Full Length Research Article

Assessment of household water handling practices and associated factors among households of Chencha District, southern Ethiopia

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Abstract

World Health Organization data on the burden of disease suggest that approximately 3.2% of the deaths (1.8 million) and 4.2% of the disability-adjusted-life years (61.9 million) worldwide are attributable to unsafe water, sanitation and hygiene. The present study, therefore, aimed to assess household water handling practices and associated factors among households of Chencha district, southern Ethiopia, 2017. Community based cross-sectional study design and a multi-stage sampling procedure was used to select study participants. Data was collected by trained data collectors using pretested questionnaire administered in face to face interviews after getting ethical clearance from ethical review board of Arba Minch University and informed verbal consent from participants. Data entry and clearing was made by using EpiData version 3.1 and then exported to SPSS version 20 software for analysis. Descriptive statistics such as frequency distribution and percentages was used. Crude and adjusted odds ratio was calculated in Bivariate and multivariate logistic regressions. In this study 739 respondents were asked about their household water handling practices and the response rate was 100%. The mean age of the participants was 34.62 with a standard deviation of ± 8.36 years. From total respondents only 484(65.5%) exercised good water handling practices. Age of respondent (51%), hand washing after toilet (38%), and plastic bucket (16%) were some of the factors that affected safe water handling practices. So, emphasis needs to be given to behavioral change communication to create awareness on water handling practices.

Keywords: Chencha, sanitation, water handling

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1. Introduction

Household water handling is the treatment of water at point of use and its safe storage. Practice of household water treatment and safe storage (HWTS) can help to improve water quality at the point of consumption, especially when drinking water sources are distant, unreliable or unsafe (Belay *et al.,* 2015). World Health Organization (WHO) data on the burden of disease suggest that approximately 3.2% of deaths (1.8 million) and 4.2% of disability-adjusted-life years (61.9 million) worldwide are attributable to unsafe water, sanitation and hygiene (Bloomfield, 2006). In developing countries, the rural populations that are afforded access to safe water supply have considerably increased from 36% in 1990 to 56% in 2010 (Fan *et al*., 2013). Drinking water, sanitation, and hygiene form a central part of the Sustainable Development Goals (SDGs) framework for 2015–2030 that has followed the UN's Millennium Development Goals (MDGs). Although the world met the MDG drinking water target, 748 million people mostly the poor and marginalized still lack access to an improved drinking water source. Of these, almost a quarter (173 million) relies on untreated surface water, and over 90% live in rural areas (WHO/UNICEF, 2014). In Ethiopia according to EDHS' (2016) report on households' access to drinking water, more than half of the households (57 percent) have access to an improved source of drinking water, with a much higher proportion among urban households (94%) than among rural households (46%) (Agency and Ababa, 2014). The most common source of improved drinking water in urban households is piped water, used by 87 percent of urban households. In contrast, 16 percent of rural households have access to drinking water from a protected well, and 11 percent have access this from a protected spring (Rosa and Clasen, 2010). Even if the source is safe, water become faecally contaminated during collection, transportation, storage and drawing in the household (Dawa *et al*., 2013). According to a study on household water handling practice in Low- and Medium-Income countries, the practice in Western Pacific is (66.8%), Southeast Asia (45.4%), in the Eastern Mediterranean (13.6%), and Africa (18.2%). However in Ethiopia, only 10 % of the population make use of it (Belay *et al.,* 2015; Rosa and Clasen, 2010). Lack of clean drinking water, poor sanitation facilities and lack of community education programs are contributing to continued outbreaks of acute watery diarrhea in some parts of Ethiopia (Belay *et al.,* 2015). The reason behind this was, perceptions of water quality at the tap, socio-demographic characteristics (Fielding *et al*., 2012), water quality perceptions of householder(Jain *et al*., 2014), and educational status (Amenu

et al., 2013; Fielding *et al*., 2012; Jain *et al*., 2014). The practice of safe handling of water at household level was varying in different studied areas. Therefore, the main aim of this study was to assess household water handling practice among the population of Chencha district.

2. Materials and Methods

2.1 Description of the Study Area

This study was conducted from June 2017 to July 2017 at Chencha district, southern Ethiopia. Chencha is located at 250 Km south of the capital of southern regional state, Hawassa; and 480 km south east of the capital city of Ethiopia, Addis Ababa. During the study, there were 47 rural and 3 urban administrations which are called *Kebeles* with a total population of around 154,701. From these 69, 842 were male and 84,859 were female. About 82 % of the geographical area of the district falls in high altitude (*Dega*) and 18% mid-altitude (*Weina dega*). The district had the same settlement pattern and the same mixed farming system. There were 1 Hospital, 6 Health center and 49 health post with 2 Health Extension workers in each *Kebeles*. The main water sources of the area were unprotected spring, protected spring, river, hand dug well, and deep well. These were used for drinking, cattle watering, washing clothes, and bathing in the district. Regarding improved water sources, there are 178 public tap or stand pipe, 150 spring water, 250 tube well or borehole, and 10 ponds. The overall water coverage of the area is 69.9% (Chencha district annual report, 2014).

2.1.1. Study Design

Community based cross sectional study was employed to assess household water handling practices.

2.1.2. Study Population

All households in the selected *kebels* were included as study population and those individuals who have lived at least six months in the study area were included in the study. However, respondents who were seriously ill at the time of data collection were excluded from the study.

2.2 Sample size and sampling technique

Sample size was determined using single population proportion formula by using the assumption of 95% confidence level, 5% marginal error, and 64.4% of the respondents washed their hands before collecting water (Kuberan *et al*., 2015).

$n = \underline{(Z\alpha/2)^2\ p\ (1-p)\ *deff}/\ d^2$

Where, n = sample size

P = proportion of respondents who washed their hands before collecting water

D = margin of sample error

$Z_{\alpha/2}$ = level of significant at 95% CI

Deff = design effect of clusters

$n= \underline{(1.96)^2\ 0.644\ (1-0.644)*2}/\ (0.05)^2 n= 704$

Then, by considering 5% non-response rates the final sample size administrated was739.

2.3 Sampling Technique

A multi-stage sampling technique was used to select study participant. Initially, all kebeles in the districts were registered. Accordingly, there were 50 kebeles in the district. Then, based on probability proportion to size of the *kebele*, 11 *kebele* were selected by using simple random sampling. To select household from each kebele, systematic random sampling technique was used. The number of households in the kebele were assigned proportionally to the size of the kebeles. For the last stage, in each household, simple random sampling was done to select one adult member of the household as a respondent and finally, there was no non-response in all selected HH.

2.4 Data collection instruments and procedures

Data collection was conducted using a structured, standardized questionnaire that includes both quantitative data and observations check list. Quantitative tools such as household interviews, practice interview with a HH member, and observations was made by interview teams for household characteristics, water storage containers and presence of latrines, hand washing stations, and soap. Twenty two data collectors that included health officers, nurses, health education and environmental health professionals were hired to collect the data.

i) **Data quality management:** To ensure the quality of the data, a pre-tested data collection instrument was used. The English questionnaires was translated in to Amharic by expert and translated back to English by another expert to verify the consistency and content of translation. Training was given for

data collectors (diploma nurses). One week prior to the actual data collection; pretest was conducted by taking 5% of the sample size outside the study area. Based on the pre- test results, the questionnaire was adjusted contextually and terminologically, and administered to the study population. The data was checked for completeness and consistency on daily basis by the principal investigators and incomplete where incorrectly filled ones were excluded

2.5 Data analysis

The data was entered, coded, recorded, edited, and cleaned by the investigators by using EpiData version 3.1 and then exported to SPSS version 20 software for analyses. Univariate (descriptive statistics), bivariable analysis (Cross tabulation, Crude OR with 95 % confidence interval) was done for the independent variables with the outcome variable to select candidate variables for the multivariable analysis (Adjusted OR). P-values of less than 0.05 were considered for statistically significant tests. Variables which showed significant association with the outcome variable on the bivariate analysis were entered into multivariable logistic regression analysis. Variables with a p-value < 0.25 were considered candidates for multivariable logistic regressions, variables which become significant and those variables that are considered as determinants was kept. In the multivariate logistic regression analysis, backward regression method was used to develop the model for the dependent variable. Crude and adjusted odds ratios with 95 % confidence interval was used to measure the association of the dependent and the independent variables.

2.6 Ethical considerations

Ethical clearance was obtained from Arba Minch University, College of Medicine and Health Sciences, Institutional Review Board (IRB). In addition, letter of permission from district administration was sought. Prior to the interview, house holders were communicated on the purpose of the study and its possible benefits. Written consent from kebele administrators and verbal consent from participants was obtained after explaining their full right to refuse, withdraw any time, without the need to explain or to give reasons for doing so. The right of participants to anonymity and confidentiality were ensured by making the questionnaire anonymous and by pledging confidentiality of their responses.

3. Results

3.1 Socio-demographic characteristics of the respondents

In this study 739 questionnaires were administered and all were regained and analyzed. The response rate was 100%. The mean age of the participants was 34.62 with a standard deviation of ± 8.36 years. Majority 520 (70.4%) of the participants were males and 219 (29.6%) were females. Regarding occupational status, about 307 (41.5%) were weavers, 241 (32.6%) were farmers and75 (10.1%) was governmental workers (Table 1).

Table 1. Socio demographic characteristics of the respondents in Chencha district, 2017/18.

variables	Category	Number (%)	Water handling practice		crude odds ratio (95% CI)	p - value
			Poor practice N (%)	Good practice N (%)		
Sex	Male	520(70.4)	86(39.3)	133(60.7)	0.745 (.537, 1.033)	.078
	Female	219(29.6)	169(32.5)	351(67.5)	1.00	
Age	17-24	34(4.6)	8(23.5)	26(76.5)	2.879(1.266, 6.545)	0.012
	25-34	375(50.7)	92(24.5)	283(75.5)	2.725(1.979,3.750)	.000
	>=35	350(44.7)	115(47)	175(53)	1.00	
Educational status	Illiterate	380(51.4)	165(43.4)	215(56.6)	0.220 (0.137, 0.355)	0.000
	Primary	193(26.1)	66(34.2)	127(65.7)	0.325 (.192, 0.550)	0.000
	Secondary	166(22.5)	24(14.5)	142(85.5)	1.00	
Family size	<=5	458(62)	139(30.5)	319(69.7)	1.00	
	>5	281(38)	116(41.3)	165(58.7)	0.620 (0.455, 0.845)	0.002
Job category	Government	75(10.1)	6(8)	69(92)	1.00	
	Merchant	116(15.7)	28(24.1)	88(75.9)	0.275(.107, 0.697)	0.007
	Farmer	241(32.6)	130(53.9)	111(46.1)	0.074 (.031, 0.178)	0.000
	Wavier	307(41.5)	91(29.6)	216(70.4)	0.206(0.087, 0.492)	0.000

3.2 Water treatment, usage, and storage practices

In this study, the respondents were asked about if they had information about water storage, usage and handling practices. Then, 502(67.9%) from the total of 739 respondents had information about water handling practices. Methods for storage included the use of buckets (58.7%), jerricans 627(85.3%), clay pots 88(12%), and plastic buckets 20(2.7%). Regarding household water storing practices, 498(67.4%) of the households stored water for less than a day, and 241(32.6%) more than a day. Most, that is, 641(86.7%) indicated that the containers were covered during storage. It was revealed that the preferred method (73.1%) for extracting water from storage containers was pouring from the container.

3.3 Respondents' knowledge of water and sanitation

From the total respondents, 613 (84.2%) had a functional latrine and 82% of them know that the latrine near to water sources can pollute the water sources. Even though they had information about water source contaminants, about 62% of respondents did not wash hand after toilet. Regarding the knowledge of the respondent's in relation to sanitation, in 528 (71.4%) of households the water storage container was clean internally and about 43.3% households used open field and 208(28.4%) used burning method to dispose waste.

3.4 Multivariable logistic regressions

Multivariable logistic regression was fitted in order to identify the independent predictors for house hold water handling practices. Accordingly, age of respondents, hand washing after toilet, information on water handling practices, type of water storage container, and cover for water storage container were factors that affect safe water handling practices (Table 2).

Table 2. Multivariable analysis of factors and household water handling practices in Chencha district

Variables	Category	**Water handling practice**		crude odds ratio (95% CI)	**Adjusted Odds ratio**
		Poor N (%)	Good N (%)		(AOR) (95% CI)
Sex	Male	86(39.3)	133(60.7)	0.745 (.537, 1.033)	1.273(0.828,1.958)
	Female	169(32.5)	351(67.5)	1.00	1.00
Age	17-24	8(23.5)	26(76.5)	2.879(1.266,6.545)	2.078(0.772,5.598)
	25-34	92(24.5)	283(75.5)	2.725(1.979,3.750)	2.258(1.473,3.464)*
	>=35	115(47)	175(53)	1.00	1.00
Religion	Orthodox	178(36.3)	312(63.7)	0.785(0.567,1.087)	1.319(0.856,2.032)
	Protestant	77(30.9)	172(69.1)	1.00	1.00
Educational status	Illiterate	165(43.4)	215(56.6)	0.220 (0.137, 0.355)	1.022(0.517,2.019)
	Primary	66(34.2)	127(65.7)	0.325 (.192, 0.550)	1.078(0.533,2.179)
	Secondary	24(14.5)	142(85.5)	1.00	1.00
Family size	<=5	139(30.5)	319(69.7)	1.00	1.00
	>5	116(41.3)	165(58.7)	0.620 (0.455, 0.845)	1.310(0.875,1.959)
Job category	Government	6(8)	69(92)	1.00	1.00
	Merchant	28(24.1)	88(75.9)	0.275(.107, 0.697)	2.406(0.878,6.590)
	Farmer	130(53.9)	111(46.1)	0.074 (.031, 0.178)	0.765(0.912,0.500)
	Wavier	91(29.6)	216(70.4)	0.206(0.087, 0.492)	0.256(0.165,0.398)
Wash hand after toilet	Yes	51(18.2)	229(81.8)	1.00	1.00
	No	204(45.22	247(54.8)	3.153(2.283,4.354)	1.590(1.070,2.362)*
Had information on water handling	Broadcast	55(37.4)	92(62.6)	1	1.00
	Health care	51(23.7)	164(76.3)	2.439(1.405,4.008)	2.584(1.423,4.691)*
	HEW	79(30.5)	180(69.5)	4.690(2.892,7.604)	4.211(2.309,7.682)*
	Others	70(59.3)	48(40.7)	3.323(2.113,5.225)	1.988(1.256,3.148)*
Types of storage container	Clay pot	195(39.3)	301(60.7)	1.00	1.00
	Jerrican	44(44)	56(56)	0.825(0.534,1.273)	1.530(0.517,4.527)
	Plastic bucket	16(11.2)	127(88.8)	5.142(2.966,8.915)	6.261(2.300,17.041)*
Withdraw method	Pouring	182(33.7)	358(66.3)	1.00	1.00
	Dipping	73(36.7)	126(63.3)	1.140(0.812,1.600)	0.877(0.562,1.371)
Cover water container	Yes	167(26.1)	474(73.9)	1.00	1. 00
	No	88(89.8)	10(10.2)	24.977(12.687,49.175)	21.331(10.389,43.795)*

*Significant from the multivariable logistic regression (Backward LR method), COR= Crud odds ratio, AOR=adjusted odds ratio.

4. Discussion

In Ethiopia, three-fourth of the health problems are communicable diseases due to polluted water and improper water handling practices (Handling *et al*., 2011). In this study, the household water handling practice was poor, that is, about four hundred eighty four (65.5%) households exercise poor water handling practice when compared with WHO recommendation. This finding is similar with research finding at Farta woreda, northwest Ethiopia (Amenu *et al*., 2013). Supply of safe water alone cannot guarantee that the water in the household for drinking purpose is safe as well. Drinking water handling practices and levels of contamination showed that, almost half of 51.4% the study respondents were illiterates. This low level of education might be one reason for poor water handling practices and this finding is also similar with the finding from Koladiba, Ethiopia (Kuberan *et al*., 2015). Age for collection of water from source and to handle safely at household level was one of the predictor for poor water handling practices. Hand washing with soap (HWWS) is one of the most cost- effective interventions to end preventable diseases. The study conducted at Kolladiba town, showed that 62.6% of the collectors wash their hands before collecting water. However, in this study hand washing practice was very poor 38.3%. This difference might be due to contextual factor of the study area.

With regard to information about water handling practice, about 147 (19.9%) heard from broadcast, 215 (29.1%) from health professionals, 259 (35%) from community health extension workers, and 118 (16%) from other different sources. Access to safe water alone does not reduce water born diseases significantly. Even if the source is safe water become faecally contaminated during collection, transportation, storage and drawing in the home.

In this study, 85.3% of respondents used Jerrican, 12% clay pot, and 2.7% plastic buckets with covers to collect and store water. This finding is consistent with the study finding from Farta wereda, northwest Ethiopia, in which seven hundred fifty-three 90.3% of the households covered the storage containers during data collection time (19, 22). However, it was higher than a study conducted at Dire Dawa Administrative Council which revealed that, 54.68% preferred clay pots and the rest 36.88% used Jerrican (Amenu *et al*., 2013a). In addition to this, 53.12% of the respondents did not wash storage containers before re-filling. The reason behind this difference

might be the use of clay pot to collect and store which could give chance for cross-contamination.

5. Limitation of the study

Bacteriological quality of water at the sources and household level was not assessed.

6. Conclusion

The present study revealed that the water handling practice of the studied community was very poor. So, emphasis needs to be given to change the behavior of the study community through communications by health extension workers. The coummunication topics should include perception to clean water, water handling, drinking water collection and storage, and home base water treatment.

Acronyms and Abbreviations

DHS: Demographic and Health Survey, FDRE: Federal Democratic Republic of Ethiopia, HH: House Hold HWTS: Household Water Treatment and Safe Storage, IRB: Institutional Review Board JMP: Joint Monitoring Program MDG: Millennium Development Goals, PI: Principal Investigator, SD: Standard Deviation, SDG: Sustainable Development Goals, UN: United Nation, UNICEF: United Nation International Children Education Fund, WHO: World Health Organization

Competing of Interest

The authors declare that no competing of interest regarding the publication of the paper.

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Authors' Contribution

AT: Involved in generating the concept of this research paper, proposal writing, designing, analysis, write-up, preparation of scientific paper, and manuscript preparation; **Mk:** Involved in generating the concept of this research paper, proposal writing, designing, analysis, write-up, and approval of final manuscript

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