Handwashing Practices and Its Predictors Among Primary School Children in Damote Woide District, South Ethiopia: An Institution Based Cross-Sectional Study

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Amha Admasie[1], Alemu Guluma[2] and Fentaw Wassie Feleke[3]

[1]School of Public Health, Bahir Dar University, Bahir Dar, Ethiopia. [2]Wolaita Zonal Health Department, Wolaita Sodo, Ethiopia. [3]College of Health Science, Woldia University, Woldia, Ethiopia.

ABSTRACT

BACKGROUND: Handwashing in schools with soap could substantially reduce diarrhea and respiratory infections among school-age children; however, in low-and-middle-income countries, handwashing is still being practiced to a very low extent in particular critical moments such as before eating and after using the toilet. Therefore, the main objective of this study was to assess the level of handwashing practice and its predictors among primary school children in South Ethiopia.

METHODS: A school-based cross-sectional study was conducted using a multistage cluster sampling technique from 6 primary schools with 580 students in total. Schools were purposively selected and the students were random. Data were collected using pre-tested questionnaires administered by interviewers and trained data collectors. Data were entered using Epi Data and exported to SPSS software for analysis. Both bivariate and multivariable logistic regression analyzes were used.

RESULT: Proper handwashing practice was reported in 28.10% (95% CI, 24.5, 31.7%) of students. Being eighth grade (AOR = 3.44, 95% CI 1.52, 8.23), urban residence (AOR = 18.84, 95% CI 14.02, 23.29], having parents (AOR = 10.74; 95% CI 8.80-12.36), role model teachers (AOR = 6.45; 95% CI 5.52-8.99), role model health professionals (AOR = 9.62; 95% CI 2.70-14.19), and school handwashing facility (AOR = 3.84, 95% CI 3.60, 4.07) were predictors of proper handwashing practice.

CONCLUSIONS: Proper handwashing practice among schoolchildren was found below. Therefore, promoting and improving handwashing practices and preparing handwashing facilities in schools is mandatory to address the handwashing practice gap among primary school students in the study area.

KEYWORDS: Handwashing practice, primary school, school children, students, school-aged children

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CORRESPONDING AUTHOR: Fentaw Wassie Feleke, College of Health Science, Woldia University, P.O.Box: 400, Woldia, Ethiopia. Email: fentawwassie@gmail.com

Introduction

Handwashing is defined as the vigorous and brief rubbing together of all surfaces of lathered hands, followed by rinsing under a stream of water, with a fundamental principle of removal, not killing of microorganisms.[1] Handwashing facilities in schools is one of a mechanism to achieve sustainable development goals 4 and 6 (SDG 4 and 6) in schools, to "ensure inclusive and equitable quality education and promote lifelong learning opportunities for all and to ensure availability and sustainable management of water and sanitation for all by the year 2030" respectively.[2] Handwashing has been widely recognized and accepted as a low-cost and effective technique in preventing communicable diseases and this practice has been recognized as an important public health measure to prevent and control most infectious diseases.[3] The global burden of diarrheal disease can be reduced by 9.1% and 6.3% of all global deaths can be stopped by improving access to water, sanitation, and hygiene (WASH).[4,5] WASH interventions have shown significant reductions in school absenteeism and may have a positive influence on educational outcomes.[4,6]

Handwashing is a basic everyday process and is a skill and behavior that must be learned as a child and should become a habit throughout life to enjoy a better quality of life.[7,8] The use of sanitary facilities and handwashing practices is an important life skill for school children.[9,10] Handwashing with soap could substantially reduce diarrhea and respiratory infections.[11] Proper handwashing practice is a prerequisite for a child's survival, hence, improper handwashing is responsible for the majority of child deaths globally each year.[8,12] However, school-aged children in low-and-middle-income countries usually do not engage in handwashing practice at critical times, such as after using the toilet, before eating, and before cooking the food.[13,14]

In Nigeria, only 59% of urban and 22% of rural people have access to improved water and sanitation facilities.[15] Thus, inadequate sanitary conditions and poor hygiene practices play a

major role in the increased burden of communicable diseases within these low-and-middle-income countries.[16] School-based handwashing practices have been done in different countries. Some of these studies are in Colombia, where 36.6% of school children reported washing their hands always with soap and very often after using the toilet, however, only 3% always wash their hands for at least 20 seconds[17]; similarly, in Bogota, only 33.6% always or very often wash their hands with soap and clean water before eating and after using the toilet, while about 7% of students reported regular access to soap and clean water at school[18]; in Bangladesh, washing hands specifically using soap after defecation was found to be a common practice[19]; in Vietnam, the common time for handwashing was before eating (60%), but only 23% after defecation and very few did before cooking (only 7%), washed their hands at the recommended duration (30-60 seconds) was 58%, the proportion of handwashing practice was increased by grade levels (34% among grade 1 to 67% among grade 7 students[20]; in South Africa, washing of hands in schools was above 65% (70.3% in urban and 29.7% in rural schools, they did mostly before eating and after visiting the toilet.[21]

According to a study of knowledge, attitude, and practices (KAP) of handwashing in Angolela District, North Ethiopia, the handwashing practice the day before the interview was 99.7% (99% before meals, 46% after meals, and only 15% after defecation), most of them practiced using with plain water only, 36.2% of them used soap[22]; in Bale town Eastern Ethiopia, 98.3% of the children regularly practiced handwashing before meals[23]; in Arba Minch Town Southern Ethiopia, 79.1% washed their hands with soap after visiting the toilet and before a meal, 22.3% of them properly applied handwashing practice.[24]

The practice of handwashing in soap-based interventions for primary school children is effective in reducing infectious diseases in the school community. Handwashing is linked to the availability and accessibility of handwashing facilities.[24-26] A school study in Bogota, Colombia, showed that being urban schools, the availability of water and soap was 3 times more likely to wash their hands before eating and after visiting the toilet[18]; another study in Vietnam and Peru criticized that being urban primary schools, the distance from the handwashing facilities in schools, the lack of water, the lack of soap, and learning in a very crowded situation were the main reason for not washing their hands at school.[27]

The source of information on handwashing can be from different sources in different countries. For example, in Sierra Leone, primary school students had learned about handwashing at home (75%), schools (56%), radio or television (36%), health facilities (8%), and friends (5%), students residing in urban areas are more likely to report home as a source of knowledge than those in rural areas; and students in rural areas are more likely to report school as a source of knowledge than those in urban areas[25,28]; in Indonesia, the parents were the most frequent human source of information on handwashing (91.86%), followed by health workers (50.0%), teachers (34.9%), and friends (2.3%), the reasons for not washing hands were forgetfulness (81.8%), laziness (3.2%), lack of time (4.3%), lack of interest (0.8%), lack of clean water 7.8%, and lack soap 8.9%.[25]

Education level of respondents, availability of water, and access to the media have a strong positive association with handwashing with soap[29] whereas, availability of water in some rural schools,[21] availability of handwashing facilities in most schools, the high ratio of pupil-to-handwashing facilities, the availability of soap, the extensive use of shared containers, delays in the acquisition of handwashing facilities, fragmented efforts in the private sector in the promotion of hand hygiene, and non-compliance with conventional handwashing practices were contributing factors to handwashing practices.[29]

Despite substantial evidence about the effectiveness of handwashing, especially using soap at all critical times, which is proven worldwide and continentally, the level of handwashing practice in Ethiopian schools, in particular to the study area is not well known. If the level of handwashing were known in the study area, this would be helpful to devise appropriate intervention on school sanitation facilities and awareness creation. Therefore, the main objective of this study was to determine the level of handwashing practice and associated factors among primary school children in Damot Woide District, Wolaita zone, South Ethiopia.

Methods

Study setting and period

The study was carried out in Damot Woide District, Wolaita Zone, Ethiopia. The Damot Woide District is located around 400 km from Addis Ababa, the capital of Ethiopia. The district has a total population of 119 339, there are 31 primary schools (6 in urban and 25 in rural Kebeles) and 2 high schools.[30] The District has 4 health centers, 22 health posts, 12 private clinics, and 1 private drug store. Intestinal parasitoid and diarrheal diseases are the second to third leading causes of morbidity of outpatient diagnosis morbidity in the 10 top disease lists.[31] The study was conducted between January 2018 and February 2018.

Study design and population

A school-based cross-sectional study design was used on randomly selected school-age children (ranges from 10 to 20 years) from selected primary schools of Damot Woide District, south Ethiopia. The survey data was supplemented with school walk-through observation on sanitation facilities with well-prepared checklists.

Inclusion and exclusion criteria

Randomly selected students from grades 5 to 8 in selected primary schools who are registered and active students during the

study period were included. However, those students with hearing, speaking, disabilities problems, and students attending evening classes were excluded.

Sample size and sampling procedure

The sample size was calculated using a single population proportion statistical formula with assumptions of the proportion of improper handwashing practice 77.7%,[24] a 95% confidence level with a 5% error margin, and a design effect of 2 were considered; furthermore, 10% of the calculated sample size (n = 59) was added for possible nonresponse. In the multistage cluster random sampling technique initially, schools (grades 5-8) were stratified into urban and rural schools. Then, a town school and 5 rural schools were purposively selected due to transport access and logistic feasibility. Five hundred and eighty-six (586) students were selected from 6 schools proportionally. The list of students was obtained from the school roaster list. Each participating student was selected by the lottery method from the roaster list.

Variables and operational definition

The dependent variable for the study was handwashing practice, while predictor variables were socio-demographic (age, sex, educational status, occupation, residency), institutional factors (distance from the home, school sanitation facilities, source of water) personal factors, and social factors (important referents, source of information, school wash club, mini-media, and celebration of handwashing day). To assess the level of handwashing practices, respondents were asked 7 questions: washed their hands in the last 12 hours? Usual handwashing time, Items used for handwashing, commonly used type of handwashing materials in the family, duration of washing their hands at a time, how often do you wash hands with soap before a meal? How often do you wash hands with soap after using the toilet? and those who scored more than the mean value were considered as having good practices (ie, correctly responded to at least 4 of 7 practice questions) and those who scored less than the mean value were considered having poor practices (correctly responded to less than 4 of 7 practice questions).[32,33] Few variables had multiple responses, hence, we had categorized these variables in dichotomous (handwashing practice: Yes or No) based on their relevance to the benefit of handwashing as compared to others.

Data collection tools, procedures, and quality assurance

Data were collected using an interviewer-administered questionnaire with closed questions. Walk-through observations of school sanitation facilities have been observed using a checklist. The questionnaire was adopted from different published literature.[12,20,24,34] The questionnaire was first prepared in English and translated into Wolaitato (local language) and back to English to maintain the consistency of the questionnaires by involving language experts. Six trained health professionals (environmental health officers, public health nurses) have been involved in data collection under the supervision of 2 environmental health officers daily. Data collectors and supervisors were trained for 2 days about the whole data collection process. The pre-test (approximately 5% of the total sample size) was conducted in Sake Primary School, which has the same socio-demographic characteristics as those of the study schools. Based on the pretest, questions were revised, edited, and the necessary corrections were made accordingly before the actual data collection is started.

Data management and analysis

Data were checked for completeness, edited manually, coded, and then entered into Epi Data version 3.1[35] and exported into SPSS version 20 (IBM Corp. Released 2011. IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY) for clearance and analysis. Bivariate and multivariate logistic regression analysis was used. All factors with a *P*-value less than .25 in the bivariate logistic regression analysis were considered for the multivariate analysis. Both crude and adjusted odds ratios with a 95% confidence interval were reported. Multicollinearity tests were conducted using the Variance Inflation Factor (VIF < 5). Hosmer and Lemeshew's Goodness of fit test ($P < .085$) was used to check for the fitness of the model. Variables with a *P*-value less than .05 in multivariate analysis were considered statistically significant.

Results

Socio-demographic characteristics

Five hundred eighty (580) students completed survey questions (response rate = 98.9%). About 174 (30.0%) were students in grade 6 and 168 (29.0%) were students in grade 5 (Table 1). About 312 (53.8%) were female students. The mean age of the respondents was 13.3 ± 1.7 years. About 449 (77.5%) lived in a rural area at the time of the survey. Regarding the educational and occupational status of the student's mother, 174 (30.0%) and 359 (61.9%) were illiterate and housewives, respectively.

The practice of handwashing

Among the respondents, 147 (25.8%) and 184 (32.3%) wash their hands before meals and after meals respectively (Figure 1). Respondents who had washed their hands on the morning of interview day were 520 (89.7%) (Table 2). More than half (53.3%) students had used only plain water to wash their hands and were followed by 149 (25.7%) who used soap to wash their hands. The majority of study participants 305 (52.6%) responded that they don't know for how long to wash their hands at a time. In terms of frequency, 388 (66.9%) of participants reported that they wash their hands often with soap before meals followed by

Table 1. Socio-demographic characteristics of students in Damot Woide District Primary Schools, Wolaita zone, Ethiopia, May 2018 (n = 580).

VARIABLE	RESPONSE	URBAN	RURAL	TOTAL
		N (%)	N (%)	N (%)
Grade	Grade 5	42 (25)	126 (75)	168 (29.0)
	Grade 6	35 (20.1)	139 (79.9)	174 (30.0)
	Grade 7	27 (20.8)	103 (79.2)	130 (22.4)
	Grade 8	26 (24.1)	82 (75.9)	108 (18.6)
Age (y)	<14	97 (29)	237 (71)	334 (57.6)
	⩾14	33 (13.4)	213 (86.6)	246 (42.4)
Sex	Male	54 (20.1)	214 (79.9)	268 (46.2)
	Female	76 (24.4)	236 (75.6)	312 (53.8)
Maternal education	Illiterate	22 (12.6)	152 (87.4)	174 (30)
	Grade 1-8	31 (13.6)	197 (86.4)	228 (39.3)
	Grade 9-12	32 (29.6)	76 (70.4)	108 (18.6)
	Grade ⩾12	45 (64.3)	25 (35.7)	70 (12.1)
Maternal occupation	Housewife	57 (15.9)	302 (84.1)	359 (61.9)
	Non-housewife	73 (33.1)	148 (66.9)	221 (38.1)
Fathers education	Illiterate	14 (10.8)	116 (89.2)	130 (22.4)
	Grade 1-8	23 (13.2)	151 (86.8)	174 (30)
	Grade 9-12	35 (19.7)	143 (80.3)	178 (30.7)
	Grade ⩾12	58 (59.2)	40 (40.8)	98 (16.9)
Fathers occupation	Farmer	27 (7)	357 (93)	384 (66.2)
	Non-farmers	103 (52.5)	93 (47.5)	196 (33.8)

those washing very often with soap 76 (13.1%). Of 580 students, 372 (64.1%) reported that they often wash their hands with soap after using the toilet, whereas only 74 (12.8%) of the students wash their hands always after using the toilet. In general, 163 (28.1%) (95% CI, 24.5, 31.7%) of the participants had good handwashing practice.

Handwashing facilities at the home of students

The most common water source in households was piped water, 337 (58.1%) (Table 2). Most of the students 474 (81.7%) reported having a handwashing facility in the family and of which 394 (82.9%) responded as handwashing is functional (properly working at the time survey, faucets are working and water is available) (Table 3). Two hundred thirty (39.7%) students responded to the presence of only water to wash hands at home, while 396 (68.3%) reported the presence of water and soap for washing hands at home.

Personal and social factors for handwashing practice

The majority of the 398 students (73.3%) mentioned the benefit of handwashing in the prevention of disease (Table 4). Three hundred twenty (55.2%) respondents reported forgetfulness as the reason for not washing hands, followed by laziness 78 (13.4%). The majority of participants 509 (87.8%) responded that as they know, poor handwashing causes disease. Two hundred sixty (44.8) of the respondents reported that plain water is enough for handwashing. Two hundred ninety-seven (51.2%) participants reported that they need to wash their hands with soap if only they look filthy or smell bad. Most of the participants 175 (30.2%) and 170 (30%) reported having heard about handwashing from the mini-media (school-based mass-media, audio-visual, and information center) and radio, respectively. Referents (role models) of students for handwashing were parents 306 (52.8%) and teachers124 (21.4%), respectively.

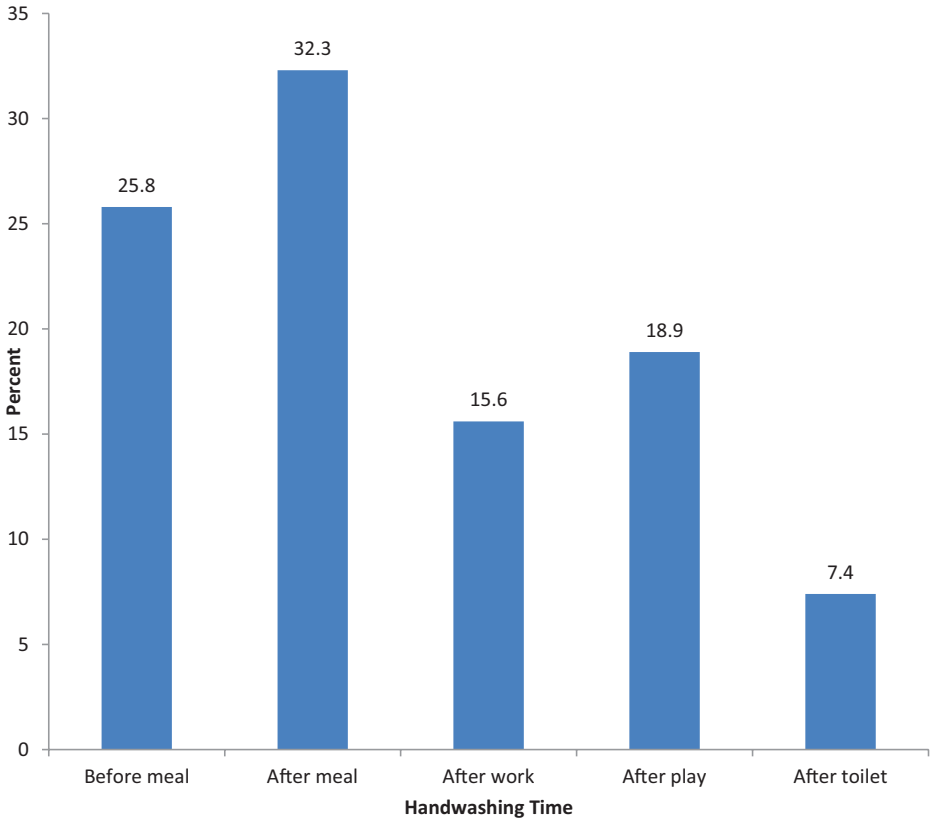

Figure 1. Usual handwashing time of students in primary schools of the Damot Woide district in the Wolaita zone, Ethiopia, May 2018.

School handwashing facility observation result

Based on the observational checklist, 4 of 6 schools had handwashing facilities (tap water, tippy-tap, buckets, soap, basin, sink, etc. . .) in their compound at a distance of fewer than 10 m from the latrine facilities. But access to water to handwashing facilities is only available in 3 schools. There is no soap for handwashing facilities in all schools. The handwashing facilities in all schools are not connected to the pipeline, since the school did not have access to water through the pipe. In 5 schools, there are sanitation and hygiene clubs to provide awareness to the school community, but only 4 schools clubs had broadcast handwashing promotions through mini-media. About 5 of the schools celebrate the annual "Handwashing Day."

Factors affecting handwashing practice in primary school children

On the result of multivariate logistic regression models, being grade 8, living in an urban area, having referents as parents, teachers, and health professionals, and the presence of a handwashing facility in the school was significantly associated with handwashing practice. Grade 8 students were 3.54 times more likely to practice proper handwashing practice compared to grade 5 students (AOR = 3.54, 95% CI: 1.52, 8.23). Students living in an urban area were 18.84 times more likely to practice proper handwashing practice compared to students living in a rural area (AOR = 18.84, 95% CI: 14.02, 23.29). Students whose referents were parents, teachers, and health professionals were more likely (AOR = 10.74; 95% CI 8.80-12.36, AOR = 6.45; 95% CI 5.52-8.99, AOR = 9.62; 95% CI 2.70-14.19 respectively) to practice proper handwashing practice compared to those whose referents were friends. Students attending a school where there is a handwashing facility were 3.84 times more likely to practice proper handwashing practice compared to those who are learning at school where there is no handwashing facility (AOR = 3.84, 95% CI 3.60, 4.07) (Table 5).

Discussion

The proportion of students with good handwashing practice in primary schools in Damot Woide district of Wolaita zone, Ethiopia, was 28.10% (95% CI, 24.5, 31.7%). A slightly higher proportion of the handwashing practice of the students was criticized compared to the study conducted in the town of Arba Minch town, Ethiopia which is (22.3%)[24] and slightly lower proportion than a study conducted in Sebeta, Ethiopia (32%)[36] whereas a study in Colombia, showed 36.6%.[17] The variability in proportion may be due to the difference in access to handwashing facilities in schools and households and, sociodemographic, educational, economic, and cultural differences with the current study area.

This study identified associated factors for proper handwashing practice among students, grade 8 students were 3.54

Table 2. Handwashing practice of the students in Damot Woide District primary schools in Wolaita zone, Ethiopia, May 2018 (n = 580).

VARIABLE	RESPONSES	FREQUENCY	PERCENT
Water sources in	Pipe water	337	58.10
	Spring	114	19.70
	Hand-dug well	22	3.80
	Deep well	20	3.40
	River/Lake	87	15.00
Washed their hands in the last 12 h	Yes	570	98.30
	No	10	1.70
Usual hand washing time	Before meal	147	25.80
	After meal	184	32.30
	After work	89	15.60
	After play	108	18.90
	After toilet	42	7.40
Items used for hand washing	Plain water only	309	53.30
	Plain water with Soap	149	25.70
	Plain water with Ash	39	6.70
	Other	23	4.00
More practiced to washing hands in the family	Ash and water	28	4.80
	Soap and water	203	35.00
	Water only	349	60.20
Duration of washing their hands at a time	<20 s	63	10.90
	20 s-1 min	212	36.60
	Do not know	305	52.60
How often do you wash hands with soap before a meal?	Always	50	8.60
	Very often	76	13.10
	Often	388	66.90
	Some times	66	11.40
How often do you wash hands with soap after using the toilet?	Always	74	12.80
	Very often	48	8.30
	Often	372	64.10
	Some times	70	12.10
	Never	16	2.80
Proper handwashing practice	Yes	163	28.10
	No	417	71.90

times more likely to practice proper handwashing compared to grade 5 students, this could be due to teachers focusing on higher grade students, and they could learn as their age increases and are more likely to practice what they learned. This study is comparable to that in Vietnam in that the proportion of handwashing increased with increasing students' grade level.[20]

Students living in the urban area were 18.84 times more likely to practice proper handwashing compared to students

Table 3. Handwashing facilities at the students' home in Damot Woide District primary schools in the Wolaita zone, Ethiopia, May 2018.

VARIABLE	RESPONSE	FREQUENCY	PERCENT
Presence of handwashing facility in the home	Yes	474	81.70
	No	106	18.30
Functional handwashing facility in the home	Yes	394	82.90
	No	80	17.10
Time taken to fetch water in the home	<15 min	360	62.10
	15-30 min	150	25.90
	>30 min	70	13
Handwashing facilities in the home easy to Clean	Yes	252	43.40
	No	328	56.60
Presence of soap and water for handwashing at home	Yes	396	68.30
	No	184	31.70

Table 4. Personal factors for the practice of handwashing by children in primary schools in the Damot Woide district in the Wolaita zone, SNNPR, Ethiopia, May 2018.

VARIABLE	RESPONSES	FREQUENCY	PERCENT
The benefit of handwashing	To prevent disease	398	73.30
	To free from bad smell	48	8.80
	To remove dirt's	42	7.70
	To clean hand	49	9
What are your reasons for not washing hands	Forget fullness	320	55.2
	Laziness	78	13.4
	Lack of time	36	6.2
	Lack of interest	58	10.0
	Lack of water	55	9.5
	Lack of soap	33	6.0
Source of media information about handwashing	Television	65	11.2
	Radio	174	30.0
	Leaflets	61	10.5
	Newspaper	11	1.9
	Min-media	175	30.2
	Textbooks	94	16.2
Referents (role model) for handwashing practice	Parents	306	52.8
	Teachers	124	21.4
	Health professionals	50	8.6
	Friends	100	17.2

living in the rural area. A similar study was conducted in Arba Minch[24] and Bangladesh[29] revealed that urban students living in urban settings were more likely to practice proper handwashing than those living in rural areas. These differences can be revealed that evaluating school children's handwashing practice in a rural and urban setting could be worth of different

Table 5. Predictor variable analysis of children's handwashing practice in the primary school of the Damot Woide District primary schools in the Wolaita zone, Ethiopia, May 2018.

VARIABLE	RESPONSE	HAND WASHING PRACTICE		OR 95% CI	
		PROPER	IMPROPER	COR	AOR
Grade of students	Grade 5	42	126	1.00	
	Grade 6	37	137	0.80 (0.50, 1.34)	0.87 (0.45, 1.69)
	Grade 7	45	85	1.58 (0.96, 2.60)	1.54 (0.75, 3.16)
	Grade 8	39	69	1.70 (1.00, 2.80)	3.54 (1.52, 8.23)
Age	<14 y	103	231	1.00	1.00
	⩾14 y	60	186	0.72 (0.49, 1.05)	0.38 (0.21, 1.70)
Sex	Male	84	184	1.34 (0.94, 1.93)	1.15(0.70, 1.90)
	Female	79	233	1.00	1.00
Residence	Urban	72	59	4.70 (3.17, 7.26)	18.84 (14.02, 23.29)
	Rural	91	358	1.00	1.00
Maternal education	Non-educated	27	147	1.00	1.00
	Grade 1-8	69	159	2.36 (1.40, 3.88)	1.57 (0.78, 3.14)
	Grade 9-12	38	70	2.95 (1.67, 5.20)	1.86 (0.83, 4.17)
	Grade ⩾12	29	41	3.80 (2.05, 7.20)	2.79 (0.89, 8.70)
Paternal education	Non-educated	21	109	1.00	1.00
	Grade 1-8	47	127	1.92 (1.08, 3.41)	1.16 (0.54, 2.48)
	Grade 9-12	56	122	2.38 (1.38, 4.18)	1.56 (0.72, 3.36)
	Grade ⩾ 12	39	59	3.43 (1.85, 6.36)	1.25 (0.45, 3.51)
Referents for handwashing practice	Parents	99	207	7.50 (3.17, 17.69)	10.74 (8.80, 12.36)
	Teachers	47	77	9.50 (3.80, 23.50)	6.45 (5.52, 8.99)
	Health personnel	11	39	4.40 (1.50, 12.70)	9.62 (2.70, 14.19)
	Friends	6	94	1.00	1.00
Handwashing facility in the school	Yes	158	257	3.44 (2.15, 5.50)	3.84 (3.60, 4.07)
	No	25	140	1.00	1.00

scenarios.[37] This may be due to behavioral differences among rural and urban dwellers and also due to inadequate access to water, handwashing facility, and household level issues.

Students whose parents are used as important referents/role models to wash their hands were 10.74 times more likely to practice handwashing than those who used their friends as a role models. Similarly, students whose referents are teachers for handwashing practice were 6.45 times more likely to practice proper handwashing compared to those students whose important referents/role models were friends. These are in line with a study conducted in Indonesia and Arba-Minch, Ethiopia.[24,29,38] This might be due to parents and teachers being more trustworthy sources of information for behavioral changes in students than friends. Though friends are peers, they undermine their friends due to the "we are all in the same boat" effect.

Students attending a school where there is a handwashing facility were 3.84 times more likely to practice proper handwashing than those attending a school where there is no handwashing facility. According to a study conducted in Ghana, accessibility, and availability of handwashing facilities in schools[26,39] and Indonesia, availability of clean water and soap at handwashing stands[25,40] were found to be significant predictors of proper handwashing practice. This may be because handwashing facilities motivate the students to wash their hands properly.

The strength of this study was conducted in a school-based environment in which handwashing matters most in maintaining the health of pupils in representing both rural and urban school settings. However, parents and teachers have not been involved in responding to students' handwashing practice-related questions which was a missing opportunity. Schools were selected purposively due to lack of transport access and logistic inconveniences that may introduce some level of bias in terms of representativeness and generalizability. Data collection would have been best if handwashing practices were observed anonymously than depending on the self-reported practice. Being cross-sectional study design and the majority of the finding is based on the self-reported response of study participants. Data analysis lacks some level of weighing for clustering effect between urban and rural school settings.

Conclusion

The proportion of students who practiced proper handwashing in the school was low. Grade 8 students; urban students; students whose important referents for handwashing were parents, teachers, and health professionals; and students who had access to handwashing facilities in schools were significant factors for proper practice of handwashing. Therefore, all primary schools should advocate and involve students in handwashing practice activities at school and outside the school in age-specific WASH intervention in both rural and urban setting schools. The rural health extension program should focus on hygiene education on handwashing practice at the family level (children and their parents) and in schools (teachers). Local government and non-governmental offices in the area should support school clubs to teach/demonstrate proper handwashing practices by providing well-designed, well-functioning, and conveniently-located handwashing facilities and infrastructures. Finally, we strongly recommended a more robust research design for future studies, involving parents and more in the observational and qualitative study design.

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Author Contributions

AA: conceived and designed the study, performed analysis, interpreted the data. All authors were involved in the analysis, interpretation of the data. AA: prepared the original manuscript draft. FWF: revised the manuscript. All authors critically reviewed and approved the final manuscript.

Availability of Data and Materials

The data sets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Ethical Considerations

Ethics clearance was obtained from the Ethics Review Board of Wolaita Sodo University. After approval, an official letter of cooperation was sent to the Damot Woide District Education office. The permission letter was obtained from the district education office before data collection. The nature of the study was fully explained to the study participants and informed written consent was obtained from each school director before data collection to maintain privacy and confidentiality. Participants were told that documents will be kept in a secure place to avoid access to others, and they were informed that they have the right to refuse and withdraw from the interview at any time if they are not comfortable.

ORCID iD

Fentaw Wassie Feleke https://orcid.org/0000-0002-4482-877X

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