

## ORIGINAL ARTICLE

# Availability and utilization of sanitation facilities in Enderta district, Tigray, Ethiopia

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## Keywords

Availability • Utilization • Sanitation • Water • Ethiopia

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## Summary

**Introduction.** *Despite concerted efforts by governmental and non-governmental organizations, water and adequate sanitation still remain a challenge worldwide. Therefore, this study assessed the availability and utilization of sanitation facilities in Enderta district of Tigray, Ethiopia.*

**Methods.** *A cross-sectional study was conducted in May 2016. An interview and observation were conducted in a total of 450 households. An interviewer administered questionnaire and observation checklist were used to collect the data. Multivariable logistic regression was done to identify the predictors of availability and utilization of latrine, hand washing, and drinking water.*

**Results.** *Out of 450 households, only 68.4% had latrine of which only 21.4% had hand washing facility near the toilet. Likewise, only 9.3% washed their hand after toilet. However, all households had access to improved water source. In this study, proper*

*utilization of latrine, hand washing, and water facilities was observed in 53%, 42.4% and 36.2% of the study households, respectively. The family size and getting sanitation information from health care providers, health extension workers, and health development army had a positive effect on availability and utilization.*

**Conclusions.** *Though Community-Led total sanitation and hygiene approach has been implemented in the study area, the availability and proper utilization of latrine, and hand washing are still low. Only few households used drinking water properly. The education or information on hygienic practices found to affect the availability and utilization of the sanitation facilities positively. Therefore, strengthening the health extension workers and health development army to provide sustainable education and health information is needed.*

## Introduction

Adequate drinking water, proper sanitation, and hygiene are essential requirements to ensure human health and better economic development [1]. Currently, the importance of water and adequate sanitation is recognized at both local and global levels. In spite of concerted efforts by governmental and non-governmental organizations, water and adequate sanitation are still remained a challenge. Globally, 2.4 billion people still lack improved sanitation facilities, and more than half billion people lack access to improved drinking water sources [2]. And, sub-Saharan Africa is the region where most of these people live. In Ethiopia, though there is a significant improvement in access to water and sanitation facilities, the sanitation coverage is still minimal [3]. An estimated 47.5% and 72% of the population lack access to improved drinking water source and sanitation facilities, respectively [2, 4]. Moreover, open defecation is still practiced by more than a quarter (29%) of the population [5, 6]. In Tigray region, the area in which the current study conducted, the open field defecation rate is 35.6% which is slightly higher than the national level [5]. Further, in 2011 the latrine coverage was 87%, though the utilization rate was very minimal (34%) in the region [7]. However, a higher latrine utilization rate

(57.3%) was reported in one of the districts of the region since 2013 [8].

Diarrheal diseases represent the most significant health impact of unimproved sanitation, and extremely high impact upon children [9]. Globally, inadequate sanitation, poor hygiene, and unsafe drinking water contribute to 88% of diarrheal disease [9-11]. Moreover, diarrheal diseases are the second leading cause of death in children under the age of five, estimated that 1.5 million child deaths annually. Severe diarrhea may be life threatening due to fluid loss, particularly in infants, young children, the malnourished and people with impaired immunity such as those living with Human Immunodeficiency Virus (HIV). Likewise, the impact of poor sanitation, hygiene, and unsafe drinking water is also recognized to have a positive effect on the burden of neglected tropical diseases such as trachoma, dracunculiasis and visceral leishmaniasis [12].

In Ethiopia, 60% of overall diseases are related to poor sanitation and lack of hygiene. Diarrhea is the leading cause of under-five mortality causing 23% of all under-five deaths in the country [13]. By improving water, sanitation, and hygiene about 64,540 children could be saved every year in the country. About 40% of under-five children in Ethiopia are stunted, which can be strongly linked to the childhood incidence of diarrhea [13, 14].

The Community-led Total Sanitation and Hygiene (CLTSH) approach has been proven as one of the cost effective approaches to improve the water, sanitation, and hygiene worldwide especially for those with low-income. Thus, with the goal of ending "open defecation" through self-built toilets, and by encouraging appropriate hand washing and water handling practices; the government of Ethiopia has been implementing CLTSH by integrating it with the health extension program in all the nine regions since 2011 [15]. However, political commitment at all levels had focused on sanitation coverage, with less attention given to improving safe water, sanitation, and hygiene practices such as hand-washing, safe water storage and handling, and latrine maintenance and usage [16]. As a result, with all the efforts, the prevalence of sanitation related diseases is still high in the country [17].

There are few studies conducted in Ethiopia [8, 18-21]. However, these studies were focused on latrine utilization and they were conducted at the time when the CLTSH was not implemented or too child in the country. They were only focused on utilization of latrine but all issues regarding sanitation and drinking water were not addressed fully. However, the current study was conducted after five years of CLTSH implementation thus the findings could show us the improvement brought by the program. Therefore, the aim of this study is to assess the availability and utilization of sanitary facilities in CLTSH implemented district of Tigray region, Ethiopia. The finding of the study, therefore, will help to design evidence based strategy to enhance availability and utilization of sanitary facilities on the study area. Hence, the CLTSH implementation will be further strengthened.

## Methods

### STUDY AREA AND DESIGN

A community-based cross-sectional study was conducted in May 2016 in Enderta district. The district is located at the 795 kms north of Addis Ababa, the capital of Ethiopia, and about 12 kms southeast of the Tigray Regional city, Mekelle. The district comprises 17 kebeles (the smallest administrative unit in Ethiopia) and 60 villages. In 2015, the district had a total of 112,154 and 25,489 population and households, respectively. There are 6 health centers, 11 health posts, and 664 health development armies with the total health staffs of 170, of which 35 are Health Extension Workers (HEWs).

### STUDY POPULATION

Randomly selected households of the rural community who owned private latrine were the study population for this study.

### SAMPLE SIZE, SAMPLING TECHNIQUE AND PROCEDURE

The sample size was determined using single population formula with 2015 estimates of access to sanitation 28% [2], with a margin of error of 0.05% at the 95%

confidence level. Then, multiplying by a design effect of 1.5, the total sample size was calculated to be 450. A multistage sampling technique was employed to select the sample households. Primarily, three kebeles were selected randomly. From each kebele, one village was selected randomly. Then, the sample of 450 households was selected based on proportional to population size (PPS) allocation to each of the selected villages. The households were selected by systematic sampling method from the already prepared sampling frame. Then, in the selected households, the household heads were recruited and observations were done.

### DATA COLLECTION TOOLS AND PROCEDURE

Data collection tools such as interviewer administered questionnaire and observation checklist were used to collect data from the households. The data collection tools include socio-demographic and other characteristics that would measure the availability and utilization of sanitation facilities and associated factors after reviewing relevant literatures.

### OPERATIONAL DEFINITIONS

Presence of sanitation and hygiene facilities such as a latrine, hand washing, and water source was considered as availability. Households were considered as properly utilizing latrine if the latrine is not shared, pit with slab/cover, the compound is free of observable faeces and has functional latrine during the study, having no observable faeces around the squat hole [22]. Households were considered as properly practice hand washing if there was hand washing material with water and soap/or ash during the data collection period. In this study, a household was considered as properly handling water, if the container is clean, has cover and placed away from any source contamination such as animals during the data collection period [22].

### DATA QUALITY CONTROL

Prior to data collection training was given to data collectors and supervisors on the content, objective and methods of data collection and interviewing techniques. The pretest was done in 5% of the sample from villages with the population having similar socio-demographic characteristics that were not included in the study and minor correction was done accordingly. The questionnaire was also translated into local language (Tigrigna) and back-translated to English to ensure the consistency of the thought of the questions. During data collection time, a clear introduction that explained the purpose and objectives of the study were provided to respondents. A close supervision, honest communication and on spot decisions were made during data collection.

Validity and reliability of the questionnaire was determined as follows. Face and content validity of the tool was determined based on viewpoints of the experts on the area. Test-retest reliability of the tool was examined by pre-testing the tool on 5% of the sample size in similar context with 10-12 days interval. Hence, the questionnaire was reviewed and analysed for repeatabil-

ity and internal consistency aspects. Cronbach's alpha coefficient was also used to assess internal consistency and said to be internally consistent if score of 0.8 and above. Repeatability was estimated using the intra-class correlation coefficient (ICC). Based on ICC reliability ranges of less than 0.4 (poor), 0.4-0.7 (fair to good), 0.6-0.8 (good) and 0.8-1 (excellent), the reliability of the questionnaire was considered excellent.

**DATA MANAGEMENT AND ANALYSIS**

Quantitative data were checked for completeness, edited, coded, entered and analyzed using STATA version 13 (Stata Corp. Texas, USA). The descriptive summary was done using frequencies and proportions. Multivariable logistic regression was done to identify the independent predictors of availability and utilization of sanitation facilities and drinking water. The strength of association was measured by odds ratios at their 95% Confidence levels and the statistical significance was set at the p-value of 0.05.

**ETHICAL CONSIDERATION**

Ethical approval was obtained from the Institutional Review Board of College of Health Sciences, Mekelle University (EBC-06128/2016). Verbal consent was obtained from each study participants after the information about the study like the objective was explained. The participants were informed that it was their right to refuse or withdraw from the study at any point during the course of study. Names and other personal information which could violate the confidentiality of respondents were not recorded and information was kept confidential.

**Results**

**SOCIO-DEMOGRAPHIC CHARACTERISTICS OF HOUSEHOLD HEADS**

A total of 450 households were included in the study with 100% response rate. Of the total respondents, 323 (71.8 %) were female headed and 334 (74%) were married. More than half (56%) of households had more than 4 family sizes. About 82% (370) household heads were illiterate (Tab. I).

**AVAILABILITY AND UTILIZATION OF SANITATION FACILITIES**

Out of the total observed households (N = 450), 68.4% respondents had the latrine, of which 45.8% were with a cover of the hole. About six in ten (86.7%) households had no faeces on the wall, floor and/or door, and 85.1% households had no faeces on their compound. Sixty-six (21.4%) had hand washing facility near to the toilet. However, fewer than half (42%) of hand washing facilities were with ash/soap. Although all households were using public piped hand pump water and 98.4% of them had a water container with cover, in 61.8% of them the water container was not hygienic. Three hundred ninety-three (87.8%) of the observed Households keep their

drinking water away from animals (Tab. II). The overall proper utilization of latrine, hand washing and water were 53.3%, 42.4%, and 36.2%, respectively.

**HAND WASHING PRACTICE**

Regarding hand washing practice during critical times, only 9.3% of household wash their hands after toilet. Similarly, lower proportions of households, 27.8%, and 34.2%, washed their hands before feeding their child and after cleaning their child, respectively. Whereas, most of the households, 83.3%, and 90.4%, washed their hands before preparing and eating their food, respectively (Fig. 1).

**FACTORS ASSOCIATED WITH AVAILABILITY OF SANITATION FACILITIES**

Family size and getting information or education about sanitation by either health professionals or health extension workers and health development army were positively associated with the availability of latrine. Households who had more than or equals to four family size had 72% (AOR = 1.72; 95% CI (1.13, 2.61)) higher odds of having latrine than those households that had less than four family size. According to trend chi-square test, there was increasing in the trend of having latrine as the number of sources of information about sanitation is increased (P-value < 0.001) (Tab. III). Households that have more than four families had 80% higher [AOR = 1.8; 95% CI (1.00, 3.32)] odds of having hand washing facility than their less than four counterparts.

**FACTORS ASSOCIATED WITH UTILIZATION OF SANITATION FACILITIES**

Having hand washing facility, properly use water and informed about sanitation by health development Army (HAD) were positively associated with latrine utiliza-

Tab. I. Background characteristics of household heads in Enderta Woreda, Ethiopia, 2016 (n = 450).

Characteristics	Frequency	%
Family size		
1-4	197	43.8
> 4	253	56.2
Sex (HH head)		
Male	127	28.2
Female	323	71.8
Marital status		
Single	60	13.3
Married	334	74.2
Divorced	26	5.8
Widowed	30	6.7
Occupational status		
Farmer	422	93.8
Daily laborer	12	2.7
Merchant	10	2.2
Government employee	6	1.3
Educational status		
Illiterate	370	82.2
Primary	29	6.4
Secondary & above	51	11.3

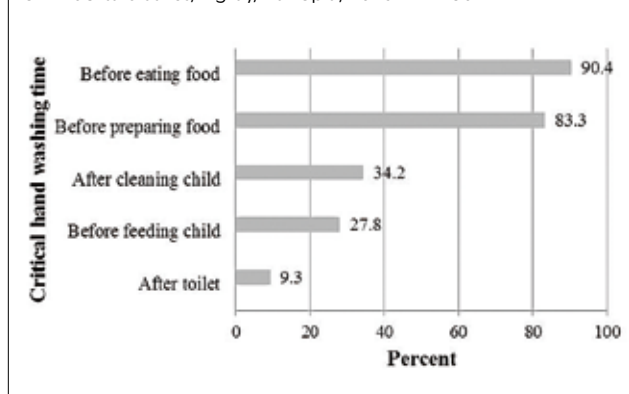
HH: household.

Tab. II. Availability and utilization of sanitation facilities Enderta Woreda, Ethiopia, 2016.

	Sanitation facilities	Variables	Frequency	%
Availability	Latrine	Latrine (n = 450)		
		No	142	31.6
	Yes	308	68.4	
	Hand washing	Hand washing facility near the latrine (n = 308)		
		No	242	78.6
	Yes	66	21.4	
Water	Presence of improved drinking water source <sup>a</sup>			
Yes	450	100		
Utilization	Latrine (n = 308)	Latrine hole has cover/slab		
		No	103	33.4
		Yes	205	66.6
		Absence of faeces on the wall, floor, and door		
		No	41	13.3
		Yes	267	86.7
		Absence of faeces on the compound of HHs		
		No	46	14.9
		Yes	262	85.1
	Latrine shared			
	Yes	41	13.1	
	No	267	86.9	
	Hand washing (n = 66)	Presence of water for hand washing		
		No	23	34.8
		Yes	43	65.2
Presence of soap/ash on the hand washing				
No	38	57.6		
Yes	28	42.4		
Water (n = 450)	Is water container covered			
	No	8	1.6	
	Yes	442	98.4	
	Is water container hygienic/dipper not put on floor			
	No	278	61.8	
	Yes	172	38.2	
Is drinking water away from domestic animals				
No	55	12.2		
Yes	395	87.8		

<sup>a</sup>: all households had public piped hand pump water.

Fig. 1. Hand washing practice in the critical times in households of Enderta district, Tigray, Ethiopia, 2016 (n = 450).



tion. Households having hand washing facility had 2.53 times [AOR = 2.53; 95% CI (1.38, 4.59)] higher odds to utilize latrine than households that did not have hand washing facility. Likewise, those who properly use water had 97% higher [AOR = 1.97; 95% CI (1.22, 3.20)] odds to use latrine than households who did not use wa-

ter properly. Households who got information/education about sanitation had 2.31 times [AOR = 2.31; 95% CI (1.39, 3.86)] higher odds to use latrine properly than their counterparts (Tab. IV).

Getting information about sanitation from HEWs was positively associated with utilization of hand washing facility. Moreover, getting information about sanitation from HEWs, using the latrine and visited by the community sanitation committee were positively associated with proper utilization of water. Households who used latrine properly had 2.07 times [AOR = 2.07; 95% CI (1.27, 3.38)] higher odds of using water properly than those who did not use latrine (Tab. IV).

## Discussion

The current study found that 68.4% of the household had latrine though only 21.4% of these households had hand washing facility near the latrine. Our finding is comparable with the 2015 national sanitation review report that reported 68% and 61% of latrine coverage nationally and in Tigray region, respectively [5]. The present study also showed that all the households in the study

**Tab. III.** Factors associated with availability of sanitation facilities in Enderta district, North Ethiopia.

Variables	Availability of latrine		X <sup>2</sup> -test	AOR (95% CI)
	No: n (%)	Yes: n (%)		
<b>Family size</b>				
1-4	75 (38.1)	122 (61.9)	1	1
> 4	67 (26.5)	186 (73.5)	6.9**	1.72(1.13, 2.61)*
<b>Informed by HPs</b>				
No	18 (50.0)	18 (50.0)	1	1
Yes	124 (29.9)	290 (70.1)	6.2*	2.96 (1.44, 6.09)**
<b>Informed by HEWs</b>				
No	100 (41.2)	143(58.8)	1	1
Yes	42 (20.3)	165(79.7)	22.5***	2.21 (1.40, 3.47)**
<b>Informed by HDAs</b>				
No	121 (37.0)	206 (63.0)	1	1
Yes	21 (17.1)	102 (82.9)	16.4***	2.32 (1.31, 4.09)**
<b>Source of information about latrine</b>				
Not heard from any of the (HP, HEW, HDA)	5 (55.6)	4 (44.4)	5.9a***	-
Heard from one of (HP, HEW, HDA)	99 (43.4)	129 (56.6)		
Heard from two	26 (21.1)	97 (78.9)		
Heard from three of them	12 (13.3)	78 (86.7)		
<b>Availability of hand washing facility</b>				
	No: n (%)	Yes: n (%)	X <sup>2</sup> -test	AOR (95% CI)
<b>Family size</b>				
1-4	103 (84.4)	19 (15.6)	4.1*	1.8 (1.00, 3.32)*
> 4	139 (74.7)	47 (25.3)		
<b>Informed by HDAs</b>				
No	152 (73.8)	54 (26.2)	8.5**	0.37(0.19, 0.74)**
Yes	90 (88.2)	12 (11.8)		

HPs: health professionals; HDAs: health development armies; HEWs: health extension workers; AOR: adjusted odds ratio; \*: trend Chi-square test; significant at p-value: \* < 0.05, \*\* < 0.01, \*\*\* < 0.001.

area had access to improved water source (public stand hand pump) [2]. However, the proper utilization was low in which 53%, 42.4% and 36.2% of households utilize latrine, hand washing, and drinking water properly, respectively. The current finding is consistent with the previous finding reported in 2013 as 57.3%, and 61.2% of latrine utilization rate [8, 20]. Besides, the present finding clearly indicates the availability of the latrine could not be a guarantee for proper utilization.

Though more than two-third of households had a latrine, only a few (9.3%) households wash hands after visiting toilet that is much lower than the nationally reported 45% [5]. Further, low proportions of households washed their hands before feeding the child (27.8%) and after cleaning their child (34.2%). However, the present study revealed higher proportions of households wash their hands before preparing (83.3%) and eating (90.4%) food which is consistent with national survey report of 2016

**Tab. IV.** Factors associated with utilization of sanitation facilities in Enderta district, North Ethiopia.

Variables	Utilization of latrine		X <sup>2</sup> -test	AOR (95% CI)
	No: n (%)	Yes: n (%)		
<b>Hand washing facility</b>				
Not available	123 (50.8)	119 (49.2)	7.52**	2.53 (1.38, 4.59)**
Available	21 (31.8)	45 (68.2)		
<b>Proper water utilization</b>				
No	98 (53.3)	86 (47.7)	7.77**	1.97 (1.22, 3.20)**
Yes	46 (37.1)	78 (62.9)		
<b>Informed by HDAs</b>				
No	107 (51.9)	99 (48.1)	6.72**	2.31 (1.39, 3.86)**
Yes	37 (36.3)	65 (63.7)		
<b>Utilization of hand washing facility</b>				
	No: n (%)	Yes: n (%)	X <sup>2</sup> -test	AOR (95% CI)
<b>Informed by HEWs</b>				
No	28 (70.0)	12 (30.0)	6.41*	3.73 (1.32, 10.56)*
Yes	10 (38.5)	16 (61.5)		
<b>Proper utilization/handling of water</b>				
	No: n (%)	Yes: n (%)	X <sup>2</sup> -test	AOR (95% CI)
<b>Informed by HDAs</b>				
No	207 (63.3)	327 (36.7)	0.11	0.57 (0.33, 0.99)*
Yes	80 (65.0)	43 (35.0)		
<b>Informed by HEWs</b>				
No	178 (73.3)	65 (26.7)	20.5***	2.05 (1.23, 3.42)**
Yes	109 (52.7)	98 (47.3)		
<b>Latrine utilization</b>				
No	98 (68.1)	46 (31.9)	7.77**	2.07 (1.27, 3.38)**
Yes	86 (52.4)	78 (47.6)		
<b>Visited by sanitation committee</b>				
No	94 (75.8)	30 (24.2)	10.72**	2.23 (1.27, 3.89)**
Yes	193 (59.2)	133 (40.8)		

HDAs: health development armies; HEWs: health extension workers; AOR: adjusted odds ratio; significant at p-value: \* < 0.05, \*\* < 0.01, \*\*\* < 0.001.

in which 96% of households wash their hands before eating food.

The current study also found that family size and getting information or education about water, sanitation, and hygiene from either health professionals or health extension workers or HDA were positively affected the availability of latrine in the households. That is, the households who had more than four family members had higher odds of having latrine than their counterparts. This is consistent with the finding from Ethiopia in which households who had been visited by health professionals are more likely to construct latrine and good sanitation practice [18]. Also, it was found that the size of the family was positively related with the availability of hand washing facility. The households that have more than four family members had 80% higher odds of having hand washing facility near the toilet than those who have less than four family members. Regarding utilization, households who had hand washing facility near their toilet were 2.5 times likely to use latrine properly. Likewise, those who use water properly had 97% higher odds to utilize latrine properly than their counterparts. Providing health information about sanita-

tion through HDA, HEWs, and health professionals had a positive effect on proper utilization of latrine, hand washing, and water. In line with the present finding, it is evidenced that having materials to build the latrine and to improve latrine utilization have a positive effect on the utilization of latrine [8]. Further, it has been evidenced that households educated or get informed in hygienic practices are more likely to practice latrine, water, and hygiene properly [23].

Being a model in healthy practice is evidenced to enhance the community to practice healthy behaviors [24, 25]. Likewise, in the present study, the households that used latrine properly had 2 times higher odds of utilizing water properly than those who had improper latrine use. Visit by community sanitation committee was found to have a positive effect on proper utilization of water. In line with this, a study conducted in 2015, in Ethiopia shows the households need sustainable information and education in order to utilize latrine, water and hygiene practice properly [26].

As the present study attempted to collect appropriate primary data through observation and interview, the findings are highly valid and reliable for the study area and can be applied in other similar settings.

## Conclusions

This study found that significant proportions of households have no latrine and hand washing facility though they have access to improved water source. It was also found that only a few utilize latrine, hand washing, and drinking water properly. Further, though more than three-fourth (68.4%) of households had a latrine, the present study found that only 9.3% of them wash their hands after toilet. In general, our findings showed the availability and proper utilization of latrine, hand washing, and water depends mainly on the follow-up of households to encourage and educate on hygienic practices by either health extension workers, HDAs or the sanitation committee. To have important sustainable outcomes from CLTSH program, it was evidenced to provide training to local actors including HEWs and HDA [27]. Therefore, strengthening the HEWs and the HDAs to provide sustainable education and health information is needed.

## Abbreviations/acronyms

AOR: Adjusted Odds Ratio; CI: Confidence Interval; CLTSH: Community-led Total Sanitation and Hygiene; HDA: Health Development Army; HEWs: Health Extension Workers; HHs: Households; ICC: Intra-class Correlation Coefficient; PPS: Proportional to Population Size; HPs: Health Professionals.

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## Conflict of interest statement

None declared.

## Authors' contributions

All authors involved in conception, design, coordination and supervision of the research project. AB, ZA and MB have made analysis of the data and interpretation of the results. AB and MB wrote the manuscript. All authors revised the manuscript and gave their contribution to improve the paper. All authors read and approved the final manuscript.

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