Specialized Hospital was 30.09% (95% CI: (26%, 35%)). Age of mothers (AOR=3.72, 95% CI: (1.67, 8.28)), mothers' educational status (AOR=0.44, 95% CI: (0.23, 0.80)), malnutrition (AOR=6.72, 95% CI: (3.44, 13.11)), and maternal knowledge of handwashing (AOR=0.49, 95% CI: (0.27, 0.90)) were factors associated with diarrheal disease among under-five children.

**Conclusion:** The prevalence of diarrheal disease was higher in the current study, which is a major public health concern. Age of mothers, malnutrition, and mothers' handwashing knowledge and educational status were significantly associated with diarrheal disease of under-five children. In order to reduce diarrheal disease and improve child health, attention should be given to improving mothers' educational status and knowledge regarding handwashing.

**Keywords:** diarrheal disease, knowledge, under-five children

Correspondence: Zewudu Andualem;  
Henok Dagne  
Department of Environmental and Occupational Health and Safety, Institute of Public Health, College of Medicine and Health Sciences, University of Gondar, Gondar, Ethiopia  
Email zewuduandulem12@gmail.com;  
enoch2313@gmail.com

## Introduction

By 2030, it is estimated that 4.4 million under-five children will die from infectious diseases annually and that 60% of those deaths will occur in sub-Saharan Africa.<sup>1,2</sup> Globally, there are nearly 1.7 billion cases of childhood diarrheal disease and

diarrhea kills about 525,000 under-five children every year.<sup>3</sup> The majority of the mortality occurs in resource-constrained countries.<sup>3</sup> In Ethiopia, the Ministry of Health lists diarrhea as the second leading cause of mortality.<sup>4</sup>

Diarrhea is defined as the passage of three or more loose or liquid stools per day (or more frequent passage than is normal for the individual).<sup>5</sup> It can be categorized as acute or chronic diarrhea.<sup>6,7</sup> Diarrhea still appears to be the main cause of child death in several countries, consisting of a discriminatory indicator of geographical areas characterized by precarious collective living conditions, typifying the so-called poverty ecosystem.<sup>8,9</sup> In sub-Saharan Africa, diarrhea is the second most common cause of mortality and morbidity of under-five children. Only 40% of people living in urban settings had access to improved sanitation and 72% of people living in Ethiopia had no improved sanitation facilities.<sup>10</sup> The problem is related to environmental, socioeconomic, and cultural factors, and low coverage and effectiveness of health services. These factors can determine marked differences in their evolution due to inequalities that undermine the profile of production and distribution of goods and services in different strata of the population.<sup>8</sup>

Studies in India have shown that mothers with good knowledge of hand hygiene can prevent diarrhea by 38.88%,<sup>11</sup> and the counterpart spread of disease from hands will go a long way in increasing the prevalence of infectious diseases and unwashed hands leading to diarrhea,<sup>12</sup> and handwashing with soap removes transient potentially pathogenic organisms from hands and it is not sufficient to wash hands with only water after critical events like defecation.<sup>11</sup> In Pakistan, 85% of mothers had a lack of knowledge about the method of making Oral Rehydration Solutions (ORS) at home, due to which 60% of children were suffering from severe dehydration.<sup>13</sup> In Ethiopia, 65.2% of mothers had good knowledge about prevention and home-based management of diarrhea among under-five children,<sup>14</sup> and the promotion of hand washing in communities prevents one-quarter of episodes of diarrhea with a higher effect size when soap is provided free of charge.<sup>15</sup>

The aim of this study was to assess the prevalence of diarrheal disease among under-five children and its association with mothers' handwashing knowledge among mothers attending the pediatric health service in University of Gondar Comprehensive Specialized Hospital, Northwest Ethiopia. The identification of prevalence and contributing

factors for diarrhea is very important for the effective implementation of child health programs.

## Materials and Methods

### Study Design, Period, and Setting

An institution-based cross-sectional study was conducted from May to July 2019 among under-five children visiting the University of Gondar Comprehensive Specialized Hospital pediatric ward. University of Gondar Comprehensive Specialized Hospital is located in Central Gondar Zone North West Ethiopian. This hospital serves more than 5 million people for Gondar city and the surrounding community.<sup>16</sup>

### Sample Size Determination and Sampling Procedure

The sample size was determined using a single population proportion formula with the following assumptions: proportion ( $p$ ) 50% (there is no previous study) to estimate the true proportion with 95% confidence interval, 5% absolute precision ( $d$ ),  $Z$  (standard normal distribution),  $\alpha$  (level of significance) and  $z_{\frac{\alpha}{2}}$  is 1.96.

$$n = \frac{\left(z_{\frac{\alpha}{2}}\right)^2 * p(1-p)}{d^2} n = \frac{(1.96)^2 * 0.5(1-0.5)}{(0.05)^2} = 384$$

Assuming 10% non-response, we estimated the required sample size to be 422. A simple random sampling technique was used to select the study participants from the pediatric ward in University of Gondar Comprehensive Specialized Hospital.

### Data Collection Tools and Procedures

An interviewer-administered questionnaire was used to collect the data from mothers/caregivers. The questionnaire was adapted from previous similar studies<sup>17,18</sup> and customized accordingly. The outcome variable was the diagnosed diarrhea of under-five children in the period of data collection, which was recorded directly from the children's medical chart. The independent variables included socioeconomic (residence, family size, mothers'/caregivers' age, educational status of mothers, occupation, mothers' handwashing practice, knowledge, and attitude) and child-related (meningitis, malnutrition, acute respiratory infection (ARI), age, and gender of the child) factors. The questionnaire consisted of closed-ended questions. Initially, the questionnaire was written in English and then translated into the local language (Amharic); researchers then returned

to the English language to check its consistency. Data collectors and supervisors were trained on tools for data collection, questioning methods, interview techniques, methods of verbal consent, and data collection precautions. Data collectors were five Nurses and supervisors were two Environmental health professionals.

## Data Processing and Analysis

Data were entered using Epi Info version 7 and analyzed using STATA version 14.0. Summary statistics such as frequencies, proportions, mean, and standard deviation were computed. A binary logistic regression analysis was employed between dependent and independent variables. The statistical significance was declared at  $P < 0.05$ .

## Results

### Sociodemographic Characteristics of Children and Mothers

A total of 422 mothers have been aimed at for this study and the response rate was 100%. The mean age of mothers was  $35.63 \pm 11.74$  years. Whereas, the mean age of the children was  $34.63 \pm 13.18$  months. Of the mothers, 57.58% were married and 71.09% were literate. Above two-thirds (66.05%) of mothers had good knowledge of handwashing (Table 1).

### Factors Associated with Diarrheal Prevalence Among Under-Five Children

In this study the prevalence of diarrheal disease among under-five children visiting the pediatric ward in University of Gondar Comprehensive Specialized Hospital was 30.09% (95% CI: (26%, 35%)). Bivariable and multivariable logistic regression analyses were performed to identify factors associated with diarrheal disease among under-five children.

In the bivariable analysis, age of the child, age of mothers, educational status of mothers, malnutrition, and maternal handwashing knowledge were associated with diarrheal disease. Whereas, age of mothers, malnutrition, and maternal handwashing knowledge and educational status had an association with diarrheal disease in multivariable analysis.

Of the respondents, under-five children having mothers aged  $\geq 43$  years were 3.72 (AOR=3.72, 95% CI: (1.67, 8.28)) times more likely to get diarrheal disease compared with those whose mothers were aged 16–27 years.

Under-five children who had literate mothers were 56% (AOR=0.44 95% CI: (0.23, 0.80)) less likely to

**Table 1** Socio-Demographic Characteristics of Children and Mothers in University of Gondar Comprehensive Specialized Hospital, Northwest Ethiopia, 2019

Variables		Frequency (n=422)	Percent (%)
Age of child (n=415)	2–26 months	107	25.79
	27–36 months	104	25.06
	37–46 months	108	26.02
	47+ months	96	23.13
Age of mothers	16–27 years	106	25.12
	28–33 years	109	25.82
	34–42 years	107	25.36
	$\geq 43$ years	100	23.70
Residence	Urban	238	56.40
	Rural	184	43.60
Sex (n=419)	Male	208	49.64
	Female	211	50.36
Monthly income (n=165)	500–2500	47	28.48
	2501–3500	36	21.82
	3501–5100	41	24.85
	>5101	41	24.85
Educational status	Unable to read and write	122	28.91
	Literate	300	71.09
Marital status	Currently not married	179	42.42
	Married	243	57.58
ARI	No	307	72.75
	Yes	115	27.25
Meningitis	No	377	89.34
	Yes	45	10.66
Malnutrition	No	319	75.59
	Yes	103	24.41
Knowledge	Poor	142	33.65
	Good	280	66.35
Attitude	Poor	191	45.26
	Good	231	54.74
Practice	Poor	160	37.91
	Good	262	62.09

have diarrheal disease than those who had illiterate mothers. Malnourished children were 6.72 (AOR=6.72 95% CI: (3.44, 13.11)) times more likely to have a diarrheal disease when compared with those non-malnourished. Children who had mothers with good handwashing knowledge were 51% (AOR=0.49 95% CI: (0.27, 0.90)) less likely to get the diarrheal disease

**Table 2** Associated Factors of Diarrheal Disease Using Bivariable and Multivariable Logistic Regression Analysis Among Under-Five Children in University of Gondar Comprehensive Specialized Hospital, Northwest, Ethiopia, 2019

Variables		Diarrheal Disease		COR (95% CI)	AOR (95% CI)
		Yes	No		
Age of child	2–26 months	24	83	1	1
	27–36 months	28	76	1.27 (0.68, 2.38)	1.13 (0.55, 2.33)
	37–46 months	31	77	1.39 (0.75, 2.58)	1.13 (0.55, 2.34)
	47+ months	42	54	2.68 (1.46, 4.93)	2.02 (0.96, 4.23)
Age of mothers	16–27 years	25	81	1	1
	28–33 years	23	86	0.86 (0.45, 1.64)	1.09 (0.52, 2.30)
	34–42 years	30	77	1.26 (0.68, 2.33)	1.35 (0.64, 2.85)
	≥43 years	49	51	3.11 (1.71, 5.64)	2.51 (1.20, 5.24)*
Educational status of mothers	Unable to read and write	58	64	1	1
	Literate	69	231	0.33 (0.21, 0.51)	0.44 (0.23, 0.80)*
Malnutrition	Yes	19	84	2.26 (1.30, 3.91)	6.72 (3.44, 13.11)**
	No	108	211	1	1
Mothers' handwashing Knowledge	Good	71	209	0.52 (0.34, 0.80)	0.49 (0.27, 0.90)*
	Poor	56	86	1	1

Notes: \*Significant at  $P < 0.05$ . \*\*Significant at  $P < 0.001$ .

than those with mothers of poor handwashing knowledge (Table 2).

## Discussion

In the present study, the prevalence of diarrheal disease among under-five children visiting University of Gondar Comprehensive Specialized Hospital pediatric ward was 30.09%. The prevalence in this study is in line with previous studies in Jimma zone, Ethiopia,<sup>19</sup> Jigjiga, Ethiopia,<sup>20</sup> and in rural Burundi.<sup>21</sup> However, it is higher than prevalence reports from Iran<sup>22</sup> and India,<sup>23</sup> and lower than studies conducted in Kenya<sup>24</sup> and Ghana.<sup>25</sup> The variation might be due to the differences in the setting of the study, the economic status of the study participants, and the variety of the respondents as our study participants were mothers visiting the hospital pediatric ward.

In this study, the knowledge of mothers about handwashing was 66.05%, which is in line with a study conducted in Nigeria (67.7%),<sup>26</sup> lower than in other studies conducted in Nigeria (72.4%),<sup>27</sup> India (83.14%),<sup>11</sup> Indonesia (83.8%),<sup>17</sup> Ethiopia (92%),<sup>28</sup> and India (96.7%).<sup>29</sup> The possible explanation could be that the difference in study setting, level of education, economic status, and social norms might be responsible for the variation of knowledge.

Under-five children whose mothers were aged 43 years and above were 3.72 times more likely at risk of diarrheal disease when compared with those having mothers aged 16–27 years.

This might be due to younger mothers exhibiting more positive attitudes than the elderly. This can also be associated with education, as younger women are more educated than elderly mothers and mothers can understand better the importance of child health if they are educated.<sup>30</sup>

In this study, under-five children who had literate mothers were 56% less likely to get diarrheal disease when compared with those who had illiterate mothers. The finding of this study is similar to previous studies.<sup>31–33</sup> Education can raise awareness of diarrheal disease transmission and methods of prevention. As a result, educated women are able to seek and follow health care providers' dictates. Maternal training increases the mothers' response to children's diseases. Literacy for mothers affects hygiene practice, feeding children, weaning, and sanitation, which are, in turn, important factors for childhood diarrhea.<sup>34</sup>

Malnourished children were 6.72 times more likely to have diarrheal disease than those non-malnourished. This is supported by other studies.<sup>35,36</sup> In general, malnourished children are more prone to persistent and infectious diarrhea, and also have an impaired immune function. Persistent diarrhea is responsible for serious morbidity and proven risk of a dangerous cycle of diarrhea and malnutrition.<sup>37</sup> The magnitude of the impact is potentially altered by other variables such as etiology and clinical diarrhea, the source and adequacy of dietary intake, diagnosis, and feeding practices.

Children who had mothers with good handwashing knowledge were 51% less likely to have diarrheal disease when compared with those with mothers of poor handwashing knowledge. The finding of this study is in line with the findings of other studies.<sup>18,38,39</sup> Mothers' knowledge regarding causes of diseases, signs, and symptoms, prevention and control is very essential, thereby decreasing morbidity and mortality due to diarrhea. In this study, it is seen that mothers having higher education showing better knowledge about diarrheal disease in the prevention and management of diarrhea.<sup>18</sup>

## Conclusions

Our study findings of diarrheal disease prevalence among under-five children were significantly higher compared to some other similar studies. Age of mothers, malnutrition, and mothers' handwashing knowledge and educational status had a significant association with under-five diarrheal disease. In order to reduce the prevalence of diarrhea and improve child health, attention should be given to improving mothers' educational status and hand hygiene knowledge to integrate diarrhea and malnutrition management efforts.

## Ethics Approval and Informed Consent

Ethical clearance was approved and obtained from the ethics review committee of the Department of Environmental and Occupational Health and Safety (Ref No\_ EOHS/769/2011). Then, the official permission letter was obtained from 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 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.

## Availability of Data and Material

Data will be made available upon the reasonable request to the primary author.

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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.

## Disclosure

The authors report no conflicts of interest in this work.

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