

Knowledge, Attitudes, and Practices of Hand Washing among Aderash Primary Schoolchildren in Yirgalem Town, Southern Ethiopia

This article was published in the following Dove Press journal:
Journal of Multidisciplinary Healthcare

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Background: Hand washing is a simple, convenient, and cost-effective means to limit the transmission of communicable diseases. Improving the practice of hand washing is vital to decrease hygiene-related morbidity and mortality, particularly in developing countries. As such, this study aimed to assess knowledge, attitudes, and practices of hand washing among schoolchildren in Aderash primary school, Yirgalem town.

Methods: A cross-sectional study was conducted on 279 schoolchildren from March to May 2019. A pretested structured questionnaire was applied to collect all relevant information using simple random sampling. Data entry and clearance was done with Epi-Info version 7 and exported to SPSS version 20 for analysis. Adjusted ORs with 95% CI were used to assess statistically significant variables ($p < 0.05$).

Results: Overall, 62.7% of schoolchildren had adequate knowledge of hand washing, 61.3% exhibited positive attitudes toward hand washing and 39.1% had good hand-washing practices. Over three quarters (89%) of them had good knowledge of washing hands with soap. About 24%, 56.6%, 9.3%, 6.5%, and 3.6% of children reported washing hands after defecation, before meals, after meals, after work, and after play, respectively. In addition, 73.8% of them reported washing hands with soap if their hands looked dirty or smelled bad. Urban dwelling increased knowledge of hand washing of 1.3-fold (95% CI 1.2–2.85).

Conclusion: Even though >60% of children had adequate knowledge and exhibited positive attitudes toward hand washing, proper hand-washing practices was <40%. Therefore, much effort should be directed toward improving children's understanding of the benefits of proper hand washing in schools.

Keywords: knowledge, attitude, hand-washing practice, primary school children, Yirgalem

Introduction

Hand hygiene is a structured intervention to prevent the transmission of infectious agents. It is the act of cleaning hands to remove soil, dirt, and microorganisms from our hands with or without the application of antimicrobial soap.¹ Hand washing is a simple, convenient, effective, and cost-effective means to limit the transmission of communicable diseases from one person to another.^{2,3} Proper hand washing also significantly reduces the transmission of conjunctivitis, trachoma, and bacteria-related respiratory diseases.^{4,5} The promotion of hand washing improves the sanitation of populations, mainly those who are living in developing countries.⁶ However, the impact of scarce and insecure water supply is a big challenge concerning sanitation and hygiene, and it may predispose individuals to bad health

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outcomes.⁷ About 80% of diseases in developing countries are associated with poor hygiene,⁸ and >2 million people die every year due to diarrhea, with increased death rates among children.⁹ Studies have indicated that proper hand washing reduces diarrhea occurrences by approximately 30%–40%^{10,11} and of respiratory-tract infections by 6%–44%.¹² Moreover, around 60% of disease burden is linked with lack of proper sanitation and hygienic conditions in Ethiopia.¹³ Few schools in Ethiopia have sufficient water supply or toilet facilities for sanitation and hygiene purposes,¹⁴ the latter perhaps due to poor design and construction.¹⁴ The school toilets are not suitable, difficult to manage properly, and this situation may predispose children to open defecation instead of using these toilets. Furthermore, children's learning may be affected by intestinal helminth infection, diarrheal diseases, and malaria infections, and these factors may force children to be absent from school.¹⁵

Despite considerable evidence on the effectiveness of hand washing, particularly with the application of soap, the practice of proper hand washing is poor in developing countries, including Ethiopia. Data regarding practices of hand washing among children in primary schools are scarce. Also, children are at risks of diarrheal diseases, acute respiratory infections, and other hygiene-related problems. Therefore, this study aimed to assess knowledge, attitudes, and practices of hand washing and their predictors among schoolchildren.

Methods

Study Area, Design, and Population

An institution based cross-sectional study was conducted on 288 schoolchildren from May to June 2019 at Aderash primary school, Yirgalem town, Southern Ethiopia. Yirgalem is located 47 km from Hawassa, capital of the Southern Nations, Nationalities, and People's Region and 325 km from Addis Ababa, the capital city of Ethiopia. This governmental primary school provides free education for Yirgalem and nearby rural children. About 4,641 students (2,291 males and 2,170 females) started classes in the 2018–2019 academic year at this school.

Eligibility Criteria

All schoolchildren in the Aderash primary school for the 2018–2019 academic year were the source population, and grade 5–8 schoolchildren who attended classes during data collection were the study population.

Data-Collection Procedures and Laboratory Diagnosis

All relevant data were collected from schoolchildren using a pretested structured questionnaire through interviewer administration. The questionnaire covered grade, age, sex, parent's education level, family's monthly income, and knowledge and attitude-related questions about hand washing, as well as handwashing habits like plain hand washing, washing with soap, timing of hand washing, length of hand washing, and other related information. Moreover, instruction was given to children concerning stool sample collection and polyethylene screw-capped containers and applicator sticks given to each child to provide about 2 gram fresh stool. Subsequently, direct wet-mount microscopic examination was done in the nearby health center within 20–30 minutes of sample collection, while the leftover portion from each child's stool sample was processed for parasite concentrations using formalin ether. Laboratory technologists managed the stool-sample collection and well as laboratory diagnosis, whereas health professionals did clinical assessments.

Knowledge, Attitudes, and Practices of Hand Washing and Operational Definitions

Knowledge of hand washing was evaluated with nine items that comprised yes/no and multiple-choice questions. Attitudes toward hand washing were evaluated with eight items consisting of yes/no questions. Handwashing practices were assessed using five yes/no items and multiple-choice questions.

Overall Knowledge Level

Children who scored $\geq 65\%$ overall on knowledge-indicator items were categorized as “good knowledge of hand washing”, whereas those who failed to answer at least 65% of the items as “poor knowledge of hand washing.”

Overall Attitude Level

Children who scored $\geq 65\%$ overall on attitude-indicator items were categorized as “positive attitudes toward hand washing”, while those who failed to answer at least 65% of the items as “negative attitudes toward hand washing.”

Overall Practice Level

Children who scored $\geq 65\%$ overall on practice-indicator items were categorized as “good practices of hand

washing”, and those who failed to score on at least 65% of the items as “poor practices of hand washing.”

Data-Quality Management

Before actual data collection, the quality of the questionnaire was checked by pretesting among other schoolchildren (grades 5–8). Then, amendments were done based on pretest feedback. In addition, both stool-sample collection and laboratory examination were managed as per standard operating procedures (SOPs).

Statistical Analysis

Data were coded and entered into Epi-Info version 7, then exported to SPSS version 20 for statistical analysis. Descriptive statistics (frequencies and percentages) were used to summarize sociodemographic and other characteristics of study subjects. Binary logistic regression analysis was used to indicate the strength of associations between explanatory and outcome variables. Only variables with $p < 0.25$ on bivariate analysis were considered and included in multivariate analysis. Finally, $P < 0.05$ on multivariate analysis was taken as statistically significant with a 95% CI.

Ethical Considerations

The Ethical Review Committee of Yirgalem Hospital Medical College (ERC/2010) approved the study. An official letter was submitted to Sidama zone Dale woreda education bureau and Aderash primary school and then permission obtained for data collection. The study was conducted in accordance with the Declaration of Helsinki for research involving human subjects. The protocol of the study was well explained to the study subjects/children's parents and written informed consent obtained from subjects and/or from parents/legal guardians. Privacy of information was strictly preserved.

Results

Sociodemographic Characteristics of the Study Population

A total of 288 schoolchildren were approached and 279 enrolled in the study, giving a response rate of 96.9%: 150 (53.8%) were male and 200 (71.7%) urban dwellers. Of the total, 38 (13.6%), 105 (37.6%), 52 (18.6%) and 84 (30.1%) were in grades 5, grade, 7, and 8, respectively. Most 162(58.1%) were aged 13–15 years, and 107 (38.3%) of respondents' families earned >ETB1,500 per

Table 1 Sociodemographic Characteristics of Schoolchildren at Aderash Primary School

	n (%)		n (%)
Sex		Mothers' occupation	
Male	150 (53.8)	Employee	89 (31.9)
Female	129 (46.2)	Private worker	91 (32.61)
Age-group		Daily laborer	30 (10.75)
9–12 years	80 (28.7)	Farmers	69 (24.73)
13–15 years	162 (58.1)	Family's monthly income (ETB)	
>15 years	37 (13.3)	<1,000	84 (30.1)
Grade of students		1,000–1,500	88 (31.54)
Grade 5	38 (13.6)	>1,500	107 (38.35)
Grade 6	105 (37.6)	Mothers' education	
Grade 7	52 (18.6)	Cannot read or write	57 (20.43)
Grade 8	84 (30.1)	Grade 1–8	123 (44.1)
Illness diagnosed		Grade 9–12	49 (17.62)
Respiratory tract infection	70 (25.1)	Diploma or higher	50 (17.92)
Intestinal parasite	51 (18.3)	Residence	
None	158 (56.6)	Rural	79 (28.3)
		Urban	200 (71.7)

Note: ETB1 = US\$0.0316 during the study period.

month. A total of 51 (18.3%) and 70 (25.1%) of the children had intestinal parasites (*Ascaris lumbricoides*, *Giardia lamblia*, *Taenia* spp., and *Hymenolepis nana*) and respiratory tract infections, respectively (Table 1).

Knowledge and Attitudes Toward Hand Washing

Of the total, 251 (89.9%) of schoolchildren had knowledge of washing hands with soap, but 248 (98.8%) did

not know the exact date of Global Handwashing Day. In sum, 69 (27.5%), 46 (18.3%), 55 (21.9%), and 81 (32.3%) obtained knowledge of washing hands from television, teachers, family, and health workers, respectively. More than half (60.6%), 70 (25.1%), 30 (10.8%), 8 (2.9%), and 2 (0.7%) had knowledge of washing hands after defecation, before meals, after meals, after work, and after play, respectively. Overall, 175 (62.7%) had good (adequate) knowledge of hand washing (Table 2).

A total of 216 (77.4%) children reported that human feces could not be free from germs, while the rest 63 (22.6%) did not think so. In addition, 206 (73.8%) children indicated they should wash their hands with soap if their hands looked dirty or smell bad, and 262 (96.7%) indicated the importance of washing hands with soap before meals, to avert the transmission of diseases and contamination of foods with germs. Moreover, 171 (61.3%) children exhibited positive attitudes toward proper hand washing (Table 3).

A total of 94 (33.7%) and 81 (29%) of females and males had good knowledge of washing hands,

Table 2 Knowledge of Hand Washing Among Schoolchildren at Aderash Primary School

Questions	Response	n	%
Do you have information on hand washing with soap? (n=279)	Yes	251	89.9
	No	28	10.1
Do you when Global Handwashing Day is? (n=251)	Yes	3	1.2
	No	248	98.8
How did you find out about Global Handwashing Day? (n=251)	Television	69	27.5
	Teachers	46	18.3
	Family	55	21.9
	Health worker	81	32.3
Unclean hands are a way for disease to be transmitted. Do you agree with this?	Yes	248	88.9
	No	31	11.1
There are risks of food and water contamination if we do not wash our hands with soap. When? (n=279)	After toilet	177	63.4
	Before meal	77	27.6
	After meal	17	6.1
	After work	8	2.9
If you fail to wash your hands, you cannot be exposed to disease. Do you agree with this? (n=279)	Strongly agree	17	6.1
	Agree	40	14.3
	Disagree	24	8.6
	Strongly disagree	198	71.0
Parents or teachers have advised you to wash your hands. Do you agree with this? (n=279)	Strongly agree	157	56.3
	Agree	41	14.7
	Disagree	54	19.3
	Strongly disagree	27	9.7
When do you wash your hands? (n=279)	After toilet	169	60.6
	Before meal	70	25.1
	After meal	30	10.8
	After play	2	0.7
	After work	8	2.9
What is the benefit of hand washing with clean water and soap? (n=266)	Health promotion	160	60.1
	Prevention of disease transmission	74	27.8
	To be beautiful	32	12.0
Overall knowledge level (n=279)	Good	175	62.7
	Poor	104	37.3

Table 3 Attitudes Toward Hand Washing Among Schoolchildren at Aderash Primary School

Questions	Response	n	%
Doo human feces contain germs? (n=279)	Yes	216	77.4
	No	63	22.6
Does poor hand washing expose one to disease? (n=279)	Yes	196	70.3
	No	83	29.7
Do you think that only water is enough for washing hands? (n=279)	Yes	99	35.5
	No	180	64.5
Is washing hands with soap needed after coughing or sneezing? (n=279)	Yes	198	71.0
	No	81	29.0
If you fail to wash your hands, can they transmit infectious agents? (n=279)	Yes	222	79.5
	No	57	20.5
If you wash your hands well with water, do you need to use soap? (n=279)	Yes	129	46.2
	No	150	53.8
If your hands look dirty or smell bad, do you need to wash your hands with water and soap? (n=279)	Yes	206	73.8
	No	73	26.2
Do you think that washing your hands with soap is important before eating? (n=279)	Yes	262	96.7
	No	8	3.0
Overall attitude level (n=279)	Positive	171	61.3
	Negative	108	38.7

Table 4 Knowledge of Hand Washing Among Schoolchildren in Relation to Different Variables at Aderash Primary School

	Knowledge			Knowledge	
	Good 175 (%)	Poor 104 (%)		Good 175 (%)	Poor 104 (%)
Sex			Mothers' occupation		
Male	81 (29.03)	69 (24.73)	Employee	76 (27.24)	13 (4.7)
Female	94 (33.69)	35 (12.54)	Private worker	59 (21.15)	32 (11.5)
Age-group			Daily laborer	9 (3.22)	21 (7.52)
9–12 years	54 (19.35)	26 (9.32)	Farmer	27 (9.68)	42 (15.05)
13–15 years	101 (36.2)	61 (21.86)	Family's monthly income (ETB)		
>15 years	20 (7.16)	17 (6.09)	<1,000	50 (17.92)	34 (12.19)
Grade			1,000–1,500	51 (18.28)	37 (13.26)
Grade 5	20 (7.17)	18 (6.45)	>1,500	70 (25.09)	37 (13.26)
Grade 6	61 (21.86)	44 (15.80)	Mothers' education		
Grade 7	33 (11.83)	19 (6.81)	Cannot read or write	30 (10.75)	27 (9.68)
Grade 8	57 (20.43)	27 (9.68)	Grade 1–8	75 (26.9)	48 (17.2)
Illness diagnosed			Grade 9–12	38 (13.62)	11 (3.94)
Respiratory tract infection	44 (15.8)	26 (9.32)	Diploma or higher	33 (11.83)	17 (6.1)
Intestinal parasite	16 (5.73)	35 (12.54)	Residence		
None	113 (40.5)	45 (16.13)	Rural	45 (16.13)	34 (12.19)
			Urban	124 (44.4)	76 (27.24)

Note: ETBI = US\$0.0316 during the study period.

respectively. Of those children who had good knowledge of washing hands, 16 (5.73%) had intestinal parasites, lower than the rate among children who had poor knowledge of washing hands (12.54%, Table 4). Of the total 171 children that exhibited positive attitudes toward hand washing, 99 (35.48%), 92 (32.97%), and 79 (28.32%) were aged 13–15 years and females and males, respectively (Table 5).

Hand-Washing Practices

A majority, 246 (88.2%) reported washing hands with soap, while 33 (11.8%) reported washing hands only with water. Of the total, 158 (56.6%), 67 (24%), 26 (9.3%), and 10 (3.6%) of children reported washing hands before meals, after defecation, after meals, and after play, respectively. In addition, 64 (22.9%) reported washing their hands regularly with soap before meals (Table 6). Overall, 109 (39.1%) children had good hand washing practices, whereas 170 (60.9%) had poor hand-washing practices. Of those who had good hand-washing practices, 62 (22.2%), 64 (22.9%), and 80 (28.67%) were female, aged 13–15 years, and urban dwellers, respectively (Table 7).

Factors Affecting Knowledge, Attitudes, and Practices of Hand Washing

Initially, bivariate analysis was done and independent variables with $p < 0.25$ were included in multivariate analysis to assess factors strongly associated with the study outcome. Age 9–12 years (AOR 0.4, 95% CI 0.17–0.95), urban dwelling (AOR 1.3, 95% CI 1.2–2.85), mother's occupation (AOR 0.05, 95% CI 0.01–0.8), and mother's education level (AOR 0.3, 95% CI 0.10–0.8) were associated with knowledge of hand washing. In addition, age 9–12 years (AOR 0.1, 95% CI 0.03–0.3), mother's occupation (AOR 0.05, 95% CI 0.01–0.3), and mother's education (AOR 0.3, 95% CI 0.10–0.74) were also associated with the practice of hand washing. However, attitudes of children toward hand washing did not show associations with independent variables (Table 8).

Discussion

Hand hygiene is the act of washing hands only with water or with the application of antimicrobial soap.¹ Hand washing is the single most preventive means of the spread of infectious organisms from one person to another. Based on the

Table 5 Attitudes of Schoolchildren Toward Hand Washing in Relation to Different Variables at Aderash Primary School

	Total, n (%)	Attitude	
		Positive 171 (%)	Negative 108 (%)
Sex			
Male	150 (53.8)	79 (28.32)	71 (25.45)
Female	129 (46.2)	92 (32.97)	37 (13.26)
Age-group			
9–12 years	80 (28.7)	52 (18.63)	28 (10.03)
13–15 years	162 (58.1)	99 (35.48)	63 (22.58)
>15 years	37 (13.3)	20 (7.17)	17 (6.09)
Mothers' education			
Cannot read or write	45 (16.13)	18 (6.5)	27 (9.7)
Grade 1–8	123 (44.1)	84 (30.11)	39 (13.97)
Grade 9–12	61 (21.86)	36 (12.9)	25 (8.96)
Diploma or higher	50 (17.92)	33 (11.83)	17 (6.09)
Mothers' occupation			
Employee	89 (31.9)	73 (26.2)	16 (5.7)
Private	91 (32.62)	61 (21.9)	30 (10.7)
Daily laborer	30 (10.75)	11 (3.9)	19 (6.8)
Farmer	69 (24.73)	22 (7.9)	47 (16.8)
Residence			
Rural	79 (28.32)	49 (17.6)	30 (10.7)
Urban	200 (71.7)	122 (43.7)	78 (27.9)
Family's monthly income (ETB)			
<1,000	84 (30.11)	60 (21.5)	24 (8.6)
1,000–1,500	88 (31.54)	66 (23.7)	22 (7.9)
>1,500	107 (38.35)	76	31 (11.1)

Note: ETBI = US\$0.0316 during the study period.

study criteria, 62.7% of the children had adequate knowledge of washing hands. This finding was higher than a study conducted in northern Ethiopia, which found 52%.¹⁶ Also, the finding was lower than studies conducted in Hosanna, southern-Ethiopia¹⁷ and India,¹⁸ in which rates were 69.9% and 77%, respectively. The variations might be attributed to differences in awareness creation, scale of classification, and the number of enrolled subjects.

In this study, 61.3% of the schoolchildren had positive attitudes toward hand washing. This finding was almost comparable with the studies conducted in other parts of Ethiopia: 59.4% in Hosanna¹⁷ and 61.7% in northern Ethiopia.¹⁹ However, it was lower than one conducted in South Africa,²⁰ in which 91.4% of schoolchildren had positive attitudes toward hand washing. A large number

Table 6 Hand-Washing Practices of Schoolchildren in Aderash Primary School

Questions	Response	Frequency	
		n	%
Do you wash your hands in the morning?	Yes No	279 0	100 —
If yes, what materials do you use?	Water and soap Water only	246 33	88.2 11.8
For how long do you wash your hands at a time?	30 seconds to 1 minute < 30 seconds I do not know	68 174 37	24.4 62.4 13.3
When do you wash your hands?	After toilet Before meals After meals After play After work	67 158 26 10 18	24.0 56.6 9.3 3.6 6.5
Do you wash your hands with water and soap before meals?	Always (regularly) Very often Often Sometimes Never	64 68 109 29 9	22.9 24.4 39.1 10.4 3.2
Overall practice level	Good Poor	109 170	39.1 60.9

of students from different schools in South Africa participated, while children from a single school were included in the current study, and this might be a good reason for the variation.

In this study, overall 39.1% of children had good practices of hand washing. This finding was lower than that reported from southern Ethiopia — 71.97%.¹⁷ The variation might be attributed to the classification scale for hand-washing practices. That study used a 60% score as the cutoff for classification of hand-washing practices, whereas a 65% score was used in the current study as cutoff, and this might be a plausible reason for the variations in hand-washing practices between these studies.

The study conducted in north Ethiopia revealed 99% and 76.9% of respondents washed their hands before meals and after defecation, respectively.¹⁶ In contrast, 56.6% and 24% of our children reported washing their hands before meals and after defecation, respectively. In

Table 7 Hand-Washing Practices of Schoolchildren in Relation to Different Variables in Aderash Primary School (n=109)

	Hand-Washing Practices			Hand-Washing Practices	
	Good, n (%)	Poor, n (%)		Good, n (%)	Poor, n (%)
Sex			Residence		
Male	47 (16.85)	103 (36.9)	Rural	29 (10.39)	50 (17.92)
Female	62 (22.22)	67 (24.01)	Urban	80 (28.67)	120 (43.0)
Age-group			Family's monthly income (ETB)		
9–12 years	32 (11.47)	48 (17.20)	<1,000	27 (9.68)	57 (20.43)
13–15 years	64 (22.94)	98 (35.13)	1,000–1,500	32 (11.47)	56 (20.07)
>15 years	13 (4.66)	24 (8.60)	>1,500	50 (17.92)	57 (20.43)
Mothers' education			Illness diagnosed		
Cannot read or write	17 (6.1)	30 (10.7)	Diarrhea	7 (2.51)	11 (3.94)
Grade 1–8	38 (13.62)	85 (30.47)	Respiratory tract infection	24 (8.6)	46 (16.49)
Grade 9–12	21 (7.5)	28 (10.03)	Intestinal parasite	12 (4.3)	39 (13.98)
Diploma or higher	21 (7.53)	29 (10.39)	None	102 (36.5)	56 (20.1)
Mothers' occupation					
Employee	46 (16.49)	43 (15.41)			
Private	42 (15.05)	49 (17.56)			
Daily laborer	7 (2.50)	23 (8.24)			
Farmer	14 (5.02)	55 (19.71)			

Note: ETBI = US\$0.0316 during the study period.

the present study, 88.2% of children reported washing their hands with soap. Similarly, 91.5% of children in Mumbai²¹ and 94.5% of children in Duwakot²² washed their hands with soap. In contrast, lower rates of washing hands with soap were reported by schoolchildren in several studies: 9.9% in public schools in Kintampo municipality, Ghana,²³ 21.3% in Bangalore and Kolkata schools in India,²⁴ and 40% in rural schools of Nalgonda and Andhra Pradesh in India.²⁵ In addition, 47.3%²⁴ and 41.2%²⁵ of children washed their hands only with water. The variations may be due to awareness levels of children regarding the benefits of hand washing with soap.

In the present study, about 76% of children reported not washing their hands after defecation. This finding was nearly compatible with a study conducted in Mereb-Leke district, northern Ethiopia, which indicated >70% of children did not wash their hands after defecation.¹⁹ In the present study, children from urban areas were 1.3 times more likely to have good knowledge of hand washing (95% CI 1.2–2.85) than children from rural areas. This finding was consistent with the previous study conducted in Hosanna, Southern Ethiopia.¹⁷ Our study indicated that sex was not associated with the practice of hand washing. This finding was similar to a study conducted in Sebeta

town, Oromia region.²⁶ Whereas this finding was not in line with two other studies,^{17,27} taht indicated an association between female sex and good hand-washing practices. The reason might be females pay more attention toward beauty and hygiene than males.

Furthermore, this study indicated 18.3% prevalence of intestinal parasite infection. This finding was inconsistent with the several studies conducted in Ethiopia: 60.7% in Tigray,²⁸ 77.9% in Amhara region,²⁹ 84.3% in East Gojjam zone,³⁰ 79.8% in north Gondar,³¹ and 62.2% in the Southwest, Ethiopia.³² The knowledge gap of children concerning the transmission route of intestinal parasites and preventive measures among the studies could be responsible for the disparity in intestinal parasite infection rates. Also, the incidence of intestinal parasites might show variability across geographical locations, environmental sanitation, and personal hygiene.

Limitations

This study confronted some limits that may affect the generalizability of findings. First, we did this study at a single school, so the findings cannot be applied to the general population of all schoolchildren. Second, since the study design was cross-sectional, it referenced only a single point in time. Third, the study assessed the practice of hand

Table 8 Factors Associated with Knowledge, Attitudes, and Practices of Hand Washing Among Schoolchildren in Aderash Primary School

Explanatory variables	Outcome Variables (with 95% CI)					
	Knowledge of Hand Washing		Attitudes Toward Hand Washing		Practices of Hand Washing	
	COR	AOR	COR	AOR	COR	AOR
Sex: Male Female	1.5 (0.95–2.5) 1.00	1.3 (0.871–3.1) 1.00	NA NA	NA NA	0.4 (0.08–1.9) 1.00	0.4 (0.32–1.9) 1.00
Age-group: 9–12 years 13–15 years >15 years	0.45 (0.184–0.91) 0.53 (0.28–1.18) 1.00	0.4 (0.17–0.95)* 0.6 (0.3–1.1) 1.00	NA NA NA	NA NA NA	0.05 (0.01–0.3)** 0.1 (0.03–0.3)* 1.00	0.1 (0.03–0.3)** 0.2 (0.09–0.6)* 1.00
Residence Urban Rural	1.6 (1.3–3.7)* 1.00	1.3 (1.2–2.85)* 1.00	0.6 (0.6–2.0) 1.00	0.5 (0.7–2.0) 1.00	0.24 (0.5–0.8) 1.00	0.3 (0.17–0.7) 1.00
Mothers' occupation Employee Private worker Daily laborer Farmer	1.00 0.16 (0.02–1.2) 0.01 (0.001–0.09) 0.09 (0.09–1.00)	1.00 0.5 (0.14–1.5) 0.05 (0.01–0.8)* 0.26 (0.6–1.07)	1.00 0.7 (0.4–1.5) 2.2 (0.7–7.3) 5.6 (0.6–46.7)	1.00 0.85 (0.6–1.9) 1.0 (0.8–6.9) 1.9 (0.4–8.6)	1.00 0.16 (0.02–1.2) 0.01 (0.001–0.1) 0.09 (0.009–1.0)	1.00 0.46 (0.1–1.5) 0.05 (0.01–0.3)* 0.26 (0.6–1.1)
Family's monthly income (ETB) <1,000 1,000–1,500 >1,500	1.00 0.24 (0.05–1.1) 0.32 (0.61–2.0)	1.00 0.2 (0.1–1.5) 0.3 (0.35–1.1)	1.00 0.2 (0.6–1.1) 0.24 (0.05–1.1)	1.00 0.47 (0.7–2.3) 0.23 (0.4–1.4)	1.00 2.1 (0.7–6.4) 4.2 (0.5–4.5)	1.00 1.9 (0.6–5.9) 1.3 (0.7–3.4)
Mothers' education Unable to read and write Grade 1–8 Grade 9–12 Diploma or higher	0.37 (0.1–1.1) 1.7 (0.85–3.4) 0.48 (0.2–1.25) 1.00	0.3 (0.10–0.8)* 0.9 (0.4–1.7) 0.6 (0.3–1.4) 1.00	0.37 (0.1–1.1) 1.7 (0.85–3.4) 0.5 (0.2–1.2) 1.00	0.29 (0.10–0.8) 0.87 (0.4–1.7) 0.6 (0.28–1.4) 1.00	4.6 (0.7–29.9) 39.7 (5.6–283)** 9.7 (1.2–78.1)* 1.00	0.3 (0.1–0.74)* 1.62 (0.7–3.53) 0.48 (0.2–1.1) 1.00

Notes: TBI = US\$0.0316 US dollar during the study period; * $p < 0.05$; ** $p < 0.01$; NA, $p > 0.25$.

washing using self-response, and this might have caused recall bias. Regardless of these limits, this study ultimately adds supportive evidence to areas where there have been insufficient data.

Conclusion

Though >60% of the schoolchildren had good knowledge and exhibited positive attitudes toward hand washing, the practice of proper hand washing was <40%. Urban dwelling increased the odds of knowledge of hand washing 1.3 times. Therefore, sustainable health education in schools is vital to equip children with knowledge and healthy attitudes toward hand hygiene. Moreover, the availability of standardized latrines, sufficient water-supply systems, and antimicrobial soap in the schools play an important role to enhance proper hand-washing practices. Furthermore, extensive controlled

studies are required to address other potential factors that contribute to knowledge, attitudes, and practices of hand hygiene.

Data-Sharing Statement

The data set of this article is not openly accessible. However, it is accessible upon reasonable request from the corresponding author with the authorization of the Yirgalem Hospital Medical College ethics committee.

Acknowledgments

We want to acknowledge the Aderash primary school teachers for their great support during data collection. Further, our appreciation is also extended to the study subjects for their voluntary involvement in the study.

Author Contributions

All authors contributed toward data analysis, drafting, and revision, gave final approval to the version to be published, and agree to be responsible for all aspects of the work.

Funding

There is no funding to report.

Disclosure

The authors declare that they have no conflict of interest in this work.

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