Determinants of Potable Water Consumption in Rural Areas of Machakel District, Amhara Region, Ethiopia

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Abstract

The study examined the determinants of potable water consumption in rural areas of Machakel district. Consumption of potable water with adequate quantity is a basic requirement for human wellbeing. Potable water consumption in terms of per capita consumption and influencing factors are not well studied in remote rural areas. The study used a cross sectional survey design. Structured interviews of 293 sample respondents were conducted, who were selected using probability sampling technique. This was supplemented by key informant interviews. Descriptive statistics and multiple linear regressions were used to analyse potable water consumption and identify socio economic, demographic and water use determinants of potable water consumption in the study areas. The result show that most of the household heads used protected hand dug wells, protected springs and protected shallow wells. The average per capita water consumption was to be 14.06 litters per day from protected water sources. Household size, education, types of water sources and waiting time at the water sources had been significantly affecting per capita potable water consumption per day in the study area. Thus, local level decision makers should consider these variables in the process of potable water supply.

Keywords: Consumption, Potable water, Rural, Multiple linear regressions.

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1. Introduction

Inadequate potable water is a serious problem worldwide and about 3.4 million people die each year from avertable water related diseases, such as diarrhoea (UNICEF and WHO, 2014). This situation makes unprotected water sources as one of the leading causes of illness and death among poor countries. Lack of access to protected water sources in developing countries, such as in Ethiopia, obliges households to consume less per capita water. Likewise, individuals getting access to potable water sources with more than 1km often consumes less than five litters per day per person (UNDP, 2006). Moreover, inadequate access to potable water increases work load on women and children to waste more time and energy in collecting water (Puttaswamaiah, 2005).

Access to potable water was declared as a human right issue alongside other rights in which the United Nations (UN) general assembly expressed deep concern that about 884 million people were without access to potable water (UN, 2014). One of the declarations of the Sustainable Development Goals was also aimed to alleviate poverty through effective utilization of water sources. To achieve the goal, a priority area is providing adequate and quality water (Desalegn, 2014). Ethiopia developed the Universal Access Program in 2005 to improve the overall situation of access to potable water. The program targeted to provide access to potable water for 98% of the rural and 100% of the urban population of the country by 2012, i.e., to provide minimum of 15 litters of potable water per person per day for rural areas (MoWR, 2009).

Potable water, with adequate quantity, is considered as a basic requirement for health and serves as a determinant of standard of living. Unfortunately, Sub-Saharan Africa failed to achieve the target in the water sector for about half of the population who is lacking sustainable access to improved potable water (UNICEF and WHO, 2015).

Ethiopia is among the low achievers in terms of ensuring access to potable water and required consumption per capita. Overall, access to potable water in the country is among the lowest with 57% coverage at the national level in the year 2011. Central Statistical Agency and ICF International (2012) disaggregated the data based on residence and reported that the coverages for rural and urban areas were 46% and 94%, respectively. The empirical study by Mengesha *et al* (2002) argued that per capita potable water consumption is significantly different from the minimum standard set by World Health Organization as well as Ethiopian minimum national standard.

The empirical literatures show that different socio-economic and demographic factors determine potable water consumption. These empirical studies identified age, sex, education, walking distance, occupation, household size, income, waiting time and type of water sources as determinants affecting household access to potable water (Meseret, 2012; Dessalegn, 2012; Arouna and Dabbert, 2009 and Aschalew, 2009). However, there are certain inconsistencies in the findings. Household size, income and distance were significantly associated with per capita water consumption (Davidson *et al*, 2013).

Aschalew (2009) confirmed that income has a positive and significant effect on per capita water consumption, but waiting time was not significant. The other empirical study carried out by (Meseret, 2012) confirmed that waiting time at the source has been significantly and negatively affecting per capita water consumption. Furthermore, some empirical studies were merely descriptive in studying household access to potable water. Given this research gap, further investigation on the determinants of potable water consumption in rural areas was necessitated to contribute to the existing limited empirical evidences on the subject. Therefore, the major objective of the study was to examine the determinants of potable water consumption in rural areas of Machakel District.

2. Literature Review

2.1. The Concept of Potable Water Consumption

Potable water is understood as water that is used for all usual domestic purposes including consumption, cleaning and food preparation (WHO, 1993). The UNICEF and WHO Joint Monitoring Program for Water Supply and Sanitation, defines reasonable access to protected sources as being availability of at least 20 litters per person per day within 1kilometer of the user's home.

Estimates of the volume of water needed for health purposes differ extensively. Drawing on WHO guideline standards, it is understood that the per capita consumption of potable water per day is almost 2 litters for adults, even though actual consumption differs based on climate, activity intensity and diet. The available literature indicates that, at least 7.5 litters per capita per day will offer adequate water for hydration and incorporation into food for most people. In addition, adequate domestic water is needed for food preparation and cleaning (WHO, 2006).

Table 1. Four levels of service and quantity of water consumed

Service level	Distance/time	Volume of water collected
No access	More than 1km/30 min round trip	5 litters per capita/day
Basic access	Within 1km/within 30 min round trip	20 litters per capita/day
Intermediate access	Water provided on plot through at least 1 tap	50 litters per capita/day
Optimal access	Supply multiple taps within the house	100-200 litters per capita/ day

Source: Howard and Bartram (2003)

Potable water is not easily available to several households, particularly within Sub-Saharan Africa. Women and children, particularly girls, are most often made long queues and/or travel long distance to find potable water (United Nations, 2014).

Despite the availability of abundant water resources in Ethiopia, access to potable water is among the lowest in world. The government of Ethiopia developed policies and strategies supported by water sector development programs. The Universal Access Plan, developed in 2005, was aimed to increase rural access to potable water to 98% by 2012. Overall, access to potable water has increased from 17 to 53% from 1990 to 2015 (UNEP, 2010). The source of water is an indicator of whether it is suitable for household consumption. Sources that provide potable water for household consumption are identified as protected sources (National Planning Commission and United Nations, 2015).

Table 2. National and globally reported rural and urban access to potable water, Ethiopia

Setting	JMP (%) (2010)	JMP (%) (2011)	MoWE (%) (2010)	National WASH Inventory (%) (2011)
Rural	34	39	65.8	49
Urban	97	97	91.5	75
Total	44	49	68.5	52.6

Source: WHO and UNICEF 2012, 2013 cited by Butterworth *et al.* (2013).

Potable water supply has an enormous contribution for the socio-economic development as well as political stability in Ethiopia. The government put potable water supply issue as a top priority in its development programs and working hard to make potable water accessible to all citizens of the country. According to the National Water, Sanitation and Hygiene inventory carried out in 2011, access to potable water has reached to 52.12% at national level, with 48.85% in rural areas and 74.64% in urban areas (MoWIE, 2014). Despite this, however, the Central Statistics Authority stated that 57%of the households had access to protected sources of water in Ethiopia, with higher percentage to urban households (94%) than rural households (46%) (CSA, 2014). Of the national rural protected water facilities, 37% were protected hand dug wells with normal hand pump. Shallow well and deep wells with distribution system were 12% and springs were 38% of rural systems (Butterworth *et al*, 2013).

Table 3. Potable water percent distribution of households by source, Ethiopia

Source of water	Households		
	Urban	***Rural***	***Total***
Protected source	94.3	46.4	56.9
Unprotected source	4.7	53.1	42.5
Other source	1.0	0.5	0.6

Source: CSA (2014)

2.2. Determinants of potable water consumption

Davidson *et' al.* (2013) conducted a study on the assessment of dimensions of water accessibility in Eastern Kogi State of Nigeria. The result revealed that quantity of water is inversely correlated with household size and it was significant. Meseret (2012) undertook an assessment of drinking water quality and the determinants of household potable water consumption in Simada, Amhara Region (Ethiopia). One of the findings of this study was that the variable household size was significantly and negatively associated with the rural water consumption per-capita.

Dessalegn (2012) investigated factors determining residential water demand in North Western Ethiopia using multiple linear regressions. The findings of the study showed that primary source of water and occupation of the head had a statistically significant positive impact on daily per capita water consumption. On the other hand, age and sex negatively affected the per capita water consumption. Household size and education of the household head were found to have insignificant and negative effect on the daily per capita water consumption.

Arouna and Dabbert (2009) found household size as a key determinant, which had positive effect on water demand but when the size of the household increased the per capita potable water consumption level decreased significantly. Further, free access to water sources and wealth status significantly increased the amount of potable water consumed. On the other hand, the time required to fetch water negatively affects the potable water demand.

Aschalew (2009) in his study on the determinants of household participation in water source management found that income and household size were significantly and positively associated with amount of water used at household level. However, waiting time at the water source was inversely associated with water use at household level. The findings of this study also showed that per capita potable water use was negatively and significantly determined by the household size and distance of the water source from user's residence.

Grafton *et al* (2009) in their study of residential water consumption reported that having higher education had a significant positive association with water consumption. Age of the respondent also had significant positive association with per capita water consumption ($p<0.01$).

Schleich and Hillenbrand (2007) in their study of determinants of residential water demand in Germany reported that household size had a negative impact on water demand. But higher age appears to be associated with higher water use. The other empirical study (Mengesha *et al,* 2002), in the study of sustainability of drinking water supply projects in rural of north Gondar, Ethiopia, reported that potable water consumption was inversely related to time to collect water, distance to the water sources and household size.

2.3 Conceptual Framework of the Study

Potable water consumption is influenced by demographic, socio-economic and water use variables. Here the conceptual framework of this study is presented as follows.

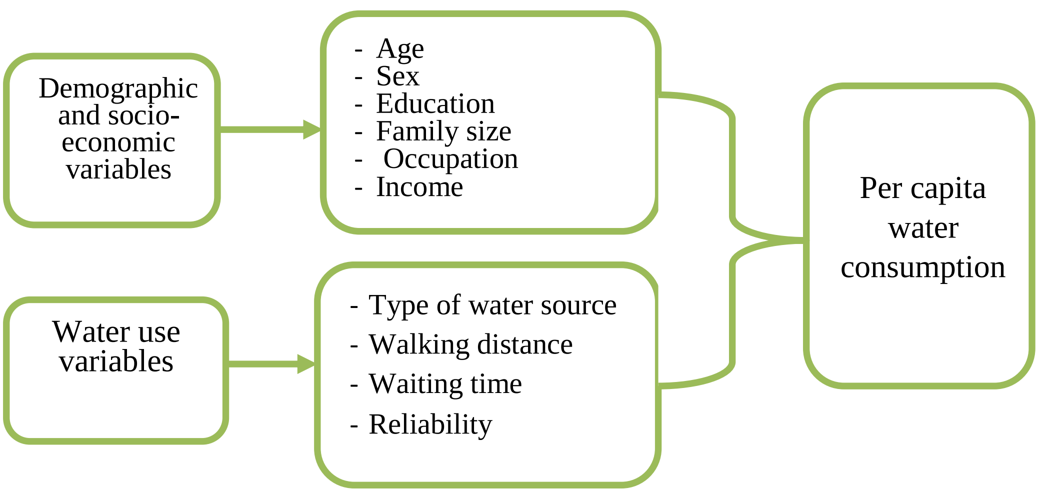

Figure 2.1. Conceptual Framework Developed by the Researcher, 2016

3.Methods and Materials

The study employed cross-sectional research design taking households as a unit of analysis. The study area, Machakel District, was selected purposively among 16 rural districts in East Gojjam zone and the district is divided into 24 rural administrative *"kebeles"* which has 27,105 households (MDoFED, 2015). Households are the smallest sampling units for this study and the heads of each household were taken as respondents.

The district is characterized by three agro-ecological zones namely *Dega*, *Woyna dega* and *Kolla*. Thus, three kebeles were selected randomly from each cluster based on 2203 household heads as the sample frame. Simple random sampling technique was used to select the three "*kebeles*" having a total of 2203 households. According to Yamane (1967), a simplified formula to calculate sample size assuming a 95% confidence interval and p = 0.05 level is given by:

$$n = \frac{\mathrm{N}}{1 + \mathrm{N(e)2}} = \frac{2203}{1 + 2203(0.05)2} = 338$$

Where n is the sample size, N indicates the size of population, and e is the level of accuracy.

Since, the target population was less than 10,000 the desired sample size was adjusted using finite population correction formula. Thus, the sample size was adjusted as:

$$fn = \frac{n}{1+\frac{n-1}{N}} = \frac{338}{1 + \frac{338-1}{2203}} = 293$$

Where: fn= The adjusted sample size

n= The sample size which was 338

N= The target population size, which was 2203

Based on the sample size determination formula above, the estimated sample size was 293 households. Furthermore, 10 key informants were selected from the study area water resource development office to take more information. Their level of official responsibility and participation was used as a single most criterion to select the key informants.

According to Bhattacherjee (2012) systematic sampling technique involves a random start and then proceeds with the selection of every k^{th} household head from that starting point onwards ($k = N/n$), where k is the ratio of sampling frame size N and the desired sample size n. Hence, this study used this method and selected every 7th household head from "*kebele*" name list in three *"kebeles"* until the total sample size is met (i.e., 293 households).

The study used both primary and secondary data sources that enabled to achieve the objectives of this study. Primary data were collected from sample household heads and key informants in the study area. The study used questionnaires and key informant interview guidelines for data collection. Structured interview questionnaire was prepared and translated to "Amharic" which is the local language in the study area. Key informant interviews were held with district water resources development office experts, coordinators and head of the office. Secondary data sources were used to collect additional data from published and unpublished materials. Manuals, journals, sector reports, previous researches, websites and policy documents were reviewed.

Data were analysed using STATA. Descriptive statistics in the form of frequency, percentage, mean and standard deviation were used to describe the socio-economic characteristics of respondents, sources and consumption of potable water. Multiple linear regression models were used to estimate the demographic socio economic and water use variables on the consumption of potable water in rural areas. The dependent variable, potable water consumption in this study, was measured as per capita potable water consumed per day. Per capita potable water consumption is a continuous variable, best measured in terms of daily intake of water by members of the household from protected sources of water. According to UNICEF and WHO (2006), types of potable water sources include piped source within the dwelling, yard, or plot; public tap/standpipe; protected shallow well; protected hand dug well; protected spring; and rainwater.

Since the dependent variable potable water consumption was a continuous variable and expected to be a linear function of the variables of the study, multiple linear regression models using the least squire estimation was used to identify the determinants of per capita consumption of potable water. According to Gujarati (2004), multiple linear regression models can be specified as:

$$Y = \beta_0 + \beta 1x_1 + \beta 2x_2 + \beta 3x_3 \dots \beta nXn + e_i \text{ .... (1)}$$

Where:

$Y =$ predicted variable, $\beta 0$ = Constant, $\beta 1, \beta 2, \beta 3 \dots \beta_n$ = parameters of the x predictor $x_1 - x_9$: are the independent variables of the model which include age, sex, education level, occupation, walking distance, waiting time, household size, income, type of water sources and e_i= error term. The independent variables were identified based on the existing empirical literatures and the actual conditions in the study area which were useful to explain the dependent variable.

4.Results and Discussion

4.1. Descriptive Statistics

The study used a total of 293 sample respondents, with a response rate of 100%. As indicated in Table 4, most of the respondents were males (88.4%). Regarding the educational background of the respondents, 34.13% of the study participants had no any education, 31.4% of respondents were able to read and write, but with no formal education. On the other hand, only 7.51% and 1.02% of the respondents completed first cycle secondary school education and preparatory and above educational levels, respectively. The findings indicate that there is a clear manifestation that most of the respondents had poor education either due to lack of access or other socio-cultural impediments.

Moreover, looking in to the primary occupational status of respondents the table below entails us almost all respondents of the study were farmers (98.98%) with only 1.02% of them having nonfarm activity. They were primarily engaged in crop production, livestock production and/or a mix of them as a mean of living.

Table 4. Percentage distribution of respondents' background characteristics, Machakel (n=293)

Variables	N	Valid %
Sex		
Male	259	88.4
Female	34	11.6
Total	293	100.0
Educational Status		
Illiterate	100	34.13
Read and Write	92	31.4
Grade 1-4	43	14.68
Grade 5-8	33	11.26
Grade 9-10	22	7.51
≥Grade 11	3	1.02
Total	***293***	***100.0***
Occupation		
Farming	290	98.98
Non-farm activities	1	0.34
Civil servant	2	0.68

Source: Field Survey, 2016

The average age of respondents was 41.53 years with standard deviation of 10.64 from the mean age of the respondents. The result indicated that most of the respondents of the study were adults given the mean value of age with its average variation. When the age variation is considered, the respondents have a huge difference in their age where the minimum age was 22 years while the maximum respondent was aged 68. The wide gap in age between sampled respondents enables to better understand the household's water consumption and perception of water quality at the source.

The table below shows that the average family size of respondents was 5.05 with standard deviation of 1.37 from the mean family size. The result indicates that most of the respondents of the study have extended family size given the mean value of family size with its average variation.

Table 5. Socio-economic Variables

Variables	N	Mean	Std. Dev	Minimum	Maximum
Age	293	41.53	10.64	22	68
Family size	293	5.05	1.37	2	9
Income	293	506.56	214.49	106.25	1285.55

Source: Field survey, 2016

Most of the sample household heads generate their income from agriculture. The average calculated crop production value for all respondents was ETB 25,586.16 per annum with standard deviation of 10070.04. Likewise, average livestock sales earning was ETB 3344.76 with standard deviation of 5133.09 and the average non-agricultural earning was 245.73 ETB per annum with standard deviation of 1475.16. The average per capita income of members of the household was ETB 506.56 per month with standard deviation of 214.49 from the mean income. The minimum per capita income was ETB 106.25 per month and the maximum per capita income was ETB 1285.55 per month.

4.2. Potable Water Source and Consumption Patterns

This study shows that most of the respondents have access to potable water from protected sources of water (protected hand dug wells, protected springs and protected shallow wells). In which (47.44%) of the respondents used protected hand dug well; (29.01%) of the respondents used protected springs and (13.31%) of the respondents used protected shallow wells as a primary source of potable water. However, (10.24%) of the respondents were using unprotected water from unprotected springs, unprotected wells and surface water sources.

Among the users of unprotected water sources (2.73%) were due to long distance to protected water sources; (6.14%) were because of extended waiting time at the protected water source; 1.02% were because of their unwillingness to participate during construction; and (0.68%) were because of non-functionality of their protected water source.

This study examines the water consumption pattern among different protected water sources and tries to determine the effect of using each water source on per capita consumption of potable water. Because each of the water sources varies in structure, that means the protected springs have multi-get-valves in which they serve more than one fetcher at the same time. However, protected hand dug wells with hand pump and protected shallow wells serves only one fetcher at a time and they need energy to pump.

Most of the respondents reported that their water sources were reliable throughout the year with no interruption (88.4%). The rest (10.58%) of the samples respond that their water sources were available throughout the year with some interruption (volume decline). But, 1.02% of the respondent's water sources were available only in rainy seasons.

Table 6. Household water source and consumption characteristics

Primary source	**N**	**Valid Percent**
Protected spring	85	29.01%
Protected hand dug well	139	47.44%
Protected shallow well	39	13.31%
Un Protected sources	30	10.24%
Total	293	100.0%
Reliability		
Reliable year round	259	88.4%
Reliable year round with interruption	31	10.58%
Reliable only in rainy season	3	1.02%
Total	293	100.0%
Waiting Time		
>15 minutes (0)	217	74.06%
≤15 minutes (1)	76	25.94%
Fetching Material		
Jeri can	209	71.33%
Clay pot	84	28.67%
Total	**293**	**100.0**

Source: Field survey, 2016

Table 6 shows that 74.06% of the respondents were waiting for more than 15 minutes at the water source to fetch water. The rest (25.94%) of respondents were waiting for less than 15 minutes to fetch water at the source. According to WHO (2006), the standard waiting time at the water source is up to 15 minutes. The descriptive statistics result showed that, most of the respondents experienced extended waiting time at the source to fetch water, which were against the standard and it has adverse effect on those, who were responsible to fetch water in rural areas. Women were more responsible to fetch water for the family every day (89.42%) followed by daughters (9.56%). Only 0.34% of husbands and 0.34% of sons were responsible to fetch water. Jerican (a water container, which is made up of plastic) was mostly used by the respondents as a fetching material (71.33%), which is recommended by the Ethiopian health extension package to prevent post contamination of water. The rest of respondents used clay pot to fetch water. The fetching materials were best used to measure the amount of water collected per day at the household level.

Table 7 show that the average distance travelled from households' home to the water source was 18.88 minutes with standard deviation of 9.95. This was in a range of World Health Organization standard to potable water access in rural areas within 30minutes (WHO, 2006). The minimum walking distance was two minutes and the maximum walking distance was 60 minutes for a single round trip. Average water fetching frequency was 3.00 times per day with standard deviation of 0.69. The minimum fetching frequency was once per day and the maximum fetching frequency was 4 times per day.

Table 7. Per capita water consumption, distance and fetching frequency per day

Variables	**N**	**Mean**	**Std.dev**	**Min.**	**Max.**
Distance	293	18.89	9.952	2	60
Fetching frequency	293	3.00	0.700	1	4
Holding capacity	293	22.3	8.32	0	35
Water consumption	293	14.06	6.46	0	30

Source: Field Survey, 2016

This study shows that the average holding capacity of the fetching material was 22.3 litters with a standard deviation of 8.32. Likewise, the result shows that the average potable water consumption was 14.06 litters per capita per day with a standard deviation of 6.46. The minimum per capita water consumption was zero litters for those who used unprotected water sources and the maximum consumption was 30 litters per person per day. The result is in line with the previous studies of (Mengesha *et al*, 2002; Aschalew, 2009 and Meseret, 2012). They argue that it was below the minimum standard of per capita potable water consumption per day set by World Health Organization to have at least 20 litters of potable water per person per day in rural areas.

The result also indicated that per capita potable water consumption was even, lower than the Ethiopian minimum potable water consumption level for rural households, in which at least 15 litters per capita per day. However, still the result shows that there is progress on average per capita potable water consumption compared to previous studies, 6.6 litters in (Mengesha *et al*, 2002); 12 litters in (Aschalew, 2009) and 11 litters in (Meseret, 2012). This may be because of integrative efforts of governmental and nongovernmental organizations to achieve the MDG goal in the water sector. Furthermore, it may be, because of community awareness improvement to consume more amount of potable water.

One-way ANOVA test was used to see the mean difference in potable water consumption between different groups in educational status, occupational status, type of water source and reliability of the water source. The test result is presented in Table 8.

Table 8. One-way ANOVA test

Groups	**SS**	**df**	**MS**	**F**	**Prob > F**
Education	3496.068	5	699.2136	23.01	0.000
Occupation	0.92615	2	0.463075	1.56	0.2111
Source type	6273.095	3	2091.032	101.68	0.000
Reliability	64.40204	2	32.20102	0.77	0.4647

Source: The researcher's computation, 2016

A one-way ANOVA test shows that there was a statistically tested significant mean difference in per capita potable water consumption between different groups of educational status with F=23.01 and p-value = 0.000. Likewise, the ANOVA test show that there was a statistically tested significant mean difference in potable water consumption between different types of water sources with F = 101.68 and p-value = 0.0000.

In other words, the ANOVA test shows that there was no significance mean difference in per capita potable water consumption between different groups of occupational status with F=1.56 and p-value = 0.2111. Furthermore, the one-way ANOVA test shows that there was no significance mean difference in per capita potable water consumption between different reliability groups with F=0.77 and p-value = 0.4647.

4.3. Determinants of Potable Water Consumption

In this study, potable water consumption was measured in terms of the amount of potable water consumed per capita per day. Therefore, multiple linear regressions were run to examine the determinants of per capita water consumption. The fitness of the model was assessed. Basic assumption of multiple linear regressions, normality, was assessed through histograms and by looking skewness and kurtosis values. The assessment shows that the distribution was skewed which may distort the estimates of the parameters. Due to non-normality in the data, the dependent variable was transformed into log values for econometric estimation. Moreover, variable occupational status of the respondents was dropped because 98.98% of the respondents were engaged in agriculture with little difference between groups of occupation.

The fitness of the model was assessed by looking at the R^2 and F-statistics. The resulting R^2 value shows that the predictors in the model explain 92% of the variations in the outcome variable. Moreover, the F-statistics value of 436.88 with a p-value of 0.000 significant levels at 1% level of significance shows that jointly the explanatory variables have the power to explain the outcome variable per capita potable water consumption and their coefficient is significantly different from zero.

Multicollinearity is another assumption of ordinary least squire regression. To this end, partial correlation of independent variables and variance inflation factor (VIF) were checked. The result indicated that the independent variables had a variance inflation factor of below 10 which indicate that multicollinearity was not a serious concern except one variable: reliability has VIF more than 10. So, reliability is omitted from the model to handle the problem. In addition, suspecting the problem of heteroscedasticity, robust option was used to enable to avoid the prevalence of this problem and enhance the robustness of estimated coefficients.

The estimated regression output shows that households with educational level of 5-8 had significantly higher level of per capita potable water consumption than the illiterate ones ($p<0.05$). The estimated result indicated that those households with an educational attainment of grade 5-8 had higher percentage changes in their level of per capita potable water consumption.

Likewise, those households with educational level of 9-10 had significantly higher level of per capita potable water consumption compared to the illiterate ones ($p<0.05$). Households with an educational attainment of grade 9-10 had 0.28 higher percentage changes in their level of per capita potable water consumption. This result is in line with the finding of Grafton et al, (2009) who reported that secondary education attainment increases the per capita potable water consumption per day.

Furthermore, the result indicates that family size has a significant and negative effect on per capita potable water consumption. This was significant at 1% level of significance. The result indicated that an increase in family size of the households would result in a decrease of 0.07 percent change in per capita potable water consumption. This implies that households with larger family size tend to access less potable water than families with small member of individuals. This may be attributed to the fact that because of large number of individuals, the already available water will be distributed insufficiently, which tends to decrees the amount of intake per individual. The result is in line with the previous studies (Meseret, 2012; Aschalew, 2009; Mengesha *et al,* 2002; Davidson *et al,* 2013; Schleich and Hillenbrand, 2007).

On the other hand, the result show that the type of water source where the unprotected water sources dummy variable was used as a base category, those households with protected spring, protected hand dug well and protected shallow well has significantly higher level of per capita potable water consumption than households who used unprotected water sources once with 95% level of confidence interval.

Table 9. Results of OLS regression for the determinants of per capita potable water consumption, n=293

Variables	**Coef.**	**Std. Err.**	**P>t**
Age	0.002	0.001	0.149
Gender	-0.023	0.036	0.518
Read_Writedummy	0.026	0.029	0.380
Grade1_4dummy	0.071	0.068	0.293
Grade5_8dummy	0.099	0.040	0.014
Grade9_10dummy	0.280	0.035	0.000
G11_abovedummy	0.025	0.077	0.744
Famsize	-0.070	0.013	0.000
Income	-3.20	9.93	0.747
PSdummy	2.441	0.088	0.000
PHD dummy	2.484	0.084	0.000
PSWdummy	2.490	0.096	0.000
Wait Dummy	0.332	0.026	0.000
Distance	-0.001	0.001	0.401
_cons	0.385	0.107	0.000

Source: Based on own survey data, 2016

The estimated result indicated that those households with protected spring, protected hand dug well and protected shallow well have 2.44 litters, 2.48 litters and 2.49 litters higher percentage changes in their level of per capita potable water consumption respectively than those who used unprotected water sources. This may be because of these water sources are protected from external contamination and they are added with chlorine. There may also be the attitudinal change of the rural community to use protected water sources. This result is in line with the findings of (Dessalegn 2012) who argues that those household heads whose primary sources of water are protected consume more potable water per capita per day.

Regarding the effect of waiting time, those who had a waiting time of more than 15 minutes at the water source are used as a base category those households with waiting time of less than or equal to 15 minutes at the water source have significantly higher level of per capita potable water consumption than those who wait more than 15 minutes at the water source once with 95% level of confidence interval.

The estimated result indicated that those households with less than or equal to 15 minutes waiting time at the water source had 0.33 litters higher percentage changes in their level of per capita potable water consumption than those who had waiting time of more than 15 minutes at the water source. This may be because the present study considered waiting time as a dummy variable using more waiting time as a base category and infers to less waiting time.

The previous empirical studies (Meseret, 2012; Aschalew, 2009; Arouna and Dabbert, 2009; WHO, 2006) reported that waiting time was negatively related with per capita water consumption. They consider waiting time as a continuous variable and argue that more waiting time at the water source reduces the amount of water for daily consumption.

4. Conclusion and Recommendations

Most of the respondents had access to potable water from protected water sources, such as protected hand dug wells, protected springs and protected shallow wells. However, average per capita potable water consumption per day was lower than the minimum standard set by the World Health Organization.

The study concluded that household size, educational status and waiting time at the source are major determinants of the consumption level of potable water in the study area.

Based on the key findings, this study recommends that integrated effort is needed among government and nongovernmental organizations working on potable water supply with the involvement of the beneficiary community to achieve the minimum per capita potable water consumption. Given the inverse association between household size and potable water use, reduction of fertility through increasing family planning program uptake is recommended. Efforts should be made to expand both formal and informal education to increase promotes knowledge and practice of water utilization among the community members. Constructing more protected water sources in the near vicinity of households should be a priority agenda for local administrators to reduce waiting time at the source.

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