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Assessing the socio-demographic, economic and water source types that influences households drinking water supply in Debre tabor town, north-west Ethiopia

Abstract

Background: Human life depends on clean and healthy environment. However, low environmental standards lead to reduced life expectancy. Most peoples who live in the developing countries are under risk of getting clean water and any form of sanitation services. Because of this, millions of peoples are suffering from diseases associated with water. Nowadays, it needs emphasis on the accessibility of drinking water and factors which determine the supply of safe drinking water for urban households.

Objectives: This study aimed to assess socio-demographic, economic and water source types that influences households drinking water supply in Debre Tabor Town, North-West Ethiopia.

Methods: A community based cross-sectional study design was conducted among households from February to March 2019. An interview-based pre-tested and structured questionnaire was used to collect data. Data collection samples were selected randomly and proportional to each kebeles. Epi info version 7.2.1.0, and SPSS Version 24 were used to enter and analyze the data; respectively and descriptive statistics with frequency counts and simple percentages were performed.

Results: 418 households were participated. On average there were about 4.53 persons per each household. The most frequently used water source is pipe water (78.95%). Fetching water was the responsibility of females and children. Majority of the population of the town had no alternative sources, since traditional water sources were polluted by animal and human wastes. Due to high scarcity of water supply, traditional water sources were used by the residents. The time taken from home to traditional water sources was about 55.74% of the population had got their water for a trip of 15-30 minutes and 35.17% of the population 31-45 minutes, was much longer than the country average. 44.50% of the population got their water supply partially per week. 91.15% of the population was under the problem of water scarcity in the town. About 85.65% scarcity was happened due to weak administration of the concerned government bodies.

Conclusion: The water supply was inadequate, and the quality was low. The median consumption was found to be 30 liters per household per day and 6.62 l/p/d, lower than the national and WHO minimum water consumption level of 20 l/p/d. Nine out of ten persons was under the problem of water scarcity in the town. The concerned government bodies should provide adequate and quality potable water facilities for the town residents.

Keywords: households, socio-demographic, economic, water source, drinking water, water supply

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Abbreviations: CSA, central statistics agency; DTT, debre tabor town; DTU, debre tabor university; EDHS, ethiopian demographic and health survey; ICF, international children's fund; JMP, joint monitoring program; l/p/d, liters per person per day; SDG, sustainable development goal; SNNP, southern nations and nationalities of peoples; SPSS, statistical package for social science; UN, united nations; WHO, world health organization

Background

Nearly three-fourth (71%) of the earth surface is covered by water bodies. Most of the water found from those sources cannot be used directly for human consumption and plantation, since it contains salt and other toxic elements. It needs some processing. The benefit of water cannot be listed simply. Primarily, it is the key element for all living things. The body of all living things is composed of water. Living things cannot survive without water. Secondly, water is the most widely used substance, raw material or starting material in the production, processing and formulation of pharmaceutical products.

Every human being has the right to access safe drinking water. It is a critical natural resource upon which all social and economic activities and ecosystem functions depends on, despite the fact that water is a critical resource, access to it remains a daunting challenge

to many people all over the world.[1] Due to different problems this is still face a global challenge.

Currently, about one billion people, who live in the developing world, including Ethiopia, don't have access to safe and adequate drinking water.[2] Contaminated water results in hazards to health and leads to illness.[3] Health science evidences proofed that drinking enough water daily is good for human health. As drinking water has zero calories, it can also help with managing body weight and reducing caloric intake when substituted for drinks with calories, like regular soda.[4–6] In addition to this, drinking water can prevent dehydration, a condition that can cause unclear thinking, result in mood change, cause your body to overheat, constipation, and kidney stones.[7,8]

Global reports stated, by 2025 two-thirds of the world's population may face water shortages. In Africa, only 60% of the population has access to improved sanitation, but the situation is worsen in rural areas, in which only 45% of the rural population has access to improved sanitation. According to WHO report, people are forced to defecate in open fields, in rivers or near areas where children play and food is prepared because they don't have access to improved sanitation.[9] A report on progress of drinking water, sanitation and hygiene[10] indicated that between 2000 and 2015, the number of people practicing open defecation declined from 1229 million to 892 million, an average decrease of 22 million people per year. Evidences showed that about 80% of all sickness and disease in the world are occurred due to inadequate sanitation and hygiene.[11] Open defecation may cause reduce in surface water quality.

Surface water quality is affected by different factors such as human made activities and natural processes. Therefore, effective and long-term management of water sources requires a fundamental understanding of hydro-morphological, chemical and biological characteristics.[12] The effective and long-term management serves clean water for consumption and other activities for human beings.

Human life depends on clean and healthy environment. However; low environmental standards lead to reduction of life expectancy. Most peoples who live in the developing countries are under risk of getting clean water and any form of sanitation services. Because of this, millions of people are suffered from diseases associated with water, commonly called waterborne diseases, such as diarrhea, trachoma and skin disease.[13] Waterborne diseases are caused by drinking contaminated or dirty water. Water borne diseases have been associated with air, water pollution, sanitation, personal hygiene and waste disposal.[14] Contaminated water may cause many types of diarrhea diseases, including Cholera, and other serious illnesses such as Guinea worm disease, Typhoid, and Dysentery. To safeguard this issue and reduce the waterborne diseases, UN has been formulated in its sustainable development goal (SDG) programs.[15]

To further illustrate in numerical facts; a study was undertaken in 2015 shows that in 54 low and middle-income countries found that 38% of health care facilities lacked access to an improved water source, 19% lacked sanitation and 35% didn't have water and soap for hand washing.[16] Challenges such as variability of the problem and solutions, sustainability and reaching people most in need were identified by (WHO and UN, Children's Fund).[16] The report added those the above mentioned challenges will be overcome along a way towards achieving universal access to safe water and sanitation by 2030. The challenge may be a critical issue for the developing country, who are in a serious case of rapid population growth, poor sanitation, contamination of water sources with domestic and industrial wastes.[17–18] Gonfa Duressa, et al.[19] generalized that despite the worldwide efforts of delivering safe drinking water, the transmission of waterborne diseases is still a matter of major concern.

Ethiopia is the country with the worst of all water quality problems in the world. The country has the lowest water supply (42%) and sanitation coverage (28%) in sub-Saharan African countries.[20] Ethiopia is considered as one of with the poorest sanitation and drinking water infrastructure.[21] Beyene, et al. (2015)[22] report showed that about 52.1% of the population has been used unimproved sanitation facilities, while 36% of them practiced open defecation. In Ethiopia due to the discontinuity of drinking water supply, affects the distribution of water to the community in need.[23] Evidences show access to safe potable water for urban areas was 91.5% (within 0.5 km), while the access to potable water in rural Ethiopia was about 68.5% (within 1.5 km) in the year 2010.[25]

The Ethiopian Demographic and Health Survey (EDHS) (CSA and ICF, 2016)[26] reported that 97% of urban households in Ethiopia have access to an improved source of drinking water and with nearly universal access to improved water, and rural areas, with only 57% improved water access, and are slight in Ethiopia. Nevertheless, no reliable information is available on the readability of drinking water quality reports.[27] in places where water scarcity is serious; water is stored for long period of time. There are many health risks when water is stored for much time, especially if it is for drinking and direct usage for humans. Literature showed that water stored for 1-9 days increased 67% of contamination, which could be the reason for increment of coliforms as storage time increased.[24]

The attention of this study is drawn towards Ethiopia, which is facing the above types of problems as any other developing countries. The Ethiopian urban water supply sector has suffered several cases like geographical location, rapid population movement from rural to urban, new settlement in urban areas (urbanization) and lack of resources for building new water sources. So that, the assessment result of this study will click the community, project designers, government and non-government organizations to think about the accessibility of drinking water and factors which determine the supply and practice of safe water, in which the urban households consume.

Methods

Study design, area and period

A community based cross-sectional study was designed from February to March 2019. Debre Tabor Town is the Zonal Administration center of South Gondar Zone, located 666 km North-West from the capital city of Ethiopia, Addis Ababa. Debre Tabor is found 103 km east away from Bahir Dar, regional town of Amhara National Regional state. It is located about 100 km South-East of Gondar and 50 km East of Lake Tana. Geographically, Debre Tabor has a latitude and longitude of $11^{0}51^{J}$N and $38^{0}1^{J}$E; respectively and an elevation of 2,706 meters above sea level. The average temperature of the town is 14.8^{0}C, and the average annual rainfall is 1497 mm. The town is known by its cold weather condition due to the presence of Maunt Guna[1] in nearby. The population of the town is expected to be 87,627 (projected population); of this number 49,535 households are users of tap water in 2019, but the left 38,092 households are not

tapped water users. There are agricultural farms in and around the city which are irrigated with river water and dug water. Animal farming in the town is very common using dug water sources. Drinking water of the town comes from large reservoirs located in its surrounding, Farta woreda, which is one of the administrative woreda in South Gondar Zonal Administration.

Debre Tabor Town has 9 underground water sources with 2 booster reservoirs. According to water agency of the town and health extension officers of each kebele the population of the town is using hand-dug-well (392), hand-pump (6), and spring water (13) (taken in February 2019). Debre Tabor Town has 6 kebeles. The samples were selected randomly and taken proportionally from each kebeles and sub-kebeles.

Sample size determination

The town has about 17,526 households and of which study population is made up of families that reside in the town, with a composition of men, women and children, all of are in different age groups. The average family size of the town was computed about 4.53 per house hold (After a pilot survey was done).

For household survey, samples were decided to select by using the sample size determination equation of Cochran (1977).[28]

$$n = \frac{Z^2 NP\,(1-P)}{d^2\,(N-1)+Z^2\,P\,(1-P)}$$

Where;

Z=95% confidence limit (z-value at α=0.05 is 1.96), N=Number of households in Debre Tabor town=17526 P=0.5, 1-P=0.5 (since no prior evidence was found) d=Marginal error or degree of accuracy =0.05, Using the above formula, it was equal to 380 Non-response rate=10% of 380=38, Total sample size=418. A sample size of 418 was used to eliminate any errors.

Data collection tools and techniques

Both primary and secondary sources of data were employed. The primary data gathering was including, household survey questionnaires and personal observation; while secondary data sources were document review on water supply and demand of the town, zone and the region. Method of data collection was done by investigator administered questionnaire. The investigator administered questionnaire was administered to participants regardless of their educational level. The questionnaire consisted of four sections namely, Section I: socio-demographic data, Section II: sources of income, Section III: water sources observation, and Section IV: household water use practice. There were Key Informant interviews and verification of the facilities using a check list.

A detailed questionnaire was prepared in the native language (Amharic) and included over 30 questions. A multiple-choice format was used to answer majority of the questions. Household characteristics, such as number of family size, educational level, and monthly income of household, type of occupation and sources of water were investigated. Furthermore, questions regarding the frequency, duration of use and water storage material (e.g. tanker, 'rotto', 'jerikan' and pot) were also included.

Data processing and analysis

The collected data were coded and entered into Epi info version 7.2.1.0, cleaned, stored and exported into SPSS version 24 for analysis. Descriptive statistics (frequencies and percentages) were employed to present the data.

Results

Demographic profile of responded households

From the study participants' of 418 households there are 1894 household members. On average there are about 4.53 persons per each household. Table 1 shows the socio-demographic data of 418 house- hold respondents in frequencies and simple percentages. Of the 1894, 1017(53.70%) are females and 877(46.30%) are males. The 824(43.51%) spouses, 1045(55.17%) children and 25(1.32%) other individuals are the members of the responded households. Among the age brackets, 470(24.81%) are aged less than 18 years old, 603(31.85%) are within (18-30) years, 511(26.98%) are within the range of (31-45) years, while 310(16.36%) are above the age of 45 years. However, it can be seen that above half (58.83%) of the respondents are young people of the household member of Debre Tabor Town.

Table 1 Socio-demographic data of responded households, Debre tabor town, North-West Ethiopia, 2019 (N=418)

Demographic information	Frequency=Household member type	Percentage (%)
Spouse	824	43.51
Children	1045	55.17
Others	25	1.32
Total	1894	100
Gender of households		
Male	877	46.3
Female	1017	53.7
Total	1894	100
Age of households		
Below 18 years	470	24.81
18-30 years	603	31.85
31-45 years	511	26.98
Above 45 years	310	16.36
Total	1894	100

[1]Maunt Guna (Amharic: Guna Terara) is a mountain located near the cities of Nefas Mewcha and Debre Tabor, in the northern Amhara region of Ethiopia. It is the highest point in the South Gondar Zone, with an elevation of 4,120 metres (13,517ft) above sea level. Mount Guna forms part of the divide between the drainage basins of the Abay and the Tekeze Rivers. It is the origin of the Gumara, Rib, and other rivers, which flow into Lake Tana and Yikalo, Mebela, Goleye and other rivers, which flow into the Tekeze river (source: Wikipedia)

Table Continued...

Demographic information	Frequency=Household member type	Percentage (%)
Educational level of households		
Illiterate	297	15.68
Read and write	345	18.22
High school complete	431	22.75
Diploma complete	390	20.6
Degree and above complete	431	22.75
Total	1894	100
Family size		
2≤family	25	5.98
3-5 family	321	76.79
>5 family	72	17.23
Total	418	100

Source: Survey February 2019

Of the respondent's level of education, the highest is the secondary school leavers (secondary level) 431(22.75%), and degree and above complete of any form, either B.Sc., B.Ed., M.Sc., M.A., etc... (Tertiary level) 431(22.75%) followed by those who possess diploma complete 390(20.60%). 345(18.22%) household members have only read and write, while 297(15.68%) are illiterate household members. The highest number of degree and above holders 431(22.75%) in the sample might be as a result of workers, who have employed in the university as it cited in the study area, and the presence of high schools, zonal and woreda offices.

In terms of family size, the ≤ family members were 25(5.98%) and 3-5 family members were 321(76.79%) and more than five family members were 72(17.23%). Among the responded households more than three quarters accounts for the family size group of 3-5. Only 25 households have one and two families are the smallest number from the family size groups.

Sources of income of households

Regarding the 418 household respondents' occupation status, Table 2 shows that government employers, merchants (which covers any kind of legal business ranging from selling coffee to selling of other items) and self-employed (who are income generators to their family other than formal trading) were the highest at 235(56.22%), 81(19.38%) and 86(20.57%); respectively. The high percentage of the government employers' occupations is because of the establishment of DTU, and the presence of many governments and a limited number of non-government organizations in the study area. Farmers (who are doing agriculture in and/or outside the town) 16(3.83%), are the least this is because of the new settlement of the town invaded the farm lands and the farmers find out other occupation to survive.

Farming was the predominant occupation of the people before the establishment of the university in the community is now gradually decreasing. From 418 study participant households, 67(16.03%) have below 1500 birr, 115(27.51%) between 1501-3000 birr, 196(46.89%) have 3001-5000 birr, and 40(9.57%) have above 5000 birr income groups per month.

Table 2 Sources of Income of respondent's Households, Debre Tabor Town, North-West Ethiopia, 2019 (N=418)

Sources of income	Frequency=418	Percentage (%)
Household sources of income		
Self-employed	86	20.57
Agriculture	16	3.83
Government employer	235	56.22
Merchant	81	19.38
Total	418	100
Monthly income		
Below 1500 birr	67	16.03
1501-3000 birr	115	27.51
3001-5000 birr	196	46.89
Above 5001 birr	40	9.57
Total	418	100

Source: Survey February 2019, *Birr=Ethiopian currency (1USD=29Birr)

Sources of water

Table 3 shows the sources of drinking water used, 330(78.95%) households use pipe water, 18(4.31%) households use ground water, 10(2.39%) households use natural spring water, 60 (14.35%) households use pipe water, ground water and spring water as an alternative. No household was observed uses ground water for consumption in the study area. It will suffice to say that most of the respondents de- pend on the pipe water for drinking mainly because it is of good quality as observed and communicated from randomly selected households.

Table 3 Sources of water of households, Debre tabor town, North-West Ethiopia, 2019 (N=418)

Household sources of water		
Sources of water	**Frequency**	**Percentage (%)**
Pipe water	330	78.95
Ground water	18	4.31
Natural spring water	10	2.39
River water	0	0
Others	60	14.35
Total	418	100

Others: Pipe water/ground water or pipe water/spring water combined Source: Survey February 2019

Additional facility in the study area (other than drinking), cattle trough 29(6.94%), fences 42(10.05%), washing (cloth and materials) 174(41.63%), shower 38(9.09%), both washing and fences 6(1.43%), both washing and shower 14(3.35%), all facilities 4(0.96%) and no any facilities 111(26.55%) were observed. The smaller number of shower facilities could be due to the cold weather condition of the study area. There are individuals, who provide shower facility as a means of income in the town (Table 4). Regarding the cleanness status of the surrounding; very clean 33(7.90%), clean 248(59.33%), partially clean 103(24.64%), somewhat clean 26(6.22%), and not clean

at all 8(1.91%) were observed. 384(91.87%) households surrounding areas have partially clean and above cleanness status (Table 5).

Table 4 Additional facilities observed in households, Debre tabor town, North-West Ethiopia, 2019 (N=418)

Additional facilities observed		
Facilities	**Frequency**	**Percentage (%)**
Cattle trough	29	6.94
Washing dish	174	41.63
Showers	38	9.09
Fences	42	10.05
Washing dish and fences	6	1.43
Washing dish and showers	14	3.35
All	4	0.96
Not at all	111	26.55
Total	418	100

Source: Survey February 2019

Table 5 Cleanness status of the surrounding, Debre tabor town, North-West Ethiopia, 2019 (N=418)

Cleanness status of the surrounding		
Cleanness status	**Frequency**	**Percentage (%)**
Not clean at all	8	1.91
Somewhat clean	26	6.22
Partially clean	103	24.64
Clean	248	59.33
Very clean	33	7.9
Total	418	100

Source: Survey February 2019

Household water use practice

The responsibility of fetching water in the households (Table 6) is husband 4(0.96%), wife 173(41.39%), children 156(37.32%), wife and children 12(2.87%), wife and husband 6(1.43%), others (other household members) 10(2.39%), and all families 57(13.64%). Households with young children the responsibility of fetching water is gone to children, while households with no and small children the responsibility is the parents (husband and wife). Wives have the highest and unlimited responsibility for fetching water and in home family management.

Regarding to the presence of alternative water source in the households 119(28.47%) households have alternative water sources such as ground water, hand-dug wells, hand pumps, rivers and public taps; while 299(71.53%) have no any alternative water sources other than pipe water (improved water sources). Households with alternative water sources might use the water for non-drinking and cooking activities (such as washing, shower and other). Nearest to three quarters of the responded households have no any alternative water sources. This becomes a serious problem if the availability of pipe water is not in good standard and daily available (Table 7).

Table 6 Responsibility of fetching water, Debre tabor town, North-West Ethiopia, 2019 (N=418)

Responsibility of fetching water		
Responsibility	**Frequency**	**Percentage (%)**
Husband	4	0.96
Wife	173	41.39
Children	156	37.32
Wife/Children	12	2.87
Wife/Husband	6	1.43
*Others	10	2.39
**All	57	13.64
Total	418	100

**all families, *families other than the listed Source: Survey February 2019

Table 7 Presence of alternative water source, Debre tabor town, North-West Ethiopia, 2019 (N=418)

Presence of alternative water source in the area		
Alternative source	**Frequency**	**Percentage (%)**
Yes	119	28.47
No	299	71.53
Total	418	100

Source: Survey February 2019

According to the number of times water collected per day from improved water sources (pipe water) is once 375(89.71%), twice 29(6.94%), three times 10(2.39%), and not at all daily 4(0.96%). About 90% of the households have got once per day from pipe water. The number of times water access increase the number of households decreases. Since the access of water is through rotation in the area, it is limited by time gap (Table 8).

Table 8 Frequency of water collection per day, Debre tabor town, North-West Ethiopia, 2019 (N=418)

Number of times water collected per day from		
	Improved source	**Traditional source**
Number of times	**Frequency(%)**	**Frequency(%)**
Once	375(89.71%)	346(82.78%)
Twice	29(6.94%)	50(11.96%)
Three times	10(2.39%)	18(4.30%)
Four and above	0(0.00%)	4(0.96%)
Not at all	4(0.96%)	0(0.00%)
Total	418(100%)	418(100%)

Source: Survey February 2019

According to the number of times water collected per day from traditional (unimproved) water sources (ground water, hand-dug wells, hand pumps, rivers and public taps) is once 346(82.78%),

twice 50(11.96%), three times 18(4.30%), and four and above times 4(0.96%). About 4 households out of five households have got water once per day from traditional (unimproved) water. The number of times water access is better for traditional water sources than improved water sources. According to this description, all households under study use traditional water sources without regarding to the number of times per day. It contradict with that about 299(71.53%) households have no alternative water sources (Table 7). This might be due to when the time taken from house to the alternative water source is higher; they do not take it as an alternative source (Table 8). Regarding to the average time taken from house to traditional water source is described as 32(7.66%) less than 15 minutes; 233(55.74%), (15-30) minutes; 147(35.17%), (31-45) minutes, and 6(1.43%), (46-60) minutes. All households have got their traditional water source below one hour (Table 9).

Table 9 Average time taken from house to traditional water source, Debre tabor town, North-West Ethiopia, 2019 (N=418)

Average time taken from house to traditional water source		
Time taken	**Frequency**	**Percentage (%)**
Less than 15 minutes	32	7.66
15-30 minutes	233	55.74
31-45 minutes	147	35.17
46-60 minutes	6	1.43
More than 1 hour	0	0
Total	418	100

Source: Survey February 2019

According to the survey the common material used for water fetching is bermel 72(17.22%), Jerikan 331(79.19%), bermel and baldi 2(0.48%), bermel and jerikan 11(2.63%), and plastic pot 2(0.48%). Most households have used jerikan for fetching water. Jerikan is an instrument of fetching water made up of plastic and commonly contains 20, 25, 30 liters. It is easily accessible material in the area. More than 90% are yellow in color. Why it is yellow in color is undetermined.

Regarding to the storage material of water fetching (Table 10) households commonly use 10(2.39%) below 10 liters; 93(22.25%) for (10-20) liters; 286(68.42%) for (21-40) liters; and 29(6.94%) above 41 liters. Most households use (21-40) liters storage material, because they use jerikan for fetching from the source (Table 11).

Table 10 Storage of water fetching material, Debre tabor town, North-West Ethiopia, 2019 (N=418)

Water fetching material storage(in Litres)		
Material	**Frequency**	**Percentage (%)**
Below 10 liters	10	2.39
10-20 liters	93	22.25
21-40 liters	286	68.42
Above 41 liters	29	6.94
Total	418	100

Source: Survey February 2019

Table 11 Material used for water fetching, Debre tabor town, North-West Ethiopia, 2019 (N=418)

Material used for water fetching		
Material	**Frequency**	**Percentage (%)**
Bermel	72	17.22
Jerikan	331	79.19
Bermel/Baldi	2	0.48
Bermel/Jerikan	11	2.63
Goma insira (Plastic jar (pot))	2	0.48
Total	418	100

Source: Survey February 2019

The weekly water collection status (Table 12) shows that 38(9.09%) not enough at all, 71(16.98%) somewhat enough, 186(44.50%) partially enough, and 123(29.43%) fully enough water were collected. Only about one-fourth of the respondents have collected enough water per week. This shows that there is water scarcity problem.

Table 12 Status of fetching enough water per week, DTT, North-West Ethiopia, 2019 (N=418)

Status of fetching enough water per week		
Status	**Frequency**	**Percentage (%)**
Not at all	38	9.09
Somewhat	71	16.98
Partially	186	44.5
Fully	123	29.43
Total	418	100

Source: Survey February 2019

Table 13 shows the purposes of water usage in the household, for drinking 53(12.68%), for washing (material and cloth) 145(34.69%), for drinking and washing 64(15.31%), for shower (bathing) 4(0.96%), and for all purposes 150(35.88%). The number of households who use the water they collected for drinking is low. The accessibility of water from improved water sources is not daily. Households have used plastic packed water for drinking, to keep their health safe from water borne diseases.

Table 13 Purposes of water usage in the household, Debre tabor town, North-West Ethiopia, 2019 (N=418)

Purposes of water usage in the household		
Purpose	**Frequency**	**Percentage (%)**
For drinking	53	12.68
For washing	145	34.69
For shower (bathing)	4	0.96
For drinking/washing	64	15.31
For others	2	0.48
For all	150	35.88
Total	418	100

Source: Survey February 2019

Average water used (in liters) per day per household (Table 14), below 20 liters 28(6.70%), (21-40) liters 295(70.57%),(41-70) liters 89(21.29%), and above 71 liters 6(1.44%). The majority households used about (21-40) liters per day. This corresponds with the storage of water fetching material households used (Table 10).

Table 14 Average water used per day per household, Debre Tabor Town, North-West Ethiopia, 2019 (N=418)

Average water used per day		
Average	**Frequency**	**Percentage (%)**
Below 20 liters	28	6.7
21-40 liters	295	70.57
41-70 liters	89	21.29
Above 71 liters	6	1.44
Total	418	100

Source: Survey February 2019

The number of times households water collected per week is once, 165(39.47%) from unprotected, 32(7.66%) from hand-dug-well, 7(1.68%) from rivers, 67(16.03%) from spring, 73(17.64%) from hand- pumps, 5(1.20%) from public tap water sources. Since unprotected water sources are not limited without regarding to distance and human power, anyone can access daily. It is clear to say that most of the respondents depend on unprotected water for non-in home water consumption activities like washing clothes, animals and planting. This can be attributed to the fact that unprotected water is already a form of water usage for out of drinking and cooking in the places when water is scarce (Table 15).

The number of times households water collected per week twice, 27(6.46%) from unprotected, 21(5.02%) from hand-dug-well, 9(2.15%) from rivers, 50(11.96%) from spring, 22(5.26%) from hand-pumps, and 4(0.96%) from public tap water sources. The number of times households water collected per week three times, 32(7.66%) from unprotected, 26(6.22%) from hand-dug-well, 16(3.83%) from spring, and 5(1.20%) from hand-pumps. The number of times households water collected per week four and above times, 169(40.43%) from unprotected, 136(32.54%) from hand-dug-well, 30(7.18%) from spring, and 6(1.44%) from hand-pumps.

About 25(5.98%) from unprotected water sources, 203(48.56%) from hand-dug-well, 402(96.17%) from rivers, 255(61.00%) from springs, 312(74.64%) from hand-pumps and 409(97.84%) from public taps households haven't collect water per week. The majority of households haven't collect water per week from public taps is due to currently public taps are malfunctioned (out of service). About 94% of households don't collect water per week. Majority of households (96.17%) don't collect water from rivers. This is due the fact that rivers are easily polluted through flood, animal and human wastes; peoples don't like to collect water from rivers (Table 15).

Table 15 Number of times water collected per week, Debre tabor town, North-West Ethiopia, 2019 (N=418)

Number of times water collected per week from water sources						
Times	**unprotected**	**hand dug well**	**rivers**	**protected springs**	**hand pumps**	**public taps**
Once	165(39.47%)	32(7.66%)	7(1.68%)	67(16.03%)	73(17.46%)	5(1.20%)
Twice	27(6.46%)	21(5.02%)	9(2.15%)	50(11.96%)	22(5.26%)	4(0.96%)
Three times	32(7.66%)	26(6.22%)	0(0.00%)	16(3.83%)	5(1.20%)	0(0.00%)
Four and above	169(40.43%)	136(32.54%)	0(0.00%)	30(7.18%)	6(1.44%)	0(0.00%)
Not at all	25(5.98%)	203(48.56%)	402(96.17%)	255(61.00%)	312(74.64%)	409(97.84%)
Total	418(100%)	418(100%)	418(100%)	418(100%)	418(100%)	418(100%)

Source: Survey February 2019

Unimproved water source using practice

Households use both improved and unimproved water sources for their daily water consumption (Table 16) shows the reason that household's use unimproved source of water rather than improved source of water. Households use unimproved source of water is due to income 51(12.20%), distance 19(4.55%), presence of alternative source 19(4.55%), quality 83(19.86%), adequacy 15(3.59%), waiting time 7(1.67%), interest 20(4.78%), all cases 4(0.96%), and other (cases other than the listed) 200(47.84%) rather than improved source of water. It is true that in quality the improved source of water is better than unimproved source of water. But it is contradicted that 83(19.86%) households preferred unimproved source of water than improved sources (it needs further investigation). Nearly half or 200(47.84%) households preferred unimproved source other than the cases of income, distance, presence of alternative source, quality, adequacy, waiting time and interest. As the investigators communicate some household members, they had used unimproved sources of water at a time when the improved sources weren't available. It needs other investigation to determine the factors (other than listed in this study) that households prefer unimproved source than improved sources.

Status of water source scarcity and the causes

From 418 responded households about 381(91.15%) believe that there is scarcity of water in the area; while 35(8.37%) respondents believe as there is no scarcity of water; and 2(0.48%) refuse to say about the presence or absence of the scarcity of water in the area. From this we can say that the scarcity of water is a serious case, because above 90% households live under water scarce conditions. If scarcity of water is available, the responded households asked about who is the concerned body they believe. Of 418 households 358(85.65%) believe it was due to government, 49(11.72%) due to local people, 9(2.15%) due to both government and local people believe that scarcity of water is happened. 2(0.48%) households who are refuse to say about the presence or absence of the scarcity of water don't like to state the concerned body shall be asked (Table 17).

Table 16 Unimproved water source preference practice, Debre tabor town, North-West Ethiopia, 2019

Why household use unimproved source of water?		
Reason	**Frequency=418**	**Percentage(%)**
Income	51	12.2
Distance	19	4.55
Presence of alternative source	19	4.55
Quality	83	19.86
Adequacy	15	3.59
Waiting time	7	1.67
Interest	20	4.78
Others	200	47.84
All cases	4	0.96
Total	418	100

Source: Survey February 2019

Table 17 Presence of scarcity of water source in the area, Debre tabor town, North-West Ethiopia, 2019

	Frequency=418	**Percentage (%)**
Presence of scarcity of water source in the area		
Yes	381	91.15
No	35	8.37
-	2	0.48
Total	418	100
If scarcity of water, the reason they believe is due to		
Government	358	85.65
Local people	49	11.72
Both (Government and local people)	9	2.15
Total	418	100

Source: Survey February 2019

Discussion

Studies showed that many factors hinder the supply of quality drinking water in households such as:- drought and politics,[29] lack of access of water,[29,30] burden of water collection in household members,[31–41] age of household members,[31,42,43] gender of household members,[31,33–41] occupation of household head,[44] time taken to collect water[31,45–49] and distance,[50] improved and unimproved water sources in rural and urban areas,[51–53,31,33] presence of safely managed services and sanitation with its coverage,[54,31] sanitation and hygiene facilities[54–56] households standard of living (income),[55,57–62] education level of household members.[40,63] household size and com- position.[33,64–67] Those factors may result in lower children school attendance[29] and water and sanitation related sicknesses.[55]

The per capita water consumption is varies due to socio-demographic and climatic factors.[68] previously, studies were undertaken in different parts of Ethiopia about the water consumption. In East Wollega 15.26 l/p/d[69] is lower than the National and WHO minimum daily water consumption of 20 l/p/d, but in SNNP 53.8 l/p/d[70] indicated better. Based on the activities done in the household the consumption level is different. Based on the report of Williams, et al,[71] it was 1.04 to 1.63 l/p/d for drinking only.

In Debre Tabor town, the demographic characteristic of the population under study was identified. The study shows female household members were greater than male household members. From the study population above half of the respondents were young people of the household member of the town.

The primary source of water of the Debre Tabor town population was pipe water (78.95% of the population) and secondarily they used protected springs. But, it was not limited; they had to use hand-dug wells, rivers, ground water as an alternative source of water. Households used two or more sources of water for their consumption. It is common to use pipe water for most urban areas of the country, even if it was not in full coverage. The water found from pipe water is safely managed (improved source), it results in low-risk of water borne diseases,[31] but it doesn't give a guarantee to be safe,[72] rather it needs a safety of storage material and in-home water use tradition.

The sources of water of households generally in Ethiopia and specifically in North-West part of the country were spread as pipe water in the towns and ground water and/or natural springs in rural parts with alternatives. The river water was mostly used for cattle trough. Fetching water was the primary responsibility of females and children. About 41.39% of female population and 37.32% of children took the burden of fetching water. Most studies shared this result.[31,33–41]

Due to the presence of agricultural activities and open defecation, majority of the population had no alternative source of water (71.53%). Because of the rivers, springs and ground water sources are disturbed by liquid and dry wastes through erosion from the towns; it is not common to use water from those sources.

About 89.71% of the population collected water from improved water sources once per day. It was rare to collect water two or more times per day. This resulted in low of getting fresh water especially for drinking and cooking. Inaccessibility of fresh water leads to water borne diseases.[3,9,13–19] It leads to high-risk especially when the majority of the population were children (55.17%). The lowest water supply and sanitation coverage of the country[20] and the discontinuity of supply[23] played its contribution in the study area. Previous study in the area stated that households get water once only in a week.[73]

Most population (82.78%) of the town collects water once per day from traditional water sources. This may happen due to the scarcity of water in the area. It was not clear how they handle the water from improved and unimproved water sources and for what purpose they use. But, some said that the water from unimproved water sources is not for drinkable purposes. Material contamination remains under question. Some of the traditional (commonly unimproved) water sources are found outside the town. About 55.74% of the population had got their water for a trip of 15-30 minutes and 35.17% of the population 31-45 minutes. It took long time than the country report of about 74% of the households taking 30 minutes or less. It is also took long time with compared to other studies.[52]

The accessibility of traditional water sources as an alternative in the town was low. Since accessibility measured by the time it takes,[31,45] most household members spent long time to fetch water.

79.19% of the population used "Jerikan" as an instrument of water collection. The reason to use this is easy to handle, accessibility in the market, non-broken able, and easily movable. Commonly its storage

ranges from 2-40 liters, but for water fetching people's use 5, 10, 12, 20, 25, 30 and 40 liters storage "Jerikans". Most households in the area used 21-40 liters storage "Jerikans".

Nearest to half (44.50%) of the population got their water partially per week. But, this coverage of water was found from both improved and unimproved sources. Only 12.68% of households used the water for drinking. The others (87.32% of households) in the town had to buy bottled water for drinking. This is heavy for low-income households. As the study showed about 43.54% of households had an income of below 3000 birr. Those individuals should be highly affected by the daily inaccessibility of water in the area. Many studies showed that households income affect the quality and accessibility of water.[55,57–62] Even if, a report showed that there is an improvement from time to time in safe drinking water,[54] it is still in low standard.

On the contrary, when the presence of water is low, households enforced to use it accurately. But there is no guarantee it would be safe. 70.57% of the population consumed on average of 21-40 liters per day. If we took the median of 30 liters per day, every household member had to use 6.62l/p/d, which is less than[74] of 9.6 l/p/d,[69] of 15.26 l/p/d,[70] of 53.8 l/p/d and the national and WHO minimum water consumption level of 20 l/p/d.

About 96.17% of the population hadn't had a habit of collecting water from rivers. The investigator recommends the household of the town to not collect water from rivers, due to the highly polluted and poor sanitation and hygiene of the area was observed.

The population of the town used both improved and unimproved water sources for their daily consumption. Households used unimproved sources of water due to several reasons such as income, distance, presence of alternative sources, quality, adequacy, waiting time, interest and others. 4.55% of the population due to distance and 19.86% of the population due to quality used unimproved sources. This contradicted with that the improved water sources in urban areas are located in short distances,[25] and the quality of water is better in improved sources; needs further investigation.

Above 90% of the town's population were under the problem of water scarcity. It indicated that the supply was below 10%, even if the demand was high. The figure was lower than 60% of the population has access to improved water sources in Africa and 42% water supply in sub-Saharan countries.[20] About one billion population in the world has no access to safe and adequate water sources[2] and with the country report of poor sanitation and drinking water infrastructure.[21] Due to the lower supply of drinking water, households use unimproved sanitation.[22] It also affects the distribution of water in the area,[23] leads to health risks.[24,11] EDHS report in 2016[26] resulted out that 97% of the urban population in Ethiopia have access to improved source of drinking water, even if it was not sure about its' quality.[27] It opposed with the current study, in which the supply is below 10%. The report of[29] reason out that the problem is occurred due to drought and the Horn of Africa regional instability. The international report of[16] also suggested the push and pool factors of poor water and sanitation.

In the study area, 85.65% of the population believed that the scarcity of water was due to the local, regional and national government poor administration. This might coincide with the international report[16] of different factors, the absence of good drinking water infrastructure[21] and discontinuous supply of drinking water.[23]

The findings of this assessment study may be relevance for the concerned government bodies, non- governmental organizations and the community to know the current status of the sources of water, per capita water consumption, water use practice, the status of water scarcity and the spread of the water sources in the study area to take immediate action with short and long time plan for the well-being of the community.

Conclusion

Four hundred eighteen households were participated. On average there were about 4.53 persons per each household. The most frequently used water source is pipe water. Fetching water was the responsibility of females and children. Majority of the population of the town had no alternative sources, since rivers, springs and ground water sources were disturbed by animal and human wastes. It is recommended to do on sanitation and hygiene facility improvements. Due to high scarcity of water supply, traditional water sources were used by the residents. The time taken from home to traditional water sources was longer than the country average. Nearly half of the population got their water supply partially per week. The median consumption was found to be 30 liters per household per day and 6.62 l/p/d, lower than the national and WHO minimum water consumption level of 20 l/p/d. Nine out of ten persons was under the problem of water scarcity in the town. The scarcity was happened due to weak administration of local, regional and national government.

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Conflicts of interest

Authors have declared that no conflicts of interest exist.

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