Original article

Water safety, sanitation and hygiene related knowledge, attitudes and practices among household residents in peri-urban areas in Northwest Ethiopia

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Abstract

Background: People living is peri-urban areas in Sub-Saharan Africa are faced with the challenge of improving sanitation, hygiene and access to safe water supplies. However, there is limited information on the knowledge, attitudes and practices of household residents in relation to water safety, sanitation and hygiene. This study was carried out in three peri-urban areas to determine residents' knowledge, attitudes and practices, as well as ascertain their sources of drinking water and access to sanitation facilities.

Methods: We conducted a cross-sectional study at household level in three peri-urban areas in May 2016. Data were collected through face-to face interviews using a structured questionnaire.

Results: Overall, 590 adults took part in the study. The overall mean knowledge of adults in terms of water safety, sanitation and hygiene was 78.1% (95% CI: 76.7-79.4). Adults' favorable attitudes to water safety, sanitation and hygiene was 73.6% (95% CI: 71.1-76.1)**.** Household water treatment (HWT) was practiced by one-third (34%) of the respondents. Chlorination, called *wuha agare* in Amharic, was a major (20%) method of HWT. Latrines were used by 523 (88.6%) respondents, with 129 (22%) using shared public latrines. Open defecation was practiced by 67 (11.3%) respondents. The respondents with a higher level of education had good knowledge and practices in relation to safe water, sanitation and hygiene compared to participants with no formal education (P<0.001). Hand washing with soap was more likely to be practiced by younger people (COR = 2.0; 95% CI: 1.3-3.0) and those who were formally educated (COR = 4.1; 95% CI: 2.3-7.3). The two-week diarrhea prevalence was significantly higher among households with no practice of HWT compared to households with HWT practices (21.2% vs 13%; P<0.02).

Conclusions: The educational status of household residents was associated with good levels of knowledge, attitudes and practices in relation to water safety, sanitation and hygiene. HWT, open defecation and shared latrines are matters that still require intervention in peri-urban areas. [*Ethiop. J. Health Dev.* 2018;32(3):00-000]

Key words: Knowledge, attitude, practices, water, sanitation, peri-urban.

Background

Water-borne diseases associated with unsafe water, poor sanitation and poor hygiene are major causes of morbidity and mortality in resource-limited countries. Access to safe drinking water is an important public health and development issue worldwide. For instance, according to a World Health Organization report, globally 2.3 billion people lack safe water at home and 844 million people do not have basic drinking water supplies (1). Furthermore, 2.5 million people worldwide do not have access to any type of improved sanitation (2). The WHO/UNICEF Joint Monitoring Programme (JMP) estimates that in Ethiopia the urban improved drinking water coverage is 93% (56% piped into premises and 37% other improved sources). The use of improved and shared sanitation coverage is estimated to be 27% and 40%, respectively (3). In Amhara region, water and sanitation/latrine coverage is between 56% and 72.2%, respectively (4).

Diarrhea associated with consuming unsafe drinking water is a major worldwide public health problem (5). In 2015, diarrhea caused 1.3 million deaths globally and is deemed to be the fourth leading cause of death among children under 5 years (6,7). Ethiopia, like other Sub-Saharan African countries, has high morbidity and mortality linked with acute diarrhea. The Ethiopian Demographic and Health Survey (EDHS) of 2016 reported prevalence of diarrhea episode at 12% in the community (8).

In Sub-Saharan Africa, access to safe drinking water in peri-urban areas is inadequate and complicated by the influx of people from rural to urban areas, poverty, and poor sanitation and housing conditions (9). Poor water supplies can lead to high incidences of diarrhea in peri-urban areas in general (10-12). Peri-urban areas in Ethiopia are no exception, hence they require improvement of sanitation, hygiene and access to improved water supplies.

Unless people have adequate knowledge, attitudes and practices in relation to drinking water, sanitation and hygiene, mere access to the services is not sufficient mitigate health problems related to unsafe water and poor sanitation and hygiene. Three key hygiene practices safe disposal of feces, hand washing with soap at critical times, and the treatment and storage of drinking water are the most effective ways of reducing diarrheal disease (13). Information on knowledge, attitudes and practices (KAPs) in relation to water

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safety, sanitation and hygiene in peri-urban areas is essential to prevent water-borne diseases. This study was carried out to determine the knowledge, attitudes and practices of adult members of households in three peri-urban areas in Northwest Ethiopia. Other findings from the study relate to residents' sources of drinking water, access to sanitation, and the extent of two-week prevalence of diarrhea in children under 5 years.

Methods

Study design and area: We carried out a cross-sectional community based study in May 2016. This study included three peri-urban areas of Bahir Dar city (Tis-Abay, Meshenti and Zegi). The number of households studied during the research period was 3,986 (Zegi = 771, Meshenti = 879 and Tis-Abay = 2,336). All household adult members of the Tis-Abay, Meshenti and Zegi areas were the target population. The study population was adults from each household aged 18 years and above (one adult from each house).

Sample size and sampling: The sample size for households was determined using Epi info version 3.5.1 (public domain software, www.cdc.gov), by considering 99% confidence level and marginal error (5%). The maximum (50%) of households assumed to have sufficient knowledge, attitude and practices on water safety and sanitation. The total sample size was 570 plus 5% (n = 29). Non-respondents were included and the total sample size was 599.

Using household lists, systematic random sampling was applied to the selection of households. To ensure homogeneity, a random number was determined to select households (HHs) by dividing the total number of HHs by the sample size. For instance, for Meshenti (HH = 771) and sample size (n = 2,005), 771/205 = 3, so 3 was used as the random number. So, every household was selected by making a gap of three households. From each household, one participant participated in the study.

Data collecting instruments: A total of 34-list of questions were included in the questionnaires sheet. The items were developed with reference to the Ethiopia Demographic and Health Survey (8). Trained health extension workers collected data through face-to-face interviews. Furthermore, observational checklists were used to assess water handling and sanitation practices. Senior health officers supervised data collectors. Eight questions were used to identify demographics, water sources, latrine coverage, and two-week prevalence of diarrhea in children under 5. Twenty-six questions were used to determine the knowledge, attitudes and practices of household adults towards water safety, sanitation and hygiene.

Data quality: All data collectors and supervisors were trained for one day on the contents of questionnaire. Supervised checked completeness of data on a daily basis. At entry investigator checked completeness and consistency.

Data analysis: SPSS ver 20 statistical package was used to analyze data and Chi-square test was applied to determine the association of between gender and categorical variables. For KAPs, mean scores were calculated. A P value of <0.05 (two-sided) was taken as a measure of statistical significance.

Operational definition: For the knowledge assessment, each correct response was given a score of 1, while a wrong response was scored as 0. A mean knowledge score of <0.70 was considered as below the expected level of knowledge, while average scores ≥ 0.70 were at the expected level of knowledge. Regarding attitudes, responses such as 'very concerned', 'concerned about water safety' and 'toilet use for health benefit' were considered 'favorable'. Two-week diarrhea was defined as the passage of three or more loose or liquid stools per day for the individual in the past two weeks before the study took place.

Ethics approval: The Research Ethics Review Board of Bahir Dar University approved the research for ethical clearance. We obtained written consent from study participants from each household. All the study participants were informed that they could refuse to participate if they were not interested in the interview. The study participants were assured that the data collection was anonymous.

Results

Demographic status: This study included 590 households from three peri-urban areas. Of the initial 599 respondents, nine respondents were excluded on the basis of missing data for at least one variable in the analysis. From each household, one adult participant was selected. Of the 590 adults, 80.8% were females. The median age of the study participants was 35. Regarding educational status, 286 (48.5%) had no formal education. Table 1 depicts the number of households surveyed, demographic variables, water sources, and sanitation and hygiene profiles of the respondents.

Water sources and sanitation profiles: Overall, 80.3% of the households used a piped water supply. Water sources from springs and privately dug wells accounted for 6.6% and 4.4% of households, respectively. The households reported that they used different water sources for various purposes, such as drinking, cleaning utensils and washing clothes. Piped water was used mainly for drinking, while more than half of the households used it for washing clothes and utensils. Moreover, 3.6% and 24.5% of households used water from a river for drinking and washing clothes, respectively (Table 1). Overall, 523 (88.6%) households had latrines. Open pit latrines were common (497, 84.2%) in households in the study areas. Of these, 22% of households shared latrines with at least one other household.

Table 1: **Demographic, water sources, sanitation and hygiene profiles of respondents**

Variables	Frequency No. (%)			
	Peri-urban areas			
	Tis-Abay (n = 199)	Meshenti (n = 204)	Zegi (n = 187)	Total (n = 590)
Gender				
Female	152 (76.4)	169 (82.8)	156 (83.4)	477 (80.8)
Male	47 (23.6)	35 (17.2)	31 (16.6)	113 (19.2)
Education				
No formal education	94 (47.2)	100 (49.0)	92 (49.2)	286 (48.5)
Grades 1–8	76 (38.2)	59 (29.0)	83 (44.4)	218 (37.0)
High school and above	29 (14.6)	45 (22.0)	12 (6.4)	86 (14.5)
Water sources				
Piped water	146 (73.4)	201 (98.5)	127 (68.0)	474 (80.3)
Bore well/tube well	0	1 (0.5)	23 (12.3)	24 (4.0)
Private dug well	1 (0.5)	2 (1.0)	23 (12.3)	26 (4.4)
Spring	30 (15.1)	0	9 (4.8)	39 (6.6)
River	18 (9.0)	0	5 (2.7)	23 (3.9)
Sanitation and hygiene				
Latrine coverage	154 (77.4)	189 (92.6)	180 (96.3)	523 (88.6)
Private	102 (51.3)	135 (66.2)	156 (83.4)	393 (66.6)
Shared	52 (48.7)	56 (33.8)	21 (16.6)	129 (22.0)
Open pit latrine	151 (76.0)	187 (91.6)	163 (87.2)	497 (84.2)
Pit with slab	0	2 (1.0)	2 (1.1)	4 (0.7)
Other improved	3 (1.5)	0	15 (9.1)	18 (3.0)
Open defecation	45 (22.6)	13 (6.4)	9 (4.8)	67 (11.3)
Hand washing				
After toilet	95 (48.0)	90 (44.)	152 (81.3)	396 (67.1)
Before eating	150 (75.4)	109 (53.4)	149 (80.0)	408 (69.2)
With water and soap	65 (32.7)	152 (74.5)	66 (35.3)	283 (48.0)
With water and ash	18 (9.0)	7 (3.5)	45 (24.1)	70 (12.4)
With water only	111 (55.8)	45 (22.0)	75 (40.1)	228 (38.6)
Diarrhea under 5 yrs in 2 wks	26 (13.1)	29 (14.2)	21 (11.2)	76 (13.6)

	Water purpose no. (%)		
Water source	Drinking	Cleaning utensils	Washing clothes
Piped water	469 (79.5)	384 (65.1)	334 (56.4)
Bore well/tube well	53 (9.0)	53 (9.0)	51 (8.6)
Private dug well	35 (6.0)	58 (10.0)	53 (9.0)
Spring	12 (2.0)	9 (1.5)	9 (1.5)
River	21 (3.6)	86 (14.6)	143 (24.5)

Levels of knowledge: The overall mean knowledge of adults in terms of water safety, sanitation and hygiene was 78.1% (95% CI: 76.7-79.4). In this study, 82%-98% of adults knew that unsafe drinking water can cause diarrhea and other illnesses. In terms of using latrines, 95.2% of adults gave the correct reason for using latrines instead of open-field defecation. Statistically significant differences were observed on the levels of knowledge and education ($P<0.05$). Study participants with higher educational status were more knowledgeable about water safety, sanitation and hygiene than their counterparts (Table 2). However, no statistically significant association was noted between gender and levels of knowledge.

Levels of attitude: In this survey, favorable attitudes towards water safety, sanitation and hygiene was 73.6% (95% CI: 71.1-76.1) (Table 3). Regarding the quality of water, 80.5% of adults had favorable attitudes (very concerned and concerned) about the safety of drinking water. Sixty-seven per cent of adults perceived that they used the toilet primarily for health benefits, while 28% stated that they used the toilet to avoid bad smells.

Table 2: **Knowledge levels in households about drinking water safety, sanitation and hygiene**

Knowledge questions	**Variables**							
	Correct answer no. (%)							
	Male	Females	P value	No education	Grade 1-8	High school	P value	**Total**
Drinking unsafe water can cause illness?	111 (98.2)	467 (97.9)	0.69	277 (96.8)	216 (99.1)	86 (100)	NA	579 (98.1)
Drinking unsafe water can cause diarrhea?	99 (87.6)	382 (80.0)	0.06	219 (76.6)	188 (86.2)	75 (87.2)	0.007	482 (81.7)
Have you ever treated drinking water?	39 (34.5)	161 (33.8)	0.71	80 (28.0)	85 (39.0)	35 (40.7)	0.010	200 (34.0)
Have you heard about safety of drinking water?	79 (70.0)	322 (67.5)	0.32	175 (61.2)	159 (73.0)	67 (78.0)	0.007	401 (68.0)
Do you think children's feces may contain germs?	107 (94.7)	432 (90.6)	0.42	251 (87.8)	204 (93.6)	85 (98.8)	0.002	540 (91.5)
Importance of using toilet than open defecation?	111 (98.2)	451 (94.5)	0.14	269 (94.0)	211 (96.8)	85 (98.8)	0.09	562 (95.2)
Overall mean knowledge in % (95% CI)	**80.5 (77.4-83.3)**	**77.4 (75.8-78.9)**		**74.0 (72-77)**	**81.3 (79-83)**	**83.9 (80-87)**		**78.1 (76.7-79.4)**

NA = not applicable; CI = confidence interval

Table 3: **Attitudes of households towards water safety, sanitation and hygiene**

Attitude questions	**Responses N (%)**				
	Very satisfied	Satisfied	Not satisfied	Don't know	Favorable attitude
Satisfied with current information about safety of drinking water?	160 (27.1)	265 (45.0)	159 (27.0)	6 (1.0)	NA
Are you concerned about safety of drinking water?	Very concerned	Concerned	Not concerned	Don't know	
	222 (37.6)	253 (42.9)	103 (17.4)	12 (2.0)	475 (80.5)
Main reason for using toilet instead of open defecation is:	Avoid bad smell	Health benefit	For privacy	Don't know	
	166 (28.0)	394 (67.0)	25 (4.2)	5 (0.8)	394 (67.0)
Overall mean favorable attitude in % (95% CI)					**73.6 (71.1-76.1)**

Levels of practice: Overall, 200 participants (34%) had treated drinking water. Of these, 20% and 13% of respondents stated that they had treated drinking water using chlorine (*wuha agare*) and by boiling, respectively. Respondents with a formal education were more likely to practice HWT (OR = 0.57; 95% CI: 0.3-0.9; P = 0.02) (Table 5). It was observed that 62.4% of households had separate water containers for drinking water. Moreover, the majority of water containers (69%) were narrow-necked, and more than half of households used a ladle to draw water from containers (Table 4).

Table 4: **Water safety, sanitation and hygiene practices of households**

Practice questions	**Frequency**	
Drinking water handling practices	**No.**	**%**
Treating drinking water by boiling	76	13.0
Treating drinking water by filtering	5	0.8
Treating drinking water using chlorine (*wuha agare*)	119	20.1
Availability of water container	555	94.0
Availability of separate container for drinking water	368	62.4
Narrow-necked water container	409	69.3
Use of ladle to draw water from container	332	56.2
Sanitation and hygiene practice		
Defecation using toilet	523	88.6
Open air defecation	67	11.4
Waste disposal practices		
Waste water into open drain	448	76.0
Waste water via drainage tube	142	24.0
Solid waste into the garden	186	31.5
Solid waste by burning	301	51.0
Solid into waste container	103	17.5
Disposal of children's feces		
Put in latrine	483	81.9
Throw in the open field	92	15.6
Buried feces	15	2.5

An assessment of hygienic practices demonstrated that hand washing after using the toilet was practiced by 67% of households. Of these, 48% of the respondents stated that they wash their hands with soap and water. Hand washing practice with soap was significantly associated with those who were younger (COR = 2.0; 95% CI: 1.3-3.0) or were educated (COR = 4.1; 95% CI: 2.3-7.3) (Table 5). In terms of sanitation, 11.4% of the households reported that they practiced open-field defecation. Moreover, 15.6% of the households practiced unsafe disposal of child feces. It was observed that 76% and 31.5% of households dispose of waste water and solid waste, respectively, into open fields.

Two-week prevalence of diarrhea: The two-week prevalence of diarrhea in children under 5 years of age was 76/559 (13.6%). Two-week prevalence of diarrhea was significantly higher among households who had lower HWT practices than counterparts (COR= 0.56, 95% CI: 0.34-0.93; P≤0.01).

Table 5: **Key hygiene and sanitation practices and associated factors of respondents**

Variables	Hand wash with soap	Open defecation	Water treatment
Sex			
Male (n = 113)	63 (55.8)	12 (10.6)	39 (34.5)
Female (n = 477)	220 (46.1)	55 (11.5)	161 (33.8)
COR, 95% CI	1.4 (0.9-2.2)	0.9 (0.4-1.8)	1.0 (0.7-1.6)
P value	0.08	0.91	0.87
Age group			
18-28 yrs (n = 197)	119 (61)	22 (11.2)	60 (30.5)
29-39 yrs (n = 198)	85 (43)	22 (11.1)	72 (36.4)
>39 yrs (n = 195)[1]	79 (40)	23 (11.8)	68 (35.0)
COR, 95% CI	2.0 (1.3-3.0)	1.0 (0.5-1.9)	0.7 (0.5-1.2)
P value	<0.001	0.98	0.21
Level of education			
No formal education (n = 286)	114 (40)	39 (13.6)	80 (28.0)
Grades 1-8 (n = 218)[1]	106 (49)	22 (10.1)	85 (39.0)
High school and above (n = 86)	63 (73)	6 (7.0)	35 (40.7)
COR, 95% CI	4.1 (2.3-7.3)	2 (0.8-5.7)	0.57 (0.3-0.9)
P value	<0.001	0.13	<0.02
Water treatment practice	**Two-week diarrhea prevalence at households**		
	Yes	No	
Yes (n = 200)	26 (13.0)	174 (87.0)	
No (n = 359)	76 (21.2)	283 (78.8)	
COR, 95% CI	0.56 (0.34-0.93)		
P value	<0.01		

Key: COR = crude odds ratio and 1 Reference category

Discussion

In the present study, the majority of households (80%) used piped water supplies. Similarly, a study conducted in 16 small towns in Ethiopia reported that 79% of households used piped water (14). This finding is in line with JMP estimates that, in urban areas, 56% of households have water piped into their homes and 36% use other improved sources. (3). The respondents stated that they use different water sources for different purposes. For instance, 24.5%, 14.6% and 3.6% of households use river water for washing clothes, cleaning utensils and drinking, respectively.

Latrine usage by households in the present study (88.6%) reflects the results of other studies in Ethiopia, which report that between 80% and 87% of households have access to latrines (14,15). According to JMP, toilets must be used by only one household. However, 22% of households shared latrines with at least one other household. This is in line with WHO reports, which state that 19% of the population in Sub-Saharan Africa depend on shared latrines (16). In contrast, the JMP's estimate of the extent of shared latrines in Ethiopia, at 40%, is much higher (3). In this study, we noted that the availability of improved sanitation (pit latrines with slab and flush toilet, private household latrines) was low.

The two-week prevalence of diarrhea among children under 5 years of age was found to be 13.6%. This is in line with the two-week prevalence of diarrhea in Ethiopia as a whole, at 11.5% to 12.2% (17). However, higher prevalence, such as 30.5%, 29%, 22.5% and 18%, have been documented in other parts of Ethiopia (18-21). These variations could be attributed to multiple factors such as access to safe drinking water supplies and sanitation. Moreover, the KAPs of parents/guardians of the children in relation to safe water and sanitation would be a factor. Furthermore, we noted that households with practice HWT had lower two-week prevalence of diarrhea compared to their counterparts.

The overall assessments of knowledge showed that the majority of respondents (75.7%) were knowledgeable about water safety, sanitation and hygiene. Study participants with higher educational levels were more knowledgeable than their counterparts. For instance, 76.6% of non-educated and 87.2% of educated respondents knew that drinking unsafe water can cause diarrhea (P<0.007). Likewise, a study conducted in India reported that 83% of respondents felt that unclean water can cause gastrointestinal infections (15). However, studies conducted in rural India reported that only 12.4% to 18% of respondents considered water as a source of diarrhea (22,23).

The safe disposal of feces, hand washing with soap at critical times, and treatment of drinking water, are the most effective ways of reducing the burden of diarrheal disease. In the present study, only one-third (34%) of the respondents had experience of HWT. Respondents who had been schooled from Grades 1 to 8, as well as those who had attended high school and above, were more likely to practice HWT than participants with no formal education. Hand washing with soap after defecation was more likely to be practiced by younger respondents. The practice of open defecation in peri-urban areas (11.4%) is still a major problem in this study, compared to JMP estimates of 6% open defecation among the urban population in Ethiopia (2). The practice of unsafe disposal of child feces (15.6%) is also a major malpractice in households. However, a study conducted in rural India reported a higher prevalence of unsafe disposal of child feces (72.4%) (19). Participants in the present study may have tended to provide socially desirable responses, therefore this is deemed as a limitation of the study.

Conclusions:

This study demonstrates that the educational status of household residents is associated with good levels of knowledge, attitudes and practices in relation to water

safety, sanitation and hygiene. Only one-third of residents had experience of HWT using chlorination and boiling. Open defecation and the unsafe disposal of child feces are still major malpractices in peri-urban areas. HWT, open defecation and shared latrines practices are still subject to intervention measures in peri-urban areas.

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