



## Assessment of Knowledge and Hygienic Practice of Bacteriological Quality of Drinking Water in House Hold Level in Jigjiga City, Eastern Ethiopia

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### Abstract

**Introduction:** Drinking water becomes contaminated by faecal and waste material due to inadequate protection of the source, Hygienic practices of the community at the source as well as house hold level.

**Objective:** The aim of this study was to assess the impact of knowledge and hygienic practices of the community on bacteriological quality of drinking water at the source and point of use.

**Method:** A community based cross-sectional study was conducted using interview administered questionnaire, the study was conducted during March 2014-June 2014 in Jigjiga city, Somali regional state. One hundred fifty-two (152) house hold were selected using random sampling techniques.

**Result:** A total of 152 household were asked for this study. Of 152, 78 (51.3%) were female and the rest 74 (48.7%) were male. Regarding their educational status 121 were literate and 31 (20.3%) were illiterates. 50 (32.9%) were private employee, 34 (22.4%) were merchants, while 44 (28.5%) have other job; and only 24 (15%) were government employee. Regarding family size 105 (69.1%) has less than five and the rest have greater than five. 122 (80.3%) were aware that water can transmit diarrhea. 56 (36.8%) of respondent have got information from TV; and the majority of the respondent 121(79.6%) aware that water from safe source can be contaminated by different microorganisms, similarly 34 (22.4%) of the respondent knew that source of contamination was unclean hand as well as other unhygienic practice committed in the home. Mothers 59(38.8%) were responsible for water fetching and other management and followed by daughters 53 (34.2%). The majority 112 (73.7%) of the respondent wash their hand and container before collection. Most of the respondents 86 (56.6%) get water from tap water and 'Biyole' which account for 42 (27%).

**Conclusion and Recommendation:** Protected water source were subject to contamination, because of poor house hold management system unhygienic practice in the home.for 42 (27%).

Proper protection of water source, regular monitoring of water quality, hygienic education and sanitation were very important strategies to improve bacteriological water quality and to safe life.

**Keywords:** Knowledge; Hygienic Practice; Bacteriological Quality; Drinking Water; Ethiopia

### Introduction

Water is the essence of life and safe drinking water is a basic human need essential to all and for sustainable development; it is known that water is the most precious resources vital for economy; our daily life and for the health of our environment. Water and sanitation inadequacies hinder economic and social development; constitute a major impedimental to poverty alleviation and inevitable lead to environmental degradation [1].

A community suffered from diarrheal and shistosomiasis diseases cannot look beyond its immediate problems toward social and economic welfare; safe water is the door way to health and health is the pre- request for progress, social equity and human dignity [2].

Protection of water supply from contamination is the first line defence against diseases. Because water plays essential role in supporting human life it has if contaminated great potential for

transmitting a wide variety of disease and illnesses; source protection almost invariable, is the most and best method of ensuring safe drinking water. However, failure to provide adequate protection, poor site selection, and unhygienic practice of the consumers and determination of the construction material may contribute to the contamination of water resources and resulting water born disease [3].

In Ethiopia over 60% of the communicable diseases is due to poor environmental health conditions arising from unsafe and inadequate water supply and poor hygienic and sanitation practice about 80% of the rural and 20% of urban population have no access to safe water and which is the least among the continent (Ombaka, *et al.* 2013).

Three-fourth of the health problem of the children in the country are communicable disease arising from the environment specially water and sanitation [4].

Water is vulnerable to contamination by bacteria at many points in its journey from reservoir to mouth. In urban environment a high concentration of bacteria is present and can easily contaminate water after collection but before consumption [5].

Diarrhea remain a major killer in children and it is estimated that 80% of all illness in developing countries is related to water and sanitation; and 15% of children deaths under the age of 5 years in developing countries result from diarrheal disease (WHO, 2003).

More than one billion people worldwide drink unsafe water. A total 3.4 Million people; Mostly children die every year from water related diseases from drinking, swimming in or washing clothes in polluted water [6].

There are some diseases which are common in less industrialized country principally owing to less problem of unsafe drinking water (WHO, 2014).

Among the diseases that are hazardous to health are cholera, salmonella, shigella, all is bacterial that cause diarrheal and sometime death (WHO, 2014).

No	Diseases	Causing agent
1	Adino virus infection	Adino varidae virus
2	Amaebiasis	Entameba histosytica
3	Campalyo bacteriosis	Compalyo bacteria jejuni
4	Crypto sporidiosis	Crypto sporium parasite
5	Cholera	Vibrio cholera bacteria
6	Hepatitis A	Hepatitis A virus
7	E. coil 157:97	E. coli bacteria
8	Giardiasis	Giardia lamblia

**Table 1:** Water Borne Diseases.

Source: Arizona – department of health service  
2009- 2014 water born disease.

More than 1.1 billion people in the world, lack access to safe drinking sources which represented 17% of the global population; Two third of this population live in Africa. In sub-Saharan Africa; 42% population still without improved water. Similarly, 2.4 billion lack access to even basic sanitary. As consequence, 1.8 billion people die every year formally from diarrheal diseases (including children); 90% under 5, Mostly in developing countries 88% diarrheal diseases is attributed to unsafe water supply in adequate sanitation and hygiene [7,8].

Fresh water is a finite and precious resource essential for sustaining life, human development and environment. A regular supply of drinking water is a basic human need and it becomes a daily factor for survival during human crisis. The united nation center for human settlement estimated that a tenth of every individual's life is lost through water related diseases [9].

In recognition of the critical importance of the water and sanitation for development which will be halve by the future on people without sustainable access to safe drinking water and basic sanitation [7].

Although safe water supply services are available in most places, the national as well as the regional information on the water quality status and the household management of local water sources is not readily available. This research tries to identify quality of protected source and household drinking water containers and

the main contributing factor towards the contamination of drinking water and its variation at the source and household level. The findings of this study may provide important information for water and sanitation policy makers and program managers, NGOs and government bodies involved in the implementation of water and sanitation projects to improve the service in the future.

### Sanitary inspection of water resources

In the case of ground water, like protected ground spring, well and protection of water connection system, it should be possible to achieve very low levels of contamination [10].

However different protected water resources are highly subjected to bacterial contamination due to various reason to assess this problem, WHO prepared standard protected spring evaluation check list which have a score of risk out ten (9 - 10) = very high, 6 - 8 = high risk, 3 - 5 = intermediate risk and 0 - 2 = low risk [11].

The following are included in the checklist; physical status at protection, box, the situation of outlet and over flow pipe the drainage system and the general sanitation of the springs, springs with high sanitary risk has an inferior bacteriological quality, and on the contrary those springs with low sanitary risk score found to have good quality. Liud [12] also indicate the higher hazards score of protected spring generally correlate well with increasing order of magnitude of faecal contamination [12].

### Water handling practices

Access to safe watery alone doesn't reduce diarrheal diseases significantly. Even if the source is safe water become fiscally contaminated during collection, transportation, storage and drawing in the home [13].

In adequate hygienic practices must be targeted the implementing water and sanitation projects as well to decrease morbidity and mortality especially in rural areas. A long with building or improving water points therefore we should provide hygienic education for all user groups. Hygiene promoters inform community members about the correct use and storage of water, the need for sanitation facilities, personal and environmental hygiene and diarrheal, transmission and management aiming at sustainable development or behavior change [8].

A key factors in provision of safe household water include the conditions and practices of water collection, storage and choice of water collection and storage containers or vessels and numerous studies have documented in adequate storage condition and vulnerable water storage containers as factor contributing to in-

creased microbial contamination and decreased microbial quality compared to either source water or water stored in improved vessels [9].

### Knowledge of water handling and contamination

About 66% water can be contaminated by due to human excretory about 8% is due to animal excreta and about 19% expressed their organic waste, in addition to this 88% of total population wash their hand for the following reasons 55% cleanness, 36% to prevent bad smell and 41% to prevent disease [14].

The main source of hygiene education on how to keep water safe were mostly health showed health professionals, a survey conducted by ministry of health showed respondent were asked whether they knew any disease that are associated with water, most were able to relate diarrhea with water [4].

### Bacteriological water quality

Outbreak of disease often epidemic proportion can occur if human wastes that are influenced with pathogens enter with water supply. Diseases that are transmitted when people drink contaminated water, swim in it, and include cholera, typhoid fever, dysentery infections, hepatitis and polio. It would be practically impossible to test for each of the wide Varsity of pathogens that may be present, As Microbial water quality. Monitoring is primary based on testing for indicator organism i.e. coliform bacteria count is used to test water for contamination by Microorganism, coliform bacteria (*E. coli*) live natural in the human intestinal tract and average person excrete billions of them in faeces in each day, the term coliform indicates a defined group of gram-negative bacteria are harmless and cause no disease but their presence in water is an indicator of faecal contamination. If none are found, the water is free from faecal contamination and can be assumed as free from pathogenic organisms (Ombaka., *et al.* 2013).

This study thus sought to assess the knowledge and hygienic practices of bacteriological quality of drinking water in house hold level in Jigjiga city, eastern Ethiopia.

## Methodology

### Description of study area

Jigjiga is a capital city of Somali regional state, located south east of capital city of Ethiopia, and 630km far from Addis Ababa. The city population was 199,756 and it composes 10 kebele. Its altitude range from 1,609 m above sea level and annual rainfall recorded is 34.5 and 50% latrine coverage of the city respectively.

### Study design

A community-based cross-sectional study was carried out using interview and questionnaires to observe the current condition of drinking water, knowledge and hygienic practices of drinking water at house hold level.

### Source of the population

All household in Jigjiga city which comprise 10 kebele and water which served for house hold use were source of the population.

### Study population

The study sample was household in Jigjiga city randomly selected from 4 kebeles were considered as the study population.

### Sampling technique

Using simple randomly sampling method from 10 kebeles of Jigjiga city 4 kebeles was selected by lottery method to assess the knowledge and hygienic practices; and the selected households were interviewed and questionnaire was given to the house holds to assess their hygienic practice. From each kebeles, 38 households were asked and interviewed.

### Sample size

Sample size was determined by taking 95% CI, precision of 5%, power of 80% etc. This is calculated by using the following formula:

$$n = \frac{1.96^2 \times P \times exp(1 - P \times exp)}{d^2}$$

$$n = \frac{1.96^2 \times 0.5(1-0.5)}{0.05^2} = 384$$

Where, n: required sample size;

D: desired absolute precision (usually);

Pexp: expected prevalence.

Since the population in each kebele is less than 10,000; i.e, as maximum as 250, the above value was corrected as follows;

$$nf = \frac{n}{1 + \frac{n}{N}}$$

Where; nf: final sample

$$= \frac{384}{1 + \frac{384}{250}} = 152$$

### Operational Definition

- o **Coliform:** Indicator organism for water pollution by bacteria mostly their natural habitat is human intestine.
- o **Faecal coliform:** Faecal origin microorganism.
- o **Knowledge:** Awareness that the people have about bacteriological quality.
- o **Hygienic practices:** Activities that the community takes to keep the water safe to drink and another house hold uses.

### Method of data collection

Data collection was made by using questionnaires open ended and closes ended questions prepared in English and local language's (Somali language), the study takes place by interviewers who physically observe the condition of water handling practices and sanitation at household level.

### Data analysis

The collected data was compiled and analyzed when the data collectors bring daily field questionnaires and interpret into valuable information by tables and percentages.

### Results

A total of 152 household were asked to collect necessary. From the total respondent of 152, 78 (51.3%) were female and the rest 74 (48.7%) were male.

Regarding their educational status 121 were literate and 31 (20.3%) are illiterates. 50 (32.9%) are private employee, 34 (22.4%) are merchants, 44 (28.5%) have other job; only 24 (15%) are government employee. Regarding their family size 105 (69.1%) has less than five and the rest have greater than five.

### Water handling practice

Majority of the people use separate container to store water; 94 (61.8%) prefer 'Jerrican' followed by Buckets which is 29 (19.1), while 29 (19.1%) were use clay pot and other. 90 (59.1) of respondent cleaned their hand before collection and 127 (85.6%) of the study subject had cover their collection container. 127 (85.6%) of the respondent cover their storage; while 77 (50.7%) of them use dipping method of water withdrawal from the storage. 54 (35.5%) place their drinking utensil on floor.

Characteristics (n = 152)	Number	Percent
Gender:		
Female	78	51.3%
Male	74	48.7%
Educational Status:		
Illiterate	31	20.3%
Elementary	36	23.7%
Secondary and Above	85	56%
Occupational Status:		
Private employee	50	32.9%
Government employee	24	15.8%
Merchant	34	22.4%
Others	44	28.5%
Family Size:		
≤ 5	105	69.1%
> 5	47	30.9%
Income Per Month:		
≤ 1000	85	55.9%
> 1000	67	44.1%

**Table 2:** Socio-Demographic Characteristics of the Respondent of Jigjiga City.

Characteristics (n = 152)	Number	Percent
Type of Water Collection Container:		
Jerrican	94	61.8%
Bucket	29	19.1%
Washing Hand Before Collection:		
Yes	90	59.1%
No	62	40.8%
During of Collected Water in Container:		
A day and less	90	59.1%
More than a day	62	40.8%
Cover Storage Container:		
Yes	127	85.6%
No	25	16.4%
Method of Withdrawal from Storage:		
Pouring	75	49.3%
Dipping	77	50.7%
Method of Placing Drinking Utensils:		
Table/Shelves	70	46.1%
Floor	54	35.5%
Others	28	18.4%

**Table 3:** Water Handling Practice at Household in Jigjiga City, 2014.

Knowledge of Respondent about Water Handling Practice, Sanitation and Related Health Issue in Jigjiga city

Assessment of knowledge done among 152 households in

this study the majority of the study subjects 122 (80.3%) aware that water can transmit diarrhea. 56(36.8%) of respondent have got information from TV; and the majority of the respondent 121 (79.6%) aware that water from safe source can be contaminated by different microorganisms, similarly 34 (22.4%) of the respondent knew that source of contamination was unclean hand as well as other unhygienic practice committed in the home. Mothers 59 (38.8%) are responsible for water fetching and other management and followed by daughters 53 (34.2%). The majority 112 (73.7%) of the respondent wash their hand and container before collection. most of the city population 86 (56.6%) get water from tap water followed by 'Biyole' which account for 42 (27%) (Table 4).

Characteristics (n = 152)	Number	Percent
<b>Can water transmit diseases</b>		
Yes	122	80.3%
No	30	19.7%
<b>Water for diarrheal diseases</b>		
Tap water	29	19.1%
River water	27	17.8%
lake	25	16.4%
well water	10	6.6%
Biyole water	41	29.1%
Pond water	20	13.2%
<b>Source of information</b>		
From Tv	56	36.8%
Health service	53	34.9%
Community Healthy worker	31	20.4%
Others	12	7.9%
<b>Can clean water be contaminated</b>		
Yes	121	79.6%
No	32	20.4%
<b>Source of contamination</b>		
Unclean hand	34	22.4%
Unclean container	30	19.7%
Uncovered container	29	19.1%
Animal/insects	19	12.5%
others	9	5.9%
<b>Responsible person to fetch water</b>		
Mother	59	38.8%
Son	35	23%
Daughter	53	34.9%
Father	5	3.3%
Do you wash your hand and container before collection?		
Yes	112	73.7%
No	40	26.3%
What is your water source?		
Tap water	86	56.6%
Biyole water	42	27.6%
Well water	13	8.6%
Pond water	11	7.2%

**Table 4:** Knowledge about water handling practice and sanitation.

## Discussion

The result of this study reveals those protected water sources were subjected for high level of contamination in most cases. Study in Sir Lanka, demonstrate that 65% to 85% of public water supply; mostly protected source become contaminated [15].

A similar study in south wollo Ethiopia and rural Zambia showed that poor community sanitary practices around the source increased the sanitary risk and contribute to bacteriological contamination of drinking water [16,17].

This study indicates that 80.3% of the respondent perceived that water can transmit diarrheal disease. This was consistent with the survey conducted by ministry of health; environmental health department; the great majority believe water can transmit diarrheal disease [4].

Water obtained from high microbial quality, inducing protected water and treated supply may become contaminated by house water handling practices. In India morbidity and mortality due to water born disease have not defined proportionally with increased availability of potable water supply [14,18].

59.1% of the interviewed household in this study has cleaned hands when collecting water. This was lower than previous report done in Jimma town and South wollo which is 86% and 73% respectively [17].

73.7% of the respondent clean their container before transferring water from collection to storage containers which was much lower than study done in Jimma town 91% [13]. Similarly 85.6% of the respondent covered their storage container, which was much greater than the study conducted in Garamuleta district 60% and Kedame Gebaya 58% but lower than when comparing with study done in South wollo 92.7% [17].

In this study, it was found that 50.7% of the respondent use dipped out water rather than poured when taking from storage container which is the risk for contamination. This was much lower when comparing with the study conducted in Zambia 80% and South wollo 72% of the household [16]. Majority 61.8% of household used Jerrican for household water storage while the remaining 19.1% stored in Buckets which is consistent with different findings in rural Bangladesh [19-24].

## Conclusions

Water Source protection is necessary, but never be sufficient for the provision of safe water supply and in reduction of diarrheal diseases unless and other wise community education is given by the concerned bodies. As the respondent's response almost, all water sources were most probably polluted except tap water There was significant variation of water quality between source water and household drinking water as the researcher observed.

The main contamination was unhygienic practice what the community committed and poor water storage activities, such as lack of cover and ignorance of washing container.

## Ethical Consideration

This study was carried out after getting ethical clearance from Jigjiga University department of biology, each head of the household as well as family members were assured that the information provided should be confidential and used only for the purpose of the research.

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## Competing Interest

The authors declare that they have no competing interest.

## Bibliography

1. WHO. "Global water supply and sanitation assessment 2000 report". Geneva (2000).
2. Nokes C., *et al.* "Geohelminth infection and academic assessment in Jamaican children". *Transactions of The Royal Society of Tropical Medicine and Hygiene* 85.2 (1991): 272-273.
3. Richards Jamie B. "Drinking water monitoring and surveillance". *African Health* (1996): 1-4.

4. Ministry of health, knowledge, attitude and practice of water supply, environmental sanitation target: the hygienic practice in selected warders of Ethiopia (1997).
5. Johanna Crampton. "Water aid maintaining dean: water contamination during water collection and storage in Addid Ababa" (2005).
6. WWW.Danial,edu/Biology Daniel (2014).
7. WHO. "Water, sanitation and hygiene links to health, facts and figures". Geneva (2004).
8. "World health organization, knowledge, practices and unices meting the MoG's drinking and sanitation target; the urban and rural challenge of the decade". Geneva (2006).
9. WHO. "Water, Sanitation and Health. Managing water in the home: accelerated health gains from improved water supply". Geneva (2002).
10. Cheesbrough M. "Medical laboratory manual for tropical countries". Butter Worth Heinemann Ltd Oxford (1984).
11. WHO. Who Guidelines for drinking water quality, surveillance and control of community water supplies; volume 3, second edition Geneva (1997).
12. Liud B. "A check list of hazards: wold health organization" (1992).
13. Thomas F Clasen and Sandy Carin Cross. "House hold water management refining the dominant paradiagram". *Tropical Medicine and International Health* 9.2 (2004): 187-197.
14. Deb BCBK, et al "Intra- familiar transmission of vibro cholera Biotype eltor in calculta slums". *Indian Journal of Medical Research* 76 (1982): 874-819.
15. Merten TE. "Determinants of water quality, availability and use in kuruneqala Sri Lanka". *Tropical Medicine and Parasitology* 41.1 (1990): 89-97.
16. Sutton dominik. "Household water quality in rural Zambia water lin" (1989): 20-21.
17. Tiku., et al. "Factor affecting water quality from source to home in tehuledere, woreda, North east Ethiopia". *Ethiopia Journal of Health Science* 13.2 (2013): 94-106.
18. Teklu Mkebede. "Survey on practice of water handling, jimma town". *Ethiopia Journal of Health Science* 8 (1998): 29-34.
19. Shears P, et al. "Water sources and environmental transmission of multiply resistant enteric bacteria in rural Bangladesh". *Annals of Tropical Medicine and Parasitology* 89.3 (1995): 297-303.
20. Anil Markandya. "Water quality issues in developing countries". World Bank report (2004).
21. Arizona department of health service 2009-2014 water born disease.
22. John P. "Water use and pattern in rural north esthoil and south ampton raw". London 9 (1999).
23. Verweij PE, et al. "Skin infections and types of water supply in Venda, South Africa". *Transactions of the Royal Society of Tropical Medicine and Hygiene* 85 (1991): 681-647.
24. D Amenu., et al. "Microbiological Quality of Drinking Water Sources in Rural Communities of Dire Dawa Administrative Council". *Science, Technology and Arts Research Journal* 1.4 (2012): 33-37.

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