HOUSEHOLD WATER TREATMENT PRACTICE AND ASSOCIATED FACTORS IN GIBE WOREDA OF HADIYA ZONE, SOUTHERN ETHIOPIA

MSc THESIS

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ACRONYMS AND ABBREVIATIONS

EDHS	Ethiopian Demography and Health Survey
HH	Household
HWTP	Household Water Treatment Practice
HWTS	Household Water Treatment and Safe Storage
MDG	Millennium Development Goal
POU	Point of Use
SNNPR	Southern Nation Nationality of People's Region
SPSS	Statistical Package for Social Science
SRS	Simple Random Sampling
SS	Systematic Sampling
UNICEF	United Nations International Children's Emergency Fund
WASH	Water, Sanitation and Hygiene
WHO	World Health Organization

ABSTRACT

Background: Household water treatment practice and safe storage is an essential component of a global strategy to provide safe water to the 884 million people who currently live without it and the millions more who suffer from contamination of their improved water sources. For populations without reliable access to safe drinking water, household water treatment or managing water at the point of use provides a means of improving drinking water quality and preventing diarrhea episodes by between 35% to 39%. However, evidences are limited regarding household water treatment practice with the available technology in southern Ethiopia including study area.

Objective: to assess the level of household water treatment practice and associated factors of Gibe Woreda.

Methods: A cross-sectional design was conducted Gibe Woreda from February 10-20/ 2018. A total of 627 randomly selected households were involved in study with response rate of 100%. Data was collected by using pre-tested questionnaire and it was administer by face-to face interview with females with their age above 18 years. The data were analyzed using descriptive statistical tests and binary logistic regression. All independent variables with p- value of < 0.25 at bi-variate analysis were included in multivariate model to determine the predictors of the outcome variable, and to control the confounding factors. For all statistical tests, a P value of ≤0.05 was a cut off point for statistical significant.

Result: The overall level of household water treatment practice was 34.3%; 95%CI (30.7%-38.1%). Educational status of being literate (AOR = 2.01, 95 % CI = 1.34–3), dipping fetching water (AOR = 1.86, 95 % CI = 1.2–2.87) and frequency of fetching water more than three time and above a day (AOR = 2.65, 95 % CI = 1.45–4.88) were significantly associated with household water treatment practice.

Conclusion: household water treatment practice is low in the study area. Educational status which are literate, drawing water by dipping and those who were fetching the water three times and above a day were predictors of household water treatment practice . Thus, efforts should be made by the health extension workers to improve household water handling practices.

Keywords: water treatment practice, household, safe storage, Ethiopia.

1. INTRODUCTION

1.1 Background

Household water treatment and safe storage technologies are any of a range of devices or methods such as boiling, filtration, or chemical disinfection, these are also known as point-of-use (POU) water treatment technologies employed for the purposes of treating water in the home (Cotruvo and Sobsey, 2006).

Household-level approaches to drinking water treatment and safe storage are also commonly referred to as managing the water at the point of use. It can improve drinking water quality prior to consumption and prevent waterborne disease. HWTS has been shown cost-effective means is simple, low-cost and effective methods that can reduce the risk of diarrhea by as much as 47%. It is an essential component of a global strategy to provide safe water to the 884 million people who currently live without it and the millions more who suffer from contamination of their improved water sources (WHO, 2013).

Improvement in drinking water quality through household water treatment, such as chlorination at point of use in and proper storage can lead to a reduce of diarrhea episodes by between 35% to 39% and improving access to safe water source and better hygiene practice can reduce trachoma morbidity by 27%. On the other hand, access to safe water, sanitation facilities and better hygienic practice can reduce morbidity from ascariasis by 29% and hookworm by 4 %(UNICEF and WHO, 2010).

HWTS can help improve water quality at the point of consumption, especially when drinking-water sources are unreliable or unsafe. However, HWTS should be viewed primarily as a make-do measure only; but not for those who get safe drinking water by a service providers. It is intended for people who have no access to improved drinking-water sources, when contamination can occur during transport and storage), for people with unreliable piped supplies who have to store water to bridge the gaps between deliveries, and for people in emergency situations (WHO/UNICEF 2012).

1.2. Statement of the problem

Globally, 1.8 million people annually death estimated is diarrhoea due to use of untreated drinking water (WHO, 2008). Over one billion people still lack access to safe *drinking water* today. Waterborne diseases are the major *health* burden which is caused by consumption of untreated *drinking water* in most of the developing countries in the world *(WHO, 2007).*

Some of the pathogens that are known to be transmitted through untreated drinking-water lead to severe and sometimes life-threatening disease. Examples include typhoid, cholera, infectious hepatitis (caused by hepatitis A virus or hepatitis E virus) and disease caused by *Shigella* spp. and *E. coli.* Others are typically associated with less severe outcomes, such as self-limiting diarrheal disease (e.g. noroviruses, Cryptosporidium) (WHO, 2011). Drinking water is found to be more often contaminated in rural areas (41%) than in urban areas (12%) and contamination is most prevalent in South-East Asia (35%) and Africa (53%) (Bain R *et al.*, 2014).

National survey 2010 shows, from 67 national survey reports on the scope of household water treatment; the practice is widespread in Western Pacific (66.8%) and Southeast Asia (45.4%) regions, and it is less common in the Eastern Mediterranean (13.6%) and Africa (18.2%) (Rosa and Clasen, 2010).

In a study of rural and peri-urban communities in Northern Sudan, water quality at the source and point of consumption among nomadic pastoralists and riverine villages, both water sources and water stored for consumption had fecal coliform counts grossly in excess of WHO standards, with higher counts at the end of the rainy season. In the peri-urban community on the outskirts of Omdurman, while water quality from the distribution system had fecal coliform counts generally below 10 d/ l, after storage, water was of considerably lower quality, with fecal coliform counts up to 1000 d /l (Musa *et al.*, 1999).

Different studies in Ethiopia show, in the last 15 years the effort made to reduce water born diseases through treating drinking water at source was not sufficient enough to reduce water born diseases in the country unless treating drinking water and hygienic handling is practiced in the home (Thewodros B and Seyoum L, 2015).

Even if Ethiopian demographic and health survey 2016 shows 7% of households in Ethiopia (11% in urban areas and 6% in rural areas) are using appropriate household water treatment

methods, there is no study was conducted on household water treatment practice and its associated factors in study area. Therefore the main aim of this study is to fill this gap by identifying the level of household water treatment practice and associated factors among households in Gibe Woreda, Southern Ethiopia.

1.3. Significance of the Study

The result of this study will help the Gibe Woreda health office, Water office and non-governmental organization program planners who work on health and health related areas by giving a clear picture on the level of household water treatment practice and its associated factors among households of Gibe Woreda. The study will useful material for academic purposes, and as an added literature to the existing knowledge.

1.4. Objectives

1.4.1. General objective

To assess the level of household water treatment practice and associated factors among households of Gibe woreda, Hadiya Zone, Southern Ethiopia from February, 10- 20/ 2018.

1.4.2. Specific objectives

1. To assess the level of household water treatment practice in Gibe woreda.
2. To identify the associated factors of household water treatment practice in Gibe Woreda.

2. LITERATURE REVIEW

2.1 Level of household water treatment practice

A Community based cross-sectional study design was conducted in 2015 to evaluate water treatment practice and associated factors among rural households in Burie Zuria Woreda, Northwest Ethiopia; the finding shows that, among the total study participants, 357(44.8%) of them treated water at their home. More than half 213(59.7%) boil water, 74(20.7%) settle and stand and 70(19.6 %) have used chlorine chemicals (wuhaAger and Bishagary) which are available in the local market for water treatment purpose. Concerning water storage practices about 490(61.5%) of respondents had water storing experience out of which 264(53.9%) stored in a clay pot and 489(99.8%) of them wash the container before fetching water (Hailegebriel *et al.,* 2015).

A descriptive qualitative assessment of sanitation and water handling practices in some rural areas of Ogun State, Nigeria was conducted in 2014 on 250 rural households. Out of these about household 20%, 36%, 12%, 9.2% and 14.4% of them use borehole (hand dug well), pipe borne water, river and streams respectively. Regarding Point-of-use water treatment about 67.0% of the 194 mention any water treatment method. 28.8%, 71.2%, 93.6% and 6.4% of them store water in open containers, closed container, wide mouthed, and narrow necked respectively (Bolatito O *et al.,* 2014).

Descriptive cross-sectional study of the household drinking water purification practices in a community of Lamingo, Plateau state, Nigeria was conducted in 2015 respondents on water storage, all the households were found to store drinking water majority of them use buckets (58.7%), jerry cans (32.0%), clay pots (6.2%) and galvanized tank (0.3%). Most (95.1%) stated that the stored water was covered but 213 (58.0%) stated that there was no dedicated container for fetching the water. Also, 244 (66.7%) of respondents stated that children easily had access to the stored water. Only 45.4% of respondents stated they would wash their hands before handling the drinking water. About 199 (54.1%) of respondents stated that the household drinking water had undergone at least a method of purification while 169 (45.9%) did no form of water purification. Methods that were used included addition of alum (43.3%), boiling (24.9%), filtration (21.4%), sedimentation and decantation (10.5%). The reasons provided for the

preferred method of purification were that it's easy to use (63%), cheap (18.5%), and readily available (12.0%). Samples of stored drinking water from a total of 90 households were analyzed. Most (62.2%) had been sourced from the borehole while 347.8%) had been sourced from the wells.(Miner CA *et al.*, 2015).

According to Malawi Preliminary Consultative Study 2012 reports about only 32% of households treat their drinking water for to reduce the risk of water borne disease through household water treatment practice the reducing risk of contracting diarrhoea by 47% was with treat their drinking water at household level. The most commonly used method of household water treatment practice was chlorination, filtration and solar disinfection (MOH, 2014).

A quantitative and qualitative studies were conducted in 2016 to investigate and cross-check the consistency of effectiveness of household water treatment practice among urban and rural population claiming to treat their drinking water at their home of Zambia; after completed baseline survey in the urban and rural studies finding shows that, Overall, 203 and 276 households the consistency of HWTP report was low; only 72.6% urban and 50% rural household were treat their drinking water prior to drink at their home (Ghislaine *et al.* 2016).

According to Ethiopia Demographic and Health Survey 2016 Reports about 91.3% of households do not treat their drinking water prior to drinking; this is more common in rural than in urban areas (92.1 percent versus 88.4 percent). Concerning methods of treatment used about 2.2%, 3.2%, 1.7%, 1.0%, 0.1%, 0.3%, and 0.2% of households use boiling, chlorine, strained through cloth, ceramic/and sand filter, solar disinfection and stand and settle systems respectively. The most commonly used method of water treatment is adding bleach or chlorine (3.2%). Overall, 6.5% of households use an appropriate treatment method (CSA, 2016).

A cross sectional study was conducted from September 2007 to July 2008 to determine water handling practices and level of contamination between the sources and at point-of-use at Kolladiba town Ethiopia; the result show that most (95.2%) of the residents use jerry cans while remaining 3.9% and 0.9% use plastic buckets and traditional clay pots respectively. About 62.6% of the collectors wash their hands before collecting water. Washing and rinsing practice of containers before collection was observed among 91.6% of respondents and about 96% of the collectors covered their filled containers. Regarding water storage most (95.2%)of the respondents used narrowed mouth jerry cans for water collection and storage which are not

convenient for drawing water by dipping method. After use, drinking utensils were mostly kept on table by 75.3% respondents while others left them inside the container, on the floor or hanged it on the wall in 10.2%, 9.7% and 4.8% of the cases, respectively. About 51% of the respondents were using separated containers for water storage for drinking and other purposes. The majority (76.2%) of households stored water for more than 2 days and from the total households surveyed, algal growth was observed on their water storage and collection containers, respectively in 27.9% and 23.6% cases (Hardeep Rai Sharma *et al.*, 2013).

2.2. Factors associated with household water treatment practice

2.3.1 Socio-economic and demographic Factors

A study done in Northwest Ethiopia in 2015 shows that sex difference of household head was statistically significant on home water treatment, i.e. female headed households practice water treatment 1.24 times more likely than male headed households (adjusted odd ratio(AOR) = 1.80, (Hailegebriel *et al.*, 2015).

A community based cross-sectional study design was conducted to evaluate water treatment practice and associated factors among rural households in Burie Zuria Woreda, Northwest Ethiopia in 2015, the results of the finding indicates that the proportion of households who treat their water prior to use is higher for households with more schooling. That mean being literate were more than double to practice small scale water treatment at household level than those illiterate head of households (AOR = 2.07, (Hailegebriel *et al.*, 2015).

A community based cross-sectional study design with quantitative approach was conducted to assess Bacteriological and Physicochemical quality of drinking water sources and household water handling practice Among Rural Communities of Bona District, Sidama Zone-Southern, Ethiopia in 2015, the results of the finding indicates that the respondents who can read and write and those who completed at least a secondary education were more likely to safely handle drinking water at home than illiterates, AOR=3.0 and AOR=8.5, respectively (Abebe Berhanu and Hailu, 2015).

2.3.2 Types of water source

A bi-variate meta-analysis in developing countries which was done among 45 studies revealed that piped supplies had lower odds of being contaminated than other improved supplies (AOR = 0.3; 95% CI: 0.1, 0.8; p<0.01) and all other supply types (AOR = 0.2; 95% CI: 0.1, 0.5; p<0.002) at the source. Household stored water from piped supplies had also significantly lower odds of contamination compared with all other supply types (AOR = 0.3; 95% CI: 0.2, 0.8; p<0.01) (Shields. KF et al., 2015).

During a cross sectional prospective study in the rural areas of Northwest Ethiopia (November 2011 to February 2012) a total of 53 water samples from different sources (tap, protected dug well, open dug well and open spring) were taken and the bacteriological analysis shows 72.8% of open spring, 63.7% of open dug wells and 36.4% of protected dug well had thermo tolerant coliform count coliform above the national and WHO recommended limits (Tsega et al., 2013). Similar finding from a survey in Fogera and Mecha district of Amhara in Northwest Ethiopia was done from February to March 2014 among 454 household samples and the result reveled that water from unprotected sources is 1.9 – 3.6 times (AOR=1.9-3.6, (p<0.05)) more likely to be contaminated than protected sources (Usman. M.A et al., 2016).

2.3.3 Water storage and handling

Drinking water is mostly contaminated during storage and handling in the household. A community based survey in Hyderabad, India (2006) shows among 50 household which gets their drinking water from uncontaminated sources 36% of water from storage had fecal coliforms (Eshcol. J et al., 2009).

According to a Cross-sectional study among 914 peri-urban households in Kandal Province, Cambodia between July–August 2011 unhygienic water storage and handling practices were strongly associated with microbial contamination in water samples. The result shows that Households accessing water by dipping hands or using a receptacle significantly increased E. coli counts compared with households who used pouring (E. coli: RR=10 [95% CI] 3.2–34, P < 0.005). E. coli counts in samples from households having a covered storage container were approximately half of those in samples from households with uncovered containers (RR= 0.49 95% CI 0.24–1.0, P = 0.052) (Shaheed. A et al., 2014).

A Community based cross-sectional study design was conducted to evaluate water treatment practice and associated factors among rural households in Burie Zuria Woreda, Northwest Ethiopia in 2015, the results of the finding indicates that the proportion of households who fetched their water three times a day (AOR = 4.90,) and four times a day (AOR = 3.76,) were 4.90 and 3.76 times more likely to practice small scale water treatment at household level compared to those who fetched their water once a day and respondents who draw their water by dipping their container were 4.11 times more likely to practice small scale water treatment at household level compared to those who draw their water by pouring their container (AOR = 4.11,) (Hailegebriel *et al.,* 2015).

In Ethiopia only a few studies have been conducted on determination of the level of contamination in the household. A community based survey (2016) and a cluster randomized controlled trial (2011) in rural Ethiopia shows 58% and 78% of household storage samples are contaminated by E.coli respectively (Usman. M.A et al., 2016; Mengistie. B et al., 2013). The result from a community based survey showed that a strong association has been seen between household water collection container vessels and the level of E.coli even after adjusting for household's socio-demographic and sanitary characteristics. Households who use jerrycan container for water collection activities had 2.6 times higher E.coli level than households using ensera [(AOR= 2.6), P<0.01)] (Usman. M.A et al., 2016).

2.3.4 Hygienic factors

A decreased microbial quality of water have been identified in households that had Lack of proper hygiene practices, such as cleaning of drinking water storage vessels and dipping utensils used to remove drinking water from storage vessels, and washing of hands.

According to an experimental study which is done in Ethekwini municipality, South Africa (2012) The absence of hand-washing facilities was related to higher coliform counts in water (p=0.0005) (Singh. U et al., 2013).

In Ethiopia different studies shows that poor hygienic practices are associated with low drinking water quality. A cross sectional prospective study among 35 household water containers in Bahir dar city Ethiopia (October to December, 2009) showed that 65.7% of the household wash their

water collecting container every day and only 25.7% wash their hands with soap after visiting toilet (Milkiyas et al., 2011).

A community based survey among 40 households in Tehuldere woreda, Northeast Ethiopia (2002) 17.5% of households who practice hand washing when collecting water had >10 fecal coliform count/100ml, whereas 32.5% of the household who didn't practice hand washing when collecting water had >10 fecal coliform count/100ml ($p<0.05$). Similarly households that wash their container before collection had lower fecal coliform count (15% had >10 fecal coliform/100ml) than households which didn't wash their collection container (35% had >10 fecal coliform/100ml) [$p<0.05$] (Seid. T et al., 2003). Another survey among 454 households in rural areas of Fogera and Mecha districts of Ethiopia in 2014 also indicates that hand washing with soap is associated with lower odds of storage water contamination (AOR= 0.373: $P<0.01$) than who does not wash their hands with soap (Usman. M.A et al., 2016)

2.3.5 Knowledge on Household Water Treatment practice

A descriptive cross-sectional study was conducted on knowledge of respondents on household drinking water purification practices in a community of Lamingo, Plateau state of Nigeria in 2015. The result show that knowledge of water purification was good among 26.1% of the population, 59.8% was fair while 14.1% had poor knowledge. Regarding water treatment about 26.1% households use boiling, 4.4% addition of alum, 6.6% filtration, 2.4% sedimentation with decantation and majority (54.7%) stated that a combination of methods could be used while 7.6% could not mention any method. Concerning Sources of drinking water for the households included wells (54.6%), boreholes (6.3%), river/stream (1.1%), sachet water (0.3%) and some used multiple sources (37.8%) (Miner, et al., 2015).

Another cross-sectional study which is done in Bona district, Sidama zone (2014) to assess Bacteriological and Physicochemical quality of drinking water sources and household water handling practice. Data were collected among 604 randomly selected households and from these 604 respondents, 387(64.1%) had knowledge that water can be contaminated in the house. Of these, 212 (54.8%) said that water can get contaminated by unclean container and 153(39.5%) respondents said that water can get contaminated by uncovered container (Abebe Berhanu and Hailu, 2015).

2.3 Conceptual frameworks

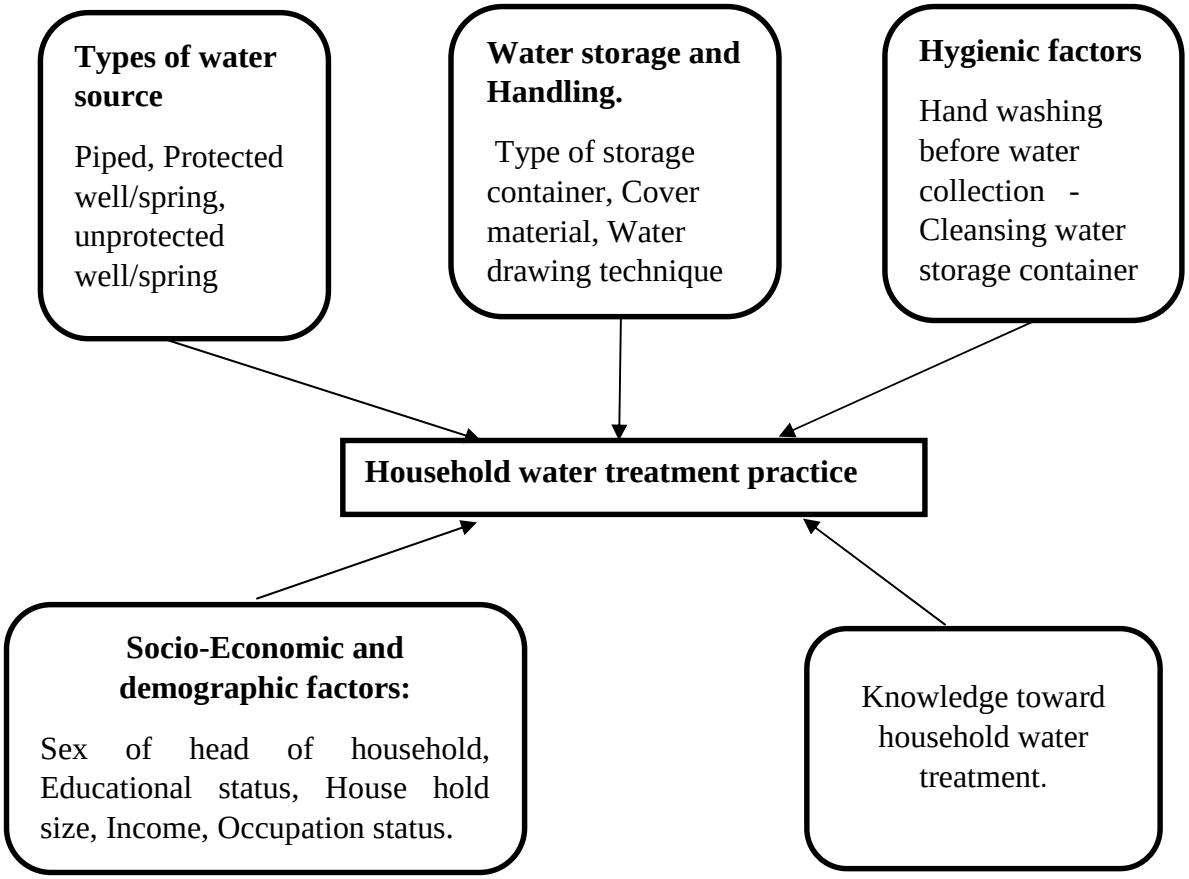

Figure 1: Conceptual frame work of factors related with a household water treatment practice in Woreda of southern Ethiopia. Source: researcher own construction (2017/18) based on review of literature.

3. METHODS AND MATERIALS

3.1 Study area and study period

The study was conducted in Gibe woreda from February 10 to 20, 2018 in selected households. Gibe Woreda is one of ten Woreda of Hadiya zone and 40 kms far from Hosanna which is capital town of zone and 171km far form Hawassa which is capital of SNNPR and 258 km far from Addis Ababa, capital city of Ethiopia. The woreda has 22 Kebeles, four urban kebeles and eighteen rural kebeles. The total population of Woreda is 141,312 of which 70,181 are males and 71,129 are females with total household of 28,840. Regarding water source, 10 ponds, 2 borehole, 14 shallow wells, 24 springs, 3 pipe water, 40 rivers and 29 stream waters. Water supply coverage of the woreda is 46.14%. (Gibe woreda water, mine, and energy office, 2017).

3.2. Study design

A community based cross- sectional study design was used

3.3. Population

3.3.1. Source population

All households in kebeles of Gibe Woreda

3.3.2. Study population

All households in the randomly selected Kebeles

3.3.3. Study sample

All selected households from the study population

3.4. Inclusion and Exclusion criteria

3.4.1 Inclusion criteria

The respondent should be resident in the household for more than six months and illegible respondent were female whose age above 18 years.

3.4.2 Exclusion criteria

Household if eligible respondent is absent due to illness or age (less than 18 years old).

3.5. Sample size calculation

For objective 1: The sample size is estimated using a single population proportion based on the following assumptions, 4% margin of error, 95% Confidence level, level of household water treatment practices of 44.8% (Hailegebriel, et al., 2015). Let as Gibe Woreda household water treatment practices is the similar as study conduct in Burie Zuria Woreda Northwest Ethiopia in rural community. P=44.8%; and 10% non-response rate.

$$n= \frac{(Za/2)^2 p\,(1-p)}{d^2}$$

Where, n=the total sample size required, d=Marginal error, Zα/2=95% confidence level =1.96, P= Proportion of household water treatment practice = 44.8%, Thus, the sample size was calculated as follows.

$$n= \frac{(1.96)^2 .448(1- .448)}{(0.05)^2} =380$$

Non-response rate of 10% (380) = 38. Design effect of 1.5, d= degree of precision 5%

Final sample size required for the study is (38+ 380)*1.5=627

For objective 2.

Sample size for the second objective is determined using double population proportion formula with the assumptions; 95% CI, power 80% and exposed to unexposed ratio 1 and 10% non-response rate.

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Table 1: Sample size calculation for second objective of Sample size determination for level of household water treatment practice and associated factors using different studies.

Variable	Proportion of exposure		**Final Sample Size (non-response rate (10%)**	**Authors**
	Exposed	Non-exposed		
Sex	Female headed HH practice water treatment 75%	Male headed HH practice water treatment 25%	42	(Hailegebriel Belay *et al.,* 2015)
Educational status	Literate practice household water treatment 64.7%	Illiterate practice household water treatment 35.3**%**	113	(Hailegebriel Belay *et al.,* 2015)
Types of water source	Protected dug wells 43.48%	Unprotected dug wells 72.16%	116	(Usman. M.A et al. 2016)

Finally, the sample size for the second objective which is calculated for the factors associated with household water treatment practice is less than the first objective. Hence, the sample size of the first objective is taken as the final sample size, final sample size is **627.**

3.6. Sampling Technique and Procedure

There are 22 Kebeles in Gibe woreda. Which are stratified to 4 urban and 18 rural kebeles, among those 6 kebeles (5 kebeles from rural and 1 from urban) were selected simple randomly. The total sample size allocated to each kebeles were proportional to the estimated size of households. Then the households in each Kebele was selected by systematic random sampling method ($N/n=K^{th}$) using health extension family folder. The first household in each Kebeles was selected randomly from 1 to k households by lottery method then the rest are every respected K^{th}

until the total sample size was achieved. Within each selected household the females above 18 years were selected for interview.

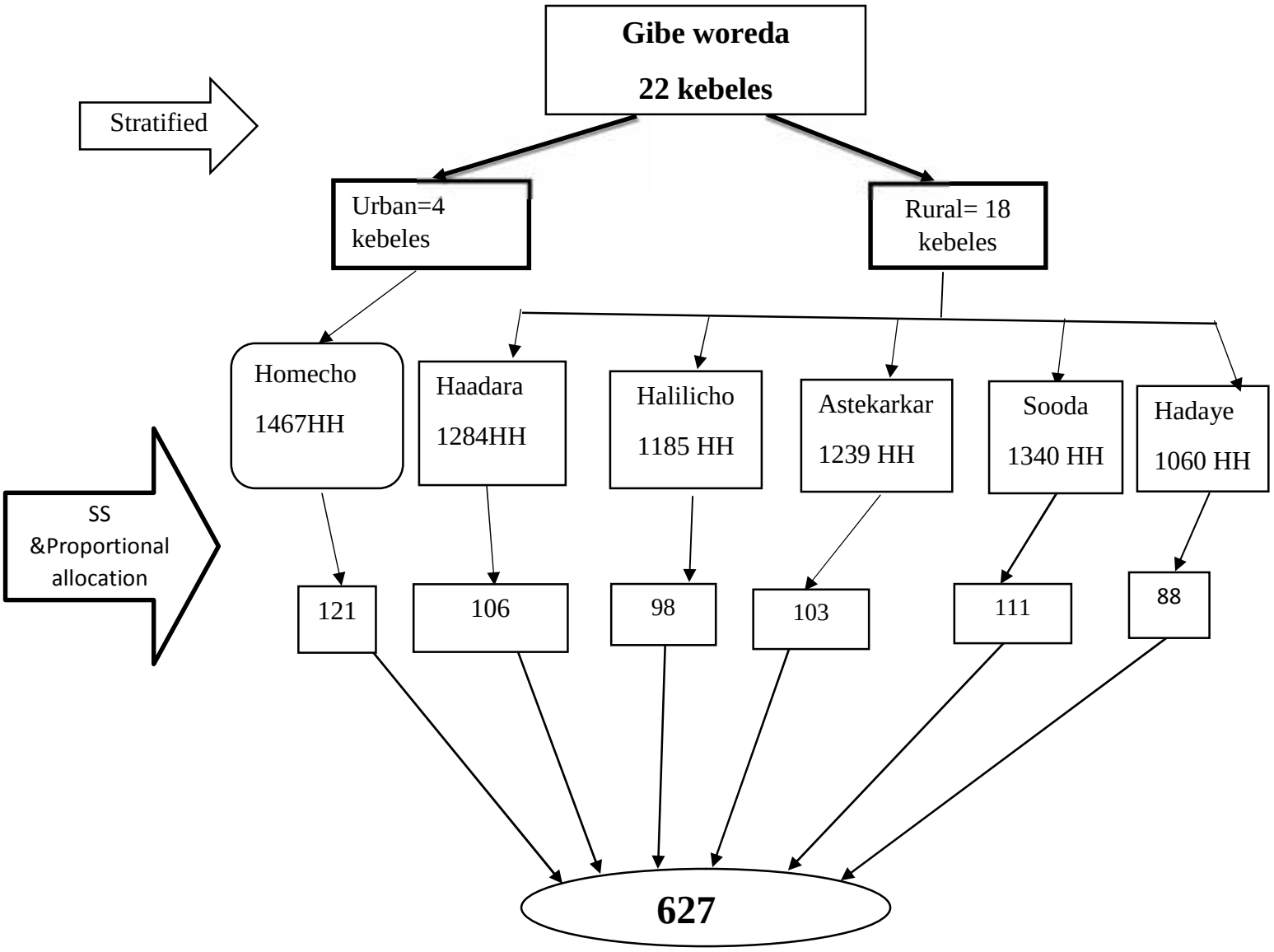

Figure2: Schematic presentation of sampling technique for assessment of household water treatment practice and associated factors of Gibe Woreda, Hadiya Zone, Southern Ethiopia, 2017/2018.

3.7. Data Collection Procedures

3.7.1 Data collection instruments

The data was collected using structured and pretested questionnaire which was adapted and modified from different literature (EDHS, 2016), (Bolatito O *et al.,* 2014), (Miner CA *et al.,* 2015), (Hailegebriel *et al.,* 2015), (Hardeep Rai Sharma *et al.,* 2013), (Koskei R.C *et al.,* 2013), (Bain. R et al., 2014b), (Shaheed. A et al., 2014), (Singh. U et al., 2013), (Milkiyas et al., 2011), (Abebe B and Hailu, 2015).The adapted questionnaires were modified and contextualized to fit the local situation and the research objective. The questionnaires were initially prepared in English and then translated into local language of Hadiyigna because almost all residents are knows Hadiyigna language. Then back to English by language experts, researchers to keep the consistency of the questionnaires.

3.7.2. Data collectors

Grade 10th complete four females, who can speak the Hadiyigna language, were involved in data collection; and two BSc holder supervisors were selected from Gibe woreda health and water office. Two days intensive training was given to data collectors and supervisors on data collection and how to approach and interview respondents and supervision.

3.7.3. Data collection procedure

Data were collected through face to face interview of eligible respondent of household member by using a structured questionnaire. The supervisors was supervised the data collection on daily basis; and they also checked the completeness of the filled questionnaires.

3.8. Study variables

3.8.1. Dependent Variable:

Household water treatment practice.

3.8.2. Independent Variables:

Socio-demographic factors (Sex, educational status, occupational status, monthly income of household head and family size).

Types of water source (piped, protected well/spring, unprotected well/spring, river).

Water storage and Handling factors: type of storage container, cover material, water drawing technique.

Hygienic Factors: Hand washing before water collection, cleansing water storage Container.

Knowledge on household water treatment practice.

3.9. Operational Definitions

Respondents: is who can respond about the household water treatment options are practiced in the house or not, and who should be resident in the household for more than six months whose age above 18 years of females.

Level of household water treatment practice: the magnitude of water treatment practice in the study area.

Household water treatment practice: was dictated as "Yes" if at least one of the following options is practiced at household such as boil, add bleach/chlorine, strain through a cloth, use water filter, solar disinfection, let it stand and settle. (EDHS, 2016)

Knowledge of respondents was respondents' score over total knowledge questions multiplied by 100 and respondents with knowledge score of 70% and above were deemed to have good knowledge, whereas 50%–69% fair and <50% as poor knowledge (Ibrahim JM *et al., 2016*).

3.10. Data Quality Control

First the questioner prepared in English was translated to Hadiyigna language. Pre-tested structured modified questionnaire adapted from different literatures were used to collect data. Pretest was conducted on 5% of households of Satara kebele of Gombora woreda which is different from study woreda before actual data collection. Two days intensive training was given for data collectors and supervisor on the objective of study, data collection tool and the way of data collection and how to maintain confidentiality. All data were checked for completeness, clarity and consistency by principal investigator and supervisors on daily basis. Double data entry was used for its validity and compare to the original data. Simple frequency and cross tabulation was done for missing, outlier and improvable values and variable.

3.11. Data processing and Analysis

The collected data was checked for completeness and entered into EpiData version 3.01 and transported to SPSS version 20.0 software packages for data processing and analysis. Descriptive statistics tests such as mean, frequency, and standard deviation was computed. Then, logistic regression analysis was used to compute crude odds ratio and its 95% confidence intervals of the independent and dependent variables; and those variables with P-value < 0.25 were considered as candidate for the final model. Finally, multivariate logistic model was used to estimate adjusted Odds ratio and its 95% CI to identify predictors of household water treatment practice. Model fitness was checked by using Hosmer and Leme-show goodness of model fit test. Level of statistical significance was declared at p-value < 0.05.

3.12. Ethical consideration

Ethical clearance was obtained from Institutional Health research ethics review committee of Haramaya University, College of Health and Medical sciences. Data collection was started after securing written permission from the post-graduate office of Haramaya University. The permission was obtained from Gibe woreda health office and respective kebeles prior to the study. The study participant was informed the purpose of the study and the importance of their participation in the study then informed, voluntary written and signed consent was obtained. The study participants were informed that the information they give is confidential and names of participants should not be written on the questionnaire. Each participant was informed that his or her participation is voluntary to participate in the study. The risk of being participating in this study were minimal, but only taking few minutes from their time. Health education was given to study participants, regarding the problem of study.

3.13. Information dissemination

First, the study will be presented to the community of Haramaya University on open defense of public health researches and defended. Then the finding of the study will be submitted to Haramaya University, Gibe woreda health office, Gibe woreda water office and NGOs working on water supply and sanitation program nationally and locally.

4. RESULTS

4.1. Socio-demographic characteristics of participants

Out of 627 study participants initially sampled in the study, 627 have participated, making a response rate of 100%. The mean age of respondents was 40.38 (SD, ±11.20) years. Among the total respondents, 351 (56 %), of them were male headed household. Majority 469 (74.8%) of the respondents were married. More than half of the respondent 368 (58.7 %) were illiterate. Regarding occupational status of the respondents majority of them 324 (51.7%) were farmer followed by 175 (27.9 %), 85(13.6 %) merchants and Government employee respectively. More than half 334 (53.3%), of households had a family size of ≥5 member. Three hundred thirty three (53.1%) of the respondents monthly average income was between 501–999 ETB **(Table 2)**.

Table 2 Socio-demographic characteristics of respondents on water treatment practice and associated factors at household level at Gibe Woreda, Hadiya Zone, Southern Ethiopia, 2018. (n=627)

Variable	Category	Frequency	percent %
Head of the household	Male	351	56.0
	Female	276	44.0
Age	18–30 years	137	21.9
	31–45 years	323	51.5
	≥46 years	167	26.6
Types of respondents	Mothers	399	63.6
	Female adult members	228	36.4
Ethnicity	Hadiya	627	100
Religion	protestant	527	84
	Orthodox	100	16
Educational status	Illiterate	368	58.7
	Literate	259	41.3
Marital status	Single	139	22.2
	Married	469	74.8
	Divorced	6	1.0
	Widowed	13	2.1
Occupational status	Farmer	324	51.7
	Merchant	175	27.9
	Government employee	85	13.6
	Unemployed	43	6.9
Number of individuals in the family	< 5	293	46.7

	≥5	334	53.3
Monthly income	≤500 ETB	91	14.5
	501–999 ETB	333	53.1
	≥1000 ETB	203	32.4

More than half of respondents 353 (56.3 %) were getting water source from piped water. Majority of respondents 588 (93.8%) had water storing experience, out of which 216 (34.4%) stored in a bucket. More than half 419 (66.8%) of respondents stated that the stored water was covered in storage vessels. Three hundred two (48.2%) of households collecting water for household three and above times a day. More than half of respondents 354 (56.5%) reported that they washed the container before storing water in home. Nearly three fourth of respondents 459 (73.2%) stated that children easily had access to the stored water. Regarding to hygienic factors only 171 (27.3%) respondents wash their hands before handling the drinking water. Two hundred sixty two (41.8 %) of the respondents reported that they wash hands after defecation (Table 3).

Table 3 Environmental characteristics of respondents on water treatment practice and associated factors at household level at Gibe woreda Hadiya Zone, southern Ethiopia, 2018. (n=627)

Variables	Category	frequency	Percent %
Source of drinking water	Piped water	353	56.3
	Spring water	133	21.2
	River water	141	22.5
Time taken to fetch the water	30-45 minutes	459	73.2
	46-60 minutes	168	26.8
Person who fetch water for household	Adult woman	291	46.4
	Adult man	52	8.3
	Female child under 15 years	143	22.8
	Male child under 15 years	141	22.5
Experience of storing water for household	Yes	588	93.8
	No	39	6.2
Times of collecting water for household	Once a day	131	20.9
	Twice a day	155	24.7
	Three times and above a day	302	48.2
Type of container for storing the water	Jerican	165	26.3
	Bucket	216	34.4

	Claypots	207	33.0
Cleaning of the water storage container	Yes	317	50.6
before storing drinking water in home	No	271	43.2
Materials used for washing the container water	Only water	218	34.8
	Soap	99	15.8
Times of washing water storing container	Daily	180	28.7
	Every 3 days	57	9.1
	Weekly	80	12.8
Covering water storage vessel	Yes	419	66.8
	No	169	27
Storage container accessible to children	Yes	459	73.2
	No	168	26.8
The way of water draw	Pouring	228	36.4
	Dipping	399	63.6
Design of water drawing material	Yes	309	49.3
(Handled and not handled)	No	198	31.6
Washing hands before handling the	Yes	500	79.7
drinking	No	127	20.3
Water in the home	Yes	197	31.4
Washing hand with soap	No	303	48.3
	Yes	267	42.6
Wash hand after defication	No	360	57.4
	Yes	17.2	108
Wash hand after defication with soap	No	159	25.4

Knowledge on household water treatment practice

Knowledge of respondents on household water treatment practice was scored as < 50% were poor knowledge , 50-69% were fair knowledge and ≥ 70 were good knowledge, according to above scoring 486 (77.5%) of respondents had poor knowledge, 12 (12.1%) had fair knowledge, and only 65 (10.4%) had good knowledge toward household water treatment practice.

4.2. Level of household water treatment practice

Over all 215 (34.3%) 95% CI, (30.7%-38.1%) participants were treat water at their home. Among those treat water in their home, different modality of treatment approaches were used, 91 (42.3%) boil water, 50 (23.3%) strain through a cloth and 74(34.4%) have used chlorine chemical (wuhaAger) which was available in the local market for water treatment purpose (**Figure 3**).

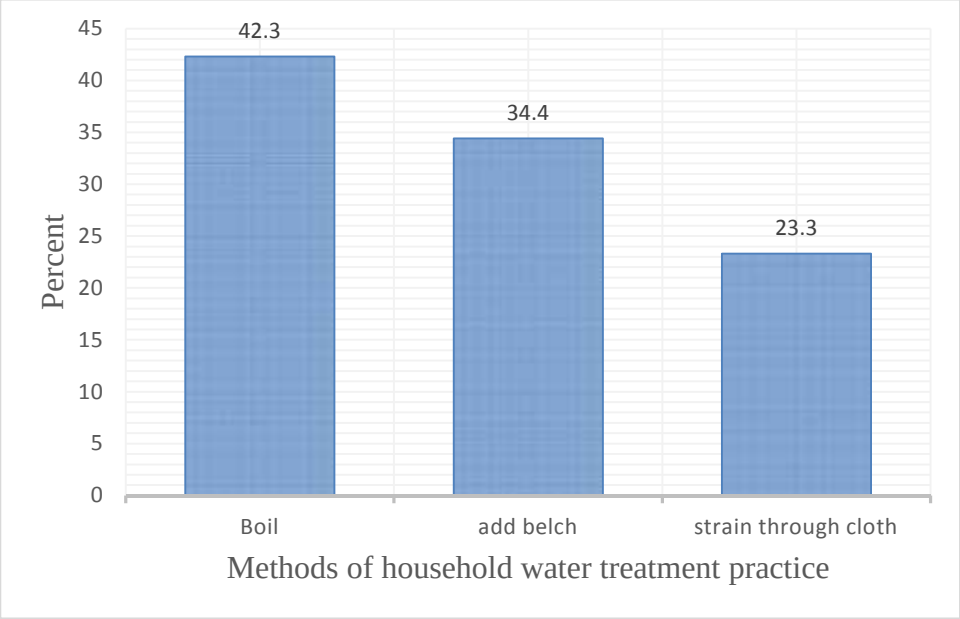

Figure 3. Household water treatment practice in Gibe woreda, Hadiya Zone, Southern Ethiopia, 2018.

4.3. Factors associated with household water treatment practice

In bivariable analysis water treatment practice at household level varied under the influence of various factors. In this test each independent variables were tested against the dependent variable. Accordingly head of household, educational status, water source, timing for fetching, washing hand with soap, covering drinking water storage vessels, cleaning drinking water storage vessels and the way of fetching water, were found to have P-value <0.25 in which this variables were candidates to multivariable logistic regression analysis (**Table 4**).

Table 4. Table showing bivariable analysis of factors associated with household treatment practice in Gibe Woreda of Hadiya Zone, Southern Ethiopia, 2018

Variable	Category	Water treatment practice		P-value	COR (95 % CI)
		Yes	No		
Head of HH	Male	108	246		1
	Female	107	166	0.023	1.47(1.05-2.05)
Knowledge	Poor	161	325		1
	Fair	29	47	0.389	1.2(0.76-2.050
	Good	25	40	0.394	1.26(0.73-2.15)
Hand washing	Water	125	178		1
	Soap	64	133	0.049	0.68(0.47-0.98)
Occupation	Farmer	108	216	0.47	1.29(0.64-2.61)
	Merchant	63	112	0.319	1.45(0.69-3.02)
	Gov't employer	32	53	0.275	1.56(0.7-3.46)
	Unemployed	12	31		1
Educational status	Illiterate	85	283		1
	Literate	130	129	0.00	3.36(2.38-4.73)
Household monthly income	< 500	29	62		1
	501-999	109	224	0.876	1.04(0.63-1.71)
	≥1000	77	126	0.317	1.3(0.77-2.207)
The way of fetching water	Pouring	47	181		1
	Dipping	168	231	0.000	2.8(1.92-4.08)
Family size	< 5	107	186		1
	≥ 5	108	226	0.271	0.831 (0.59-1.15)
Covering water storage vessels	Yes	154	265	0.039	1.5(1.02-2.21)
	No	47	122		1
Timing for fetching water	Once a day	26	124		1
	Twice a day	44	131	0.089	1.6(0.93-2.76)
	Three and above a day	145	157	0.000	4.4(2.72-7.11)
Cleaning storage vessels	Yes	120	197	0.033	1.44(1.03-2.02)
	No	80	191		1
Age	18-30	51	86		1
	31-45	108	215	0.435	0.84(0.55-1.28)
	≥ 46	56	111	0.502	0.85(0.53-1.36)
Water source	Pipe water	112	241		1
	Spring water	45	88	0.65	1.1(0.7-1.7)
	The river	58	83	0.04	1.5(1-2.25)

In multivariable logistic regression indicated that educational status of being literate were 2 times more likely practice household water treatment than those illiterate head of households (AOR = 2.01, 95 % CI = 1.34–3.0), dipping fetching water was 1.86 times more likely practice household water treatment than pouring (AOR = 1.86, 95 % CI = 1.2–2.87) and frequency of fetching water more than three time and above a day was 2.65 times more likely practice household water treatment than those fetching water once a day (AOR = 2.65, 95 % CI = 1.45–4.88) were found to be significantly associated with household water treatment practice at household level with P-value <0.05 (**Table 5**).

Table 5. Factors associated with household water treatment practice at Gibe woreda HHs, Hadiyya zone, Southern Ethiopia, 2018 (N = 627)

Variable	Category	Water treatment practice		COR (95 % CI)	AOR (95 % CI)
		Yes	No		
Head of HH	Male	108	246	1	1
	Female	107	166	1.47(1.05-2.05)	0.74(0.48-1-13)
Hand washing	Water	119	167	1	1
	Soap	70	144	0.68(0.47-0.98)	0.73(0.49-1.08)
Educational status	Illiterate	85	283	1	1
	Literate	130	129	3.36(2.38-4.73)	**2.01(1.34-3) ***
The way of fetching water	Pouring	47	181	1	1
	Dipping	168	231	2.8(1.92-4.08)	**1.86(1.2-2.87)***
Covering water storage vessels	Yes	168	290	1.5(1.02-2.21)	1.22(0.76-1.98)
	No	47	122	1	1
Timing for fetching water	Once a day	26	124	1	1
	Twice a day	44	131	1.6(0.93-2.76)	1.74(0.91-3.3)
	Three and above a day	145	157	4.4(2.72-7.11)	**2.65(1.45-4.88)***
Cleaning storage vessels	Yes	134	220	1.44(1.03-2.02)	0.88(0.56-1.4)
	No	81	192	1	1
Water source	Pipe water	112	241	1	1
	Spring water	45	88	1.1(0.7-1.7)	1.33(0.81-2.19)
	The river	58	83	1.5(1-2.25)	1.18(0.74-1.87)

AOR=adjusted odds ratio, COR = crude odds ratio ***** P-value ≤ 0.05

5 DISCUSSION

Level of household water treatment practice was found to be 215 (34.3%), (95% CI 30.7-38.1). Moreover educational status, drawing water by dipping and frequent of fetch water were factors that significantly associated with household water treatment practice.

Among the total study participants, 215(34.3 %) of them practiced household water treatment. This finding is consistent with study done in biye community, Kaduna State of Nigeria 32.4% (Ibrahim JM *et al., 2016*), Malawi 32 % (MOH 2014) lower than study done in Zambia 72.6% urban and 50% rural (Ghislaine *et al.* 2016) and also study done in North West Ethiopia 44.8% (Hailegebriel *et al.,* 2015) but higher than the findings from Ethiopian demographic health survey 2016 which is 7% (CSA, 2016). The possible explanations for this difference might be related with sample size, study design, and study period.

Literate respondents were 2.81 times more likely to practice household water treatment compared to those who were illiterate (AOR= 2.81' 95%CI=1.93-4.09). This finding was similar with study done northwest Ethiopia (Hailegebriel *et al.,* 2015) and Bona district Sidama zone southern Ethiopia (Abebe Berhanu and Hailu, 2015). The possible explanation for this finding might be due to the fact that literates might know different types of water treatment methods from media and also those literate persons better understand health risks of drinking contaminated water by reading posters and leaflets.

Respondents who draw their water by dipping their container were 1.5 times more likely to practice household water treatment than those who draw their water by pouring their container (AOR = 1.55, 95 % CI = 1.07–2.26) This finding was in line with study done northwest Ethiopia (Hailegebriel *et al.,* 2015). The possible explanation may be due to the fact that they might think that dipping the container for fetching may be likely to contaminants and to avoid those contaminants, respondents who may use at least one of water treatment method for household water treatment practice. And also they may be get information from health professionals on draw water by dipping increase water contamination.

Those respondents who fetched their water three time and above a day was 1.8 times more likely practice household water treatment than those who fetching water once a day (AOR = 1.83, 95 % CI = 1.07–3.09). This finding is in line with study done in North West Ethiopia (Hailegebriel

et al., 2015). The possible reasons for this may be those who fetched the water most frequently may have a fortuitous to store their water which in turn empowers them to treat their water by storing.

Limitations of the study

The information was collected mainly through interviews, so there is a possibility that some of the responses might suffer from self-report bias. In order to avoid this bias explanation of questions with different descriptions and fed back of the respondents was done.

6. CONCLUSION AND RECOMMENDATION

6.1. Conclusion

Household water treatment practice is low in the study area. Educational status which are literate, drawing water by dipping and those who were fetching the water three times and above a day were found to be predicators of household water treatment practice

6.2. Recommendation

According to the result of this research

Gibe Woreda Health office:-

Should give attention for those who are illiterate to teach /train them about household water treatment practice

Gibe Woreda Health office in collaboration with water office and NGOs working in WASH projects organizations should:-

Advocate household water treatment practice for illiterate and for those who fetched their water by pouring and those who fetch water less frequently store in the household.

Gibe Woreda Health extension workers

Should: - create awareness about households water treatment before consumption of their drinking water in home for those who were not practicing water treatment at household level.

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8. APPENDICES

Appendix A: Participant Information sheet and Informed Voluntary Consent for (English Version).

My name is _____. I am working as data collector for the study being conducted in this community by Bereket Tafesse who is studying his Master's degree at Haramaya University, College of Health, and medical Sciences. I kindly request you to lend me your attention to explain you about the study and being selected as the study participant.

The study title: Household water treatment practice and associated factors in Gibe woreda, Southern Ethiopia.

Purpose of the study: The findings of this study can be of a paramount importance for Gibe woreda water and health office to plan awareness programs to develop level of household water treatment and safe storage practice. Moreover, the aim of this study is to write a thesis as a partial requirement for the fulfillment of a Master's program in Water Supply and Sanitation Management for the principal investigator.

Procedure and duration: I will be interviewing you using questionnaire to provide me with pertinent data that is helpful for the study. There are 36 questions to answer where I will fill the questionnaire by interviewing you.

Risks and benefits: The risk of being participated in this study is minimal, but only taking few minutes from your time. There would not be any direct payment for participating in this study. However, the findings from this research may reveal important information for Gibe woreda Water and Health Office and government planners.

Confidentiality: The data you will provide us will be confidential. There will be no information that will identify you in particular. The findings of the study will be general for the study population and will not reflect anything particular of individual person. The questionnaire will be coded to exclude showing names. No reference will be made in oral or written reports that could link participants to the research.

Rights: Participation in this study is voluntary. You have the right to declare to participate or not in this study. If you decide to participate, you have the right to withdraw from the study at any time and this will not label you for any loss of benefit, which you otherwise are entitled. You do not have to answer any question that you do not want to answer.

Contact address: If there, are any questions or en quires any time about the study or the procedures, please contact:

Bereket Tafesse: Mobile number (+251)-917-120820).

Email Address: bereketwash@gmail.com

Institutional Health Research Ethics Review Committee: Phone Number (+251)-025-466-20-11, P.O. Box 235, Harar.

Declaration of informed voluntary consent: I have read/was read to me the participant information sheet. I have clearly understood the purpose of the research, the procedures, the risks and benefits, issues to confidentiality, the rights of participating and contact address for any queries. I have been given the opportunity to ask questions for things that may have been unclear. I was informed that I have the right to stop the study at any time or not to answer any question that I do not want. Therefore, I declare my voluntary consent to participate in this study with my initials (signature) as indicated below.

Name and signature of the participant: _____ Date: _____

Name and Signature of data collector***:*** _____ Date: _____

Appendix B: English version Questionnaire for households.

Questionnaires on assessment of household water treatment practice and associated factors of Gibe Woreda, southern Ethiopia, 2017/18 G.C.

To be filled by data collectors Kebele: _____

Name of Data Collector: _____Signature_____ Date: _____

Name of Supervisor: _____ Signature_____ Date: _____

Household ID _____

Part I: Household Demographic and Socio-Economic Information

No	Questions	Responses	Skip
101	Head of the household	1. Male 2. Female	
102	Age of respondent	_____year	
103	Type of respondent	Mother Another females adult member of household	
104	Ethnicity	1. Hadiya 2. Amhara 3. Oromo 4. Gurage 5. Other specify_____	
105	Religion	1. Protestant 2. Orthodox 3. Muslim 4. Other specify	
106	Educational level	1. Illiterate 2. Read and write (1-5 grade) 3. Elementary complete (6-8 grade) 4. Junior complete (9-10 grade) 5. High school complete and above	
107	Marital status of the household head	1. Single 2. Married 3. Divorce 4. Widowed	

108	Occupation of the household head	1 Farmer 2 Merchant 3 Government employee 4 Daily laborer 5 Unemployed 6 Other specify_____	
109	Number of individuals in the household	_____	
110	What is your Average monthly household income (in birr)?	_____ birr	
Part II: Environmental characteristics			

Types of water source			
201	What is the immediate water source that is used by the household?	1. Piped water 2. Public tap water 3. Spring water 4. River Water 5. others _____	
202	How long does it take to go there, get water and come back?	_____ in minutes	
203	Who usually goes to this source to fetch the water for your household?	1. Adult woman 2. Adult man 3. Female child (under 15 years) 4. Male child (under 15 years) 5. Others specify	
Household water storage and handling factors.			
301	Do you collect water in the house?	1. Yes 2. No	If 2 skip 302-307
302	How frequent do you collect water?	1 Once a day 2 Twice a day 3 Three times a day and above	

303	What kind of water storage vessel have you use?	1. Jerican 2. Bucket 3. Clay Pots. 4 Other specify _____	
304	Do you ever wash your water storage vessels before storing water in the home?	1. Yes 2. No	
305	With what type of materials do you use for washing the water collection container?	1. Vegetation 2. Only water 3. With soap 4. Others specify _____	
306	How often do you clean your water storage vessels?	1. Daily ____ 2. Every 3 days 3. Weekly 4. Every 15 days 5. Never	
307	Have you cover the water storage vessel?	1. Yes 2. No	
308	Does the storage containers accessible to children?	1. Yes 2. No	
309	What type of water withdraw method do you use to withdraw water from the source ?	1.Pouring 2.dipping	If 1, skip 310
310	If dipping does the utensil used to draw water from the container has a handle?	1. Yes 2. No	
	Hygienic practice		
401	Do you wash your hands before handling the drinking water in your home?	1. Yes 2. No	If 2,Skip 402
402	If Yes to the above question do you use a soap to wash your hands?	1. Yes 2. No	
403	Do you wash your hand after defecation?	1. Yes 2. No	If 2, Skip 404
404	If Yes for the above question do use a soap to wash your hands	1. Yes 2. No	
Part III: Knowledge on household water treatment practice			
501	Do you know about household water treatment methods	1. Yes 2. No	If 2, skip 503

502	If the above Q501 is yes what types of treatments methods do you know? (more than one answer is possible)	1. Boil 2. Add blech/chlorine 3. Strain through a cloth 4. Use water filters 5. Solar disinfection 6. Let it stand and settle 7. Others specify		
503	Do you think drinking water contamination occurs in home?	1. Yes 2. No		
504	Do you think cleansing water collection and storage material prevent water contamination?	1. Yes 2. No		
505	Do you think washing hands before water collection can prevent water contamination?	1. Yes 2. No		
506	Do you think washing hands after defecation can prevent water contamination?	1. Yes 2. No		
507	Do you think treating water in household can prevent water contamination?	1. Yes 2. No		
Household water treatment practice				
601	Do you do anything to the water to make it safer to drink in your home?	1. Yes 2. No		
602	If yes, the above Q601, what do you usually do to make the water safer to drink in your home? (More than one answer is possible)	Methods	Yes	No
		1. Boil 2. Add blech/chlorine 3. Strain through a cloth 4. Use water filters 5. Solar disinfection 6. Let it stand and settle 7. Others specify		

Appendix C: Participant Information sheet and Informed Voluntary Consent for (Hadiyigna version).

Ii summ _____ yamamoomo. Kabadebe baxumuyyi yokkok teim waarummok Haramayi yuniverstee'iisette Fayaom losan xaxiti abbach Barakat Tafassi kolline soroobimi masitireeta losan quxina hasiso xa'amichcha dabatoisana odim soroboina nini maqire ullitoisina maashoomine unxoomo.

Sorophphi horror sawit: Mi'n agi wo'o muccusimi yakkittee amaxamakko wirginouwa Gibei woradane Hadiyyi Zoonanne woroo'n giir giichchi Itophphe'enne.

Soroobimi awadi: Ka sorooboinse sidakam danami sawit Gibe Woradi mi 'ni woo muccusimi bikinanna ogoraamissinne disimi lachcha minadabina Gibei woraxi fayyaomi kitaaphi mini woi kitaaphi mini mateyoomine losisoissina awadokko. Lobakatooma la'mi digrei gullooki soorobachina awadokko.

Baxxi ogora amane: keese xamomi xamichi awadokkok Ka sawit soroobimminatte. Xa'michi qaxoomi 36 xammichcha ati dabatituya wonshoomo

Hawojjaa awaado: Ka soorobanne hicaa anga eddimanne affo qedi hoffane, ihonabagan hofiqaxi saata uwoomane bagani. Hanqo'i miqoi ka soorobina beisami amanoomo. Ihukaremidu ku sooroobi Gibei woraxi woi kitaaphi mini gasina danami ihaakkoo.

Gaaffasimmi ogora: Wixa'akam sawit gaffasohanee, Ku sawit keese mulla xamisobeanne. Ku sooroobi moisokoki soorobakami minadabi bireeni mula gaga xamisooki beanne. Xa'mmicha inkiranchi suma agissena horakamo.

Eyyitte: Ka soorobina Xa'mmicha dabatotokki gidishinneyyo. Ka soorobanne agimiki urimiki eyyitte kiahanne teimi agima urimma hundam xantotto odim hinkamannenem fitenami xantotto, ayyi dabachami dabarima sabenami xantotto.

Gandissa: Soorobanne agubei Xa'michi heulas kani wooroooni you xiqomminne siidenna xantotto.

Barakat Tafassa: Mobaella Xigo (+251)-917-120820).

Imeel Gandissa: bereketwash@gmail.com

Haramayi universitei fayyaomi sooroobi gasi: Mobaelli Xigo (+251)-025-466-20- 11, P.O. Saxin Xigo 235, Harara.

Eyyitte la’ishshi ogora: Anga edimmi eyyixxi bikina animi moamo moisakookom. Odim soroophi bikina xortoa moammo, baxxi ogora, affo hawojja, awaado, angaedimi bikina, eyyixxi bikina. I lagemi ayyi amanenemi ayyemi xa’ichcha dabarimine hasumilas ureena xortoa laammo. Ebikki

na, ka soorobina anga edena hassumanooma kanni woroni sidamoissinne furmainne caakiseena hassommo.

Summa anga edanchi Furimaa: _____ Balla: _____

Summa xa’amichcha wixaanch furimaa: _____ Balla: _____

Appendix D: Hadiyigna version questionnaire for households

Xa'michchuwwa mini woo muccusimi yakittenne annani annani wirginouwwa Gibei Worada, wooron giir-giich gasi qoxo'o Tophee, 2010H.D.

Xa'mmicha wixa'anchchi woomo luwwuwa.

Qaballe'e_____

Xammichcha wixaanchi summa: _____Furimaa_____ Balla: _____

Dadesanch summa: _____ Furimaa_____ Balla: _____

Mini Xigo _____

Gabali I: Man, gatee mi 'ni heechi qanqa ogora

Xigo	Xa'michchuwwa	Dabachuwwa	Hige
101	Mi'n anichi	1. Goncho 2. Menticho	
102	Dabacha dabarukani umur	_____hincho	
103	Dabacha dabarukok	1. Mi'n gasancho. 2. Mi'n anna teim ama. 3. Hardei osso	
104	Qaranchi	1. Hadiyya 2. Amahara 3. Oromo'o 4. Gurage'e 5. Muli qarancha_____	

105	Amanati	1. Amanano 2. Xoomano 3. Isllamano 4. Muli Amanano————	
106	Losani gabala	1. Mahemi losan bee 2. Qananachaa and kitabima (1-5 gabala). 3. Luxi gabala gulamo (6-8 gabala) 4. La'mi gabala (9-10 gabala) 5. La'mi gabala ehaninsem hanani	
107	Mi'n anichi agixanchi ogora	1. Woraadicho 2. Agisakohanne 3. Gindakohane 4. Annani ihakohane 5. Mulisami ihakohane ————	
108	Mi'n ani baxxi ogora	1. Abulancho 2. Dadaracho 3. Adil baxancho 4. Malayi baxancho 5. Fannoo 6. Mulibaxomi baxohane_____	
109	Abarosi dutuma	_____	
110	Agana aggoo gabee tophei biirine?	_____ Tophei birra	
Mini woi amaxamakko wirginouwwa			
Mi'n wo'o lugumi			**Hige**

201	Aggi wo'o minina awaxitakamo lugumi hinka beyyinsete?	1. Bomb wo'o 2. Mani maqili wo'o 3. Otam buo/ Otamubei buo 4. Axisam/ Axisakoi bei uli woroli wo'o 5. Dado wo'o 6. Muli wo'o _____	
202	Mini woo ebakeena marka'a dabalakam amani mei?	_____ saata	
203	Mini wo'o guguro?	1. Haridee mento 2. Haridei gona 3. Haridei landi umuri (15 umuri woroni) 4. Gono osi (15 umuri woroni). 5. Muli manimi----------	
Gabali II:Minina wo'o wixaimma muccuroomine amajja.			
301	Woo mine wixaalakamo?	1. Oyya 2. A'e	D, 2 Hige 302-307
302	Mei amane mini wo'o wixaalakamo?	1. Bali hundam 2. Muli balluwa 3. Sasasi ayammo 4. Saanti hundam 5. Muli amanemi _____	
303	Xamichi 301 Eyya ihulas hinka wo'o wixaanchi muuta awaxitakamo?	1. Jarikanna 2. Sakelo'o 3. Haracho. 4. mulimuuti yolas _____	

304	Wo'o wixaalakamo muuta anshitakamo?	1. Oyya 2. A'e	
305	Wo'o wixaalakamo muuta anshitakamo maruwinne?	1.Mutanine 2. Woi xaleine 3. Samuninne 4. Muluwine _____	
306	Wo'o wixaancho mei amanne anshitakamo?	1. Balane ____ 2. Saxi ayyamonne 3. Santasantanne 4. Tommonoontonne 5. Horremi anshinomoyyo	
307	Wo'o wixaanchika summe iffisakamo?	1. Oyya 2. A'e	
308	Wo'o wixaanchi gadanonne ciiluwwi lelo?	1. Oyya 2. A'e	
309	Hinkidoissinne mini wo'o inkitakamok?	1.Hanninne 2.Humburushimine	D1, ihulas 310 hig
310	Dabachchi umburushimi ihulas inkiranchonne angi yohoni bee?	1. Oyya 2. A'e	
Muccuroomine yakkittee			
401	Mi'n agi woo amadakoni ilage anga anshaqitakamo?	1. Oyya 2. A'e	D 2, Ihulas Hig 402
402	Hana 'ni dabachi Oyya ihulas anga Samuninne anshaqitakam?	1. Oyya 2. A'e	

403	Shuma shumela dabalituya anga anshaqitoo?	1. Oyya 2. A'e	D 2,ihulas 404 Hige
404	D, 1 ihulas Samuninne anshaqitoo?	1. Oyya 2. A'e	
Gabali III: Mi'n wo'o muccusimi bikkina yoo lacha			
501	Mi'n woo muccusimi bikina laqoo?	1. Oyya 2. A'e	D2, ihulas Hige 502
502	Hanna'n dabachcha Oyya ihulas hanninse woo muccusimi bikkina maccessotokki (lobakat dabacha dabarima xantoto).	1. 1. Wo'o ibissimi gogo 2. Kemikaluwwa issimi gogo 3. Edechine wo'o mararimi gogo 4. Anani annani mararimi gogo 5. Elinchone ibishi gogo 6. Bashil amane afusimi gogo 7. Muli gogo yolas	
503	Agi woi kolibamokoki hannonete yitaa sawitoo?	1. Minnene 2. Woo ebakami lugumonne 3. Lamemi beyyonemi 4. Muli beyyonemi _____	
504	Woo disakami muuta axaximmi woi kolibamobeisinna egerooko yitaa sawitoo?	1. Oyya 2. A'e	
505	Woo wixa'akoni ilage gaqi anganshaqimi woi kolibamo beissina awadokko yitaa sawitoo?	1. Oyya 2. A'e	

506	Shumela lasage angi muccuroomine egerimmi woi kolibamobeisinna awadokko yitaa sawitoo?	1. Oyya 2. A'e			
507	Mi'n woo muccusimi woo kolibamichchi egerooko yitaa sawitoo?	1. Oyya 2. A'e			
Mi'n woo muccusimma Yakkittee					
601	Kini minene woo muccusakam?	1. Oyya 2. A'e			D2, ihulas ulleh e
602	Hanani xamichikki dabachi oyya ihulas hinka woo muccusimi gogo awaxitakamo?	Muccurisekam gogo	Oyya	A'e	
		7. Wo'o ibissimi gogo 8. Kemikaluwwa issimi gogo 9. Edechine wo'o mararimi gogo 10. Anani annani mararimi gogo 11. Elinchone ibishi gogo 12. Bashil amane afusimi gogo 13. Muli gogo yolas…			

Appendix E: Curriculum Vitae of personal investigator

1. Personal details:
   - Name: Bereket Tafesse Tibore.
   - Place of birth: Hadiya zone, Homecho town.
   - Date of birth: 10, July. 1989
   - Sex: Male
   - Marital status: Single
   - Nationality: Ethiopian
   - Contact address: email: bereketwash@gmail.com
     Phone: +251917120820

2. Educational background:
   - Elementary: Homecho primary school (1-8)
   - Secondary: Morsito High School (9-10)
   - Preparatory: Wachamo Comprehensive School (11-12).

3. Educational qualification
   -Graduated from Jimma University with B.sc .in Chemistry.

4. Work experience

Institution	Duration	Job position
Gibe woreda Water, mine, and energy office	May 2011- Sep 2016	Alternative energy expert

5. Language skill				
Languages	Listening	Speaking	Reading	Writing
Hadiyigna	Excellent	Excellent	Excellent	Excellent
Amharic	Excellent	Excellent	Excellent	Excellent
English	Excellent	Excellent	Excellent	Excellent

5. **Skills**: - Teaching skills

   -Basic computer skills

   -Managing, monitoring and evaluating skills

6. **Interests**

   -Reading different books

   -Helping the servants'

   -Conducting research and serving community

9. Awards

-Graduate with distinction from Jimma University (CGPA-3.43)

-Certified in anti-corruption and ethical commission10.

10. **References: Derje Abate**, email: derjeab7@gmail.com

Phone: 0973196096

Yohanis Alemshet, email: yohanalem2021@gmail.com

Phone: 0910284149