

Utilization of Latrine and Associated Factors Among Rural Households in Takussa District, Northwest Ethiopia: A Community-Based Cross-Sectional Study

Authors: Omer, Nuruhusan, Bitew, Bikes Destaw, Engdaw, Garedew Tadege, and Getachew, Atalay

Source: Environmental Health Insights, 16(1)

Published By: SAGE Publishing

URL: <https://doi.org/10.1177/11786302221091742>

BioOne Complete (complete.BioOne.org) is a full-text database of 200 subscribed and open-access titles in the biological, ecological, and environmental sciences published by nonprofit societies, associations, museums, institutions, and presses.

Your use of this PDF, the BioOne Complete website, and all posted and associated content indicates your acceptance of BioOne's Terms of Use, available at www.bioone.org/terms-of-use.

Usage of BioOne Complete content is strictly limited to personal, educational, and non-commercial use. Commercial inquiries or rights and permissions requests should be directed to the individual publisher as copyright holder.

BioOne sees sustainable scholarly publishing as an inherently collaborative enterprise connecting authors, nonprofit publishers, academic institutions, research libraries, and research funders in the common goal of maximizing access to critical research.

Utilization of Latrine and Associated Factors Among Rural Households in Takussa District, Northwest Ethiopia: A Community-Based Cross-Sectional Study

Nuruhusan Omer¹, Bikes Destaw Bitew², Garedew Tadege Engdaw² and Atalay Getachew³

¹Kolla Diba Hospital, Denbia District, Central Gondar, Ethiopia. ²Department of Environmental and Occupational Health and Safety, Institute of Public Health, College of Medicine and Health Sciences, University of Gondar, Gondar Ethiopia. ³Department of Environmental Health, Debre Markos University, Debre Markos, Ethiopia.

Environmental Health Insights
Volume 16: 1–8
© The Author(s) 2022
Article reuse guidelines:
sagepub.com/journals-permissions
DOI: 10.1177/11786302221091742



ABSTRACT

BACKGROUND: The use of sanitation facilities is known to interrupt the transmission of fecal-oral related diseases. However, the evidence was limited about the utilization of latrines within the rural community of Takussa district. Therefore, this study was conducted to assess the utilization of latrines and associated factors among households in Takussa district, northwest Ethiopia.

METHODS: A community-based cross-sectional study design was employed to survey 801 rural households among initially computed 812 participants from February 15 to March 15, 2019. A structured questionnaire with face-to-face interviews was used to collect the data. SPSS version 20 was used to analyze the completed data. A binary logistic regression model was used to process bivariate and multivariable analysis of the data. The adjusted odds ratio was used for the interpretation of the data after controlling for the confounders.

RESULTS: The proper latrine utilization rate was 41.9%, with a 95% confidence interval of (38.8, 45.3). Households with school-aged children (AOR: 2.27, 95% CI: (1.44, 3.56)), a clean latrine (AOR: 3.34, 95% CI: (1.26, 4.93)), the optimal distance from the living room (AOR: 1.56, 95% CI: (1.09, 2.25)), and perceived benefit (AOR: 3.64, 95% CI: (1.13, 11.67)) were statistically associated factors.

CONCLUSION: The Proper utilization of latrines was low among rural households in the Takussa district. School children, distance, cleanliness, and the benefit of latrines were statistically associated factors. As a result, encouraging health extension workers integrated into district schools to pay special attention to frequent follow-up in order to promote proper latrine utilization at the household level.

KEYWORDS: Household, latrine utilization, Takussa district, northwest Ethiopia

RECEIVED: November 23, 2021. **ACCEPTED:** March 7, 2022.

TYPE: Insights into Diversity in the Environmental Health Science Workforce - Original Research Article

FUNDING: The author received no financial support for the research, authorship, and/or publication of this article.

DECLARATION OF CONFLICTING INTERESTS: The author declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

CORRESPONDING AUTHOR: Bikes Destaw Bitew, Department of Environmental and Occupational Health and Safety, Institute of Public Health, College of Medicine and Health Sciences, University of Gondar, Gondar Ethiopia. - Email: bikesdestaw2004@gmail.com

Background

Sanitation is the provision of facilities for the safe disposal of human feces and urine that associate hygiene practices or a safe toilet accompanied by handwashing with soap.¹ Human excreta are the source of many infectious disease agents. The provision of appropriate facilities for defecation is an essential response for people's dignity, safety, health, and well-being.² Despite widespread recognition that effective sanitation is a prerequisite for improved health, welfare, and economic productivity, progress in reducing the burden of sanitation-related diseases in developing countries has been gradual.^{3,4}

The latest figures from the Joint Monitoring Program (JMP) of the United Nations Children's Fund and the World Health Organization show that around 29% of Ethiopians (more than 28 million people) experienced open defecation. Despite the fact that open defecation (OD) has fallen by 64% points nationwide since 1990, the highest decline in that time period, open defecation is still prevalent. Access to adequate and equitable sanitation and hygiene care for all, ending open

defecation, and paying special attention to the needs of women, and, girls and people in vulnerable situations are key to the Sustainable Development Goals.^{2,3}

Ethiopia has made great strides in reducing open defecation, with a decline from 92% in 1990 to 37% in 2012. There are 38 000 staff members in counseling health, sanitation, and hygiene within the Community-Led Total Sanitation and Hygiene (CLTSH) approach.⁵ Rural health advisory service packages focus primarily on disease prevention and health promotion; hygiene and environmental sanitation are some of the most important components of good public health practices.⁶

Despite years of effort to increase the availability of latrine facilities, it is still difficult to find a village that is completely free from open defecation. The country's report points out a large discrepancy between the availability and utilization of latrine facilities in rural communities.⁷ Therefore, the aim of this study was to assess the utilization of latrine facilities and identify the associated factors that are helpful strategies to fill the identified gaps.



Creative Commons Non Commercial CC BY-NC: This article is distributed under the terms of the Creative Commons Attribution-NonCommercial 4.0 License (<https://creativecommons.org/licenses/by-nc/4.0/>) which permits non-commercial use, reproduction and distribution of the work without

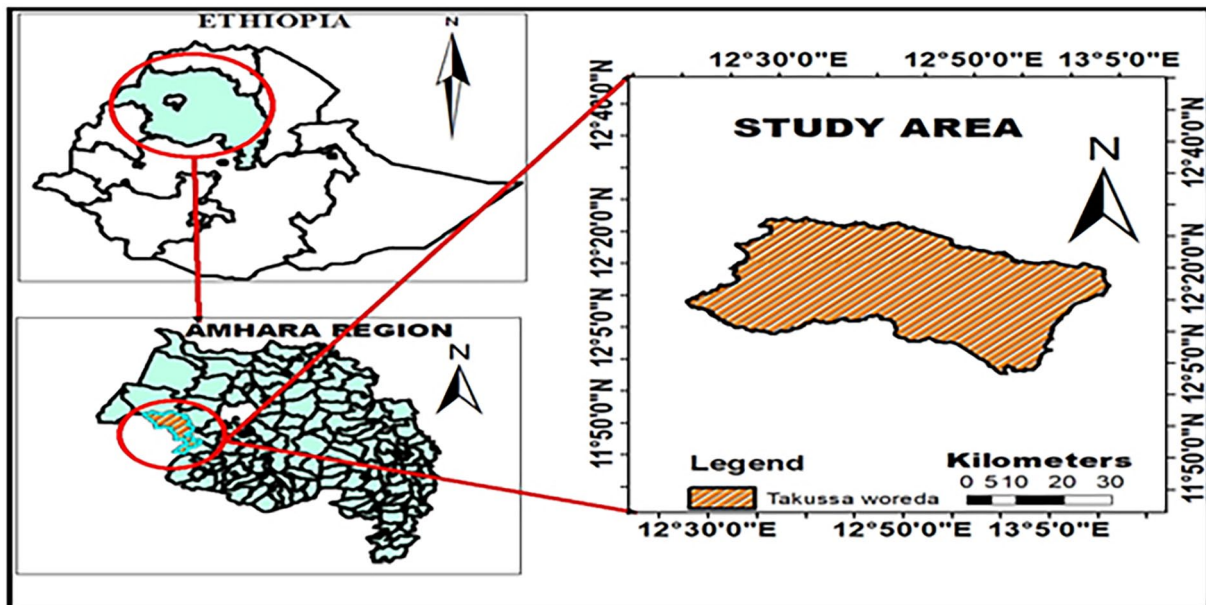


Figure 1. Map of Ethiopia, Amhara administrative region, and study area. Scale 1:100 000, Sample size and sampling technique.

Methods and Materials

Study design and period

A community-based cross-sectional study design was employed to assess utilization of latrine and associated factors in the rural community of Takussa district, northwest Ethiopia, from February 15 to March 15, 2019.

Study setting and population

The study was carried out in the Takussa district (Figure 1), which is 79 km southwest of the city of Gondar, 264 km from Bahir Dar, the capital of the Amhara administrative region, and 812 km from Addis Ababa, the capital of Ethiopia. According to the 2018 CSA population forecast, the district's total population in 2019 was around 179 830 residents, with 41 826 households. Of these, 166 931 of them were rural dwellers. The district is divided into 1 urban Kebele and thirty rural Kebeles (lowest administrative unit in Ethiopia). The climatic zones of 20 Kebeles including urban, are Dega (highland and cold) and Woyna Dega (midland and temperate), and the remaining 10 Kebeles are Kolla (lowland and hot). The community's subsistence income depends on agriculture and live-stock products. Agriculture, including crop production and dairy farms, is the primary life-supporting occupation in Takussa district, like in other parts of rural Ethiopia. The Woreda health offices indicated that the safe water and sanitation (latrine) coverage was 68.2% and 50%, respectively, in the Takussa district.⁸

The sample size was calculated using a single population proportion formula ($n = Z^2_{\alpha/2} (P1-P)/d^2$) with the assumption that the proportion of P -value from the previous study was 60%,⁹ marginal error (d) of 5%, a standard Z score of 1.96

corresponding to a 95% confidence interval, design effect (D) of 2, and adding 10% non-response rate. The final sample size was computed as 812 households.

Strategies were used to recruit the study Kebeles by the rule of thumb. The 20% of Kebeles were randomly selected out of 30 rural Kebeles in the district. A systematic random sampling technique was used to recruit the number of study households with k th intervals of 13 across the selected Kebeles.

Data collection tools

Structured questionnaires, including observational checklists, were used to collect data, which were adopted from different literature.¹⁰ These structured questionnaires addressed 4 parts of questions, which included socio-demographic factors, latrine utilization status, latrine conditions, and sanitation-related behavioral factors. The English version of the questionnaire was translated into the local language (Amharic), and it was translated back into English by the third person to check its consistency. Two days of training were given to data collectors and supervisors on the data collection process (completeness of questionnaires, cross-checking, questioning techniques, and ethical issues), interview techniques, and how to interact with respondents as precautions for data collectors and supervisors.

Operational definitions

Latrine utilization: a condition in which households have functional latrines of any design, shows at least these signs of use (functional footpath to the latrine or the pavement uncovered with grass, availability of fresh feces around the squat hole, no spider weave in the gate, or the slab is wet, visible anal cleansing materials, presence of flies.

Data quality control

Data collectors and supervisors received 2 days of training, including demonstrations, on the objectives and contents of data collection tools. Prior to actual fieldwork, 5% of the questionnaires were pre-tested in rural Kebele of Denbia district, which has similar characteristics with study households to check the reliability of the questionnaires. The changes and experiences from the pre-tested questionnaires were used to amend the final questionnaires. Close supervision, cross-checking of daily filled questionnaires, editing, coding, and clearance of data were done for data quality assurance. For completeness and consistency, the collected data were rechecked daily.

Data Processing and Analysis

The data were entered into Epi-Info 3.5.3 and exported to SPSS 20 for further analysis. Descriptive statistics were employed to analyze proportions, medians, and inter-quartile ranges (IQR) for general characteristics of study participants and the proportion for the utilization of latrines. Tables, Figures, and texts were used for the final report of quantitative data. Binary logistic regression was applied to measure the relationship between the outcome variable and explanatory variables. Bivariate analysis was used to estimate the crude odds ratio and screen for bulk variables with a P -value $\leq .2$ for further considered in the multivariable analysis model. Multivariable analysis was used to observe the relationship between many predictors and a single outcome in order to estimate the adjusted odds ratio (AOR) after controlling confounding factors. In addition, with 95% CI for all statistically significant tests, P -value $< .05$ was used as a cut-off point to declare that the association was statistically significant. The model fitness test was checked by Hosmer and Lemeshow goodness of fit test.

Results

Socio-demographic characteristics of respondents

A total of 812 respondents were recruited for this study. Of these, 801 respondents were recorded with a response rate of 98.6%. The median age of the respondents was 40.27 (IQR: 34.13–48.16) years. The majority 759 (94.8%) of respondents were married and have mean (\pm SD) family size of 5.68 (\pm 1.82) individuals. There were under 5 children in three-fourths of households, 603 (75.3%). Of these, 425 (53.1%) mothers and 361 (48.9%) fathers were unable to read and write (uneducated). Respondents were mostly farmers 663 (79%), and nearly three-quarters 589 (73.5%) of households had school-aged children. (Table 1).

Characteristics of latrine facilities

Of the total households, about half 402 (50.2%) latrines were privately owned and 399 (49.8%) were shared with neighbors.

More than half 463 (57.8%) of latrines were served 4 years or longer prior to the study. Nearly two-thirds, 502 (62.7%) of the respondents explained that they were motivated by health extension workers and 156 (19.5%) were imposed by community leaders. Though small number 143 (17.8%) of respondents were self-initiated in constructing their own latrines. Almost more than half 435 (54.3%) of households' latrines had need of maintenance (Table 2).

Utilization of latrine

The proportion of latrine utilization in rural households of Takussa district was 41.9% with 95% CI: (38.8, 45.3). However, only 22 (3.7%) children were using latrines. Half of 292 (50.3%) households improperly disposed of their children's faeces in the backyard or in the nearby fields. Although, in the compound, faeces were physically observed in 460 (57.4%) of households, that have functional latrines. Understanding the dangers of excreta to health 185 (67.3%), maintaining privacy 61 (22.2%), and a lack of other places to defecate 29 (10.5%) were the reasons why household members used latrines (Table 3).

Reasons of not using the latrine

Figure 2 illustrated that most of the study participants 312 (38.90%) claimed that the latrines were full, followed by remote latrine locations as reasons for latrine non-use.

Factors associated with utilization of latrine

In bivariate logistic regression, educational status, presence of school children, distance of latrine from living room, latrine service year, presence of door, presence of superstructure, cleanliness of latrine, presence of hand washing facilities, latrine not shared by other households, presence of sufficient height of superstructure, reason for latrine construction, benefits of latrine use, and hand washing practice were found to be significantly associated variables with the utilization of latrines.

The outcome was adjusted with multiple variables; most of the variables did not resist the final model. In multivariable analysis, the presence of schoolchildren, distance from the living room, cleanliness of latrine, and benefits of latrine utilization were statistically associated with the utilization of latrines. Households having school children used latrine 2.27 times more likely than households that did not have school children (AOR: 2.27, 95% CI: [1.44, 3.56]). Households that had latrines less than or equal to 6 m far from the living room were 1.56 times more likely to utilize their latrine compared with households had greater than 6 m away from the living room (AOR: 1.56, 95% CI : [1.09, 2.25]). Households with clean latrines were 3.34 times more likely to use their latrines than their counterparts (AOR: 3.34, 95% CI: [2.26, 4.93]). Furthermore, study participants who knew about the benefit of good latrine utilization for disease prevention were 3.64 times

Table 1. Socio-demographic characteristics of respondents in the rural areas of Takussa district, northwest Ethiopia, March 2019 (n=801).

CHARACTERISTICS		NUMBER	PERCENT (%)	REMARK	
Sex	Male	667	83.3		
	Female	134	16.7		
Age (Year)	21-30	109	13.6		
	31-40	309	38.6	Median=40.27	
	41-50	225	28.1	IQR=34.13, 48.16	
	≥51	158	19.7		
Marital status	Married	759	94.8		
	Not married*	42	5.2		
Educational level	Mother	Uneducated	425	53.1	
		Educated	376	46.9	
	Father (n=738)	Uneducated	361	48.9	
		Educated	377	51.1	
Religion	Orthodox	761	95		
	Muslim	40	5		
Family size	≤5	447	55.8	Mean=5.68	
	>5	354	44.2	SD= ±1.82	
Occupation	Farmer	633	79		
	Others@	168	21		
Under five children	Yes	603	75.3		
	No	198	24.7		
School children	Yes	589	73.5		
	No	212	26.5		

*single, divorced, widowed, @ housewife, Daily laborer, Merchant, Government employee, and self-employed, IQR: interquartile range, SD: standard deviation.

more likely to have good utilization of latrine than those who did not know about the benefit of latrine utilization about disease prevention (AOR: 3.36, [1.13,11.67]) (Table 4).

Discussion

The availability of latrine-like utilization does not have a guarantee the organization of an open defecation-free (ODF) environment. This study revealed that the status of latrine utilization among rural households in Takussa district was 41.9%, with a 95% CI: (38.8, 45.3). However, utilization of latrines was influenced by different potential factors, such as the presence of school children, the distance between the latrine and the living room, cleanliness of the latrine, and understanding the benefits of latrine utilization were found to be statistically significant predictors of the utilization of latrines.

The findings of this study (41.9%) is slightly higher than the study finding from different part of rural Ethiopia in Ilu Aba Bor Zone (36%),¹¹ West Shoa Zone, (36.8%)¹² and

Hawzien district, Tigray, (37.4%).¹³ However, the current finding is lower than studies done in the others rural communities of Ethiopia in Chenchu district, (60%),⁹ Aneded district(63.7%),¹⁴ Awabel district, 52%,¹⁵ and Hullet ejju Enessie district (60.7%).¹⁶ These variations might be due to the different socio-demographic characteristics. The effort of health extension workers may vary from region to region for promoting and close follow up on the proper utilization of latrines. In addition, community engagement may be varied to latrine utilization, which was mainly focused on latrine construction. As a consequence, emphasis only on latrine construction without utilization may not have a guarantee to keep an open defecation free (ODF) environment. Open defecation is a result of either inaccessibility or poor utilization of latrines, which is considered the leading cause of the wide spread of infectious diseases.

In the factor analysis, it was good to note that the proper utilization of latrines in households with school children was

Table 2. Characteristics of latrine facilities in the rural households of Takussa district, northwest Ethiopia, March 2019 (n=801).

CHARACTERISTICS		NUMBER	PERCENT(%)
Ownership of latrine	unshared latrine	399	49.8
	Share latrine*	402	50.2
Service year of latrine	1-3 years	338	42.2
	≥ 4 years	463	57.8
Presence of superstructure	Yes	676	84.4
	No	125	15.6
Presence of door	Yes	326	40.7
	No	475	59.3
Height of latrine	≥ 1.5 m	398	49.3
	<1.5 m	403	50.3
Squat hole cover	Yes	85	10.6
	No	716	89.4
Distance from living room	≤ 6 m	382	47.7
	>6 m	419	52.3
Hand washing facilities	Available	336	41.9
	Not available	465	58.1
Cleanliness of latrine	Good**	426	53.2
	Poor	375	46.8
Latrine need maintenance	Yes	435	54.3
	No	366	45.7
Motivation of HHs to build latrine by	HEWs***	502	67.2
	Community leaders	156	19.5
	Self-initiation	143	17.8

*shared: two or more households were commonly used a single latrine

Good latrine: a pit latrine having superstructure with a door (any cover), proper floor and properly clean which may not have nuisance insects and disgust fecal matter in and around the pit latrine. Otherwise, it was poor latrine. *Health extension workers

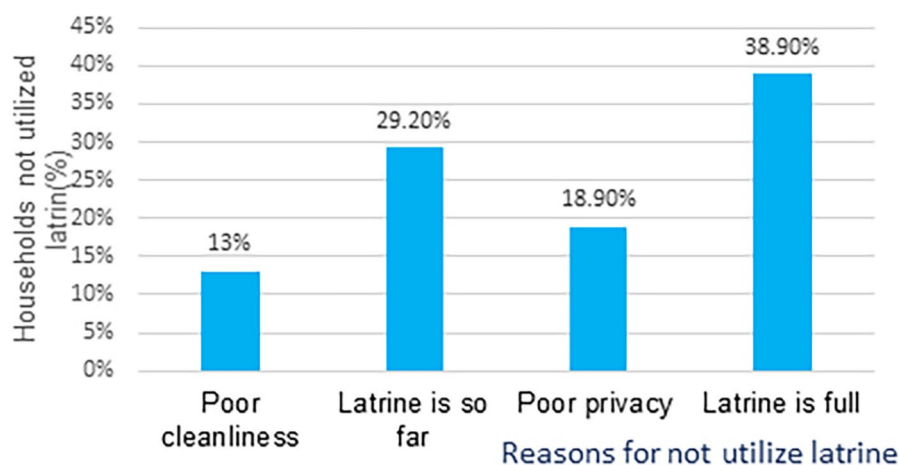
encouraged more than twice as much as in households without school children (AOR=2.27, $P < .001$). This finding is consistent with the findings from different districts of the west Gojjam zone, Ethiopia in Hulet Ejju Enessie,¹⁶ Awabel,¹⁵ and Aneded district,¹⁴ which was 2.5 times more utilized than households without school children. This could be partly explained by the fact that school children have learned in the classroom through curriculum support about environmental sanitation related to common diseases: their causes, transmission, and prevention methods. This is, therefore, a good opportunity for the dissemination of health information to make the household members aware of the proper use of latrines through the encouragement of their school children. In addition, schoolchildren are “agents of change” in pacing the behavior and practice of their family and community at large.¹⁷

Cleaning the latrine is one of the factors that attracts household members to regularly utilize the latrine. In the current study, regarding the cleanliness condition of latrines, household members were attracted to use well-cleaned latrine 3.34 times more likely than uncleaned latrine (AOR=3.34, $P < .001$). This finding is similarly supported with a study done at Denbia and Aneded districts which was encouraged 4 times more to utilize clean latrine.^{14,18} The reason could be attributed to the fact that participants behavior can be motivated by a clean floor of latrine and it may also be reduced from the problem of odor, which is released from nuisance dirt's.¹⁹ On the other hand, unsanitary conditions and odors may deter households from proper utilization of latrines.²⁰

An appropriate distance between the latrine location and the living room motivates the latrine utilization among

Table 3. Utilization of latrine in rural households of Takussa district, Northwest Ethiopia. March 2019, (n=801).

CHARACTERISTICS	CATEGORY	NUMBER	PERCENT (%)
Proper Utilization of latrine	Yes	336	41.9
	No	465	58.1
Households with under five children	Yes	603	75.3
	No	198	24.7
Frequency of cleaning latrine (n=437)	Usually	284	65
	Rarely	153	35
Reasons for latrine utilization (n=275)	Excreta are dangerous to health	185	67.3
	Privacy	61	22.2
	No other place to defecate	29	10.5
Place of under-five children faeces disposal (n=580)	Put in the pit	288	49.7
	Outside the compound	292	50.3
Reasons for Under five children not used latrine (n= 580)	Large squat hole	247	42.6
	Slab was not safe to stand on	252	43.4
	Poor cleanliness	81	14.0

**Figure 2.** Study participant's reasons for not practicing latrine utilization in rural communities of Takussa district, Northwest Ethiopia, March 2019 (n=399).

household members. The far distances can discourage latrine utilization due to the fear of health related risks at night.²¹ Even if it is advisable to build a latrine at a minimum distance of 6 m from the house.²²

This study revealed that households were motivated to utilize latrines 1.56 times (AOR=1.56, $P < .001$) more where the location of latrines did not exceed 6 m from the living room. This study finding is in line with a study done from Ghana²¹ and Bahir Dar Zuria²³ Ethiopia.

Furthermore, study participants who had awareness about the health benefits of latrine were 3.64 times more likely to adhere to latrine utilization than their encounters (AOR: 3.36, $P < .001$). This finding is similarly supported by a study done in Tanzania and Eastern Zambia.^{24,25} This could be due to the

fact that knowledge is important to understand the disadvantage of an unclean environment tainted by human waste, which can put family members in danger of infectious diseases. Limitation: This study, like other studies, may not be free from any bias. The results regarding the practice of latrine utilization were based on short time observation with assisted communication. Social desirability or observer biases due to some household members might not be used latrine, these may be led to either over or under estimates of true results.

Conclusions

The current level of proper utilization of latrine was low among rural households in the Takussa district whereas compared to the findings of different studies. The presences

Table 4. Binary logistic regression analysis of factors associated with utilization of latrine in the rural communities of Takussa district, northwest Ethiopia 2019, (n=801).

FACTORS		LATRINE		COR(95%CI)	AOR(95%CI)
		UTILIZED	NOT-UTILIZED		
Father education	Educated	195	182	1.4 (1.05, 1.88)	1.167 (0.80,1.69)
	Uneducated	156	205	1.0	1.0
School children	Yes	300	289	1.89 (1.37, 2.63)***	2.27 (1.44,3.56)***
	No	75	137	1.0	1.0
Shared latrine facilities	Yes	212	187	1.0	1.0
	No	163	239	0.60 (0.45, 0.79)	0.83 (0.57,1.21)
Service year of latrine	1-3y	174	164	1.38 (1.04, 1.83)	0.72 (0.48,1.09)
	≥4y	201	262	1.0	1.0
Cleanliness of latrine	Good	280	146	5.65 (4.15, 7.68)***	3.34 (2.26, 4.93)***
	Poor	95	280	1.0	1.0
Superstructure	Yes	348	328	3.85 (2.45, 6.05)	1.67 (0.89, 3.12)
	No	27	98	1.0	1.0
Availability of door	Yes	185	141	1.96 (1.47, 2.61)	0.94 (0.61, 1.45)
	No	190	285	1.0	1.0
Height ≥ 1.5m	Yes	220	178	1.97 (1.49, 2.62)	1.28 (0.84, 1.94)
	No	155	248	1.0	1.0
Need of maintenance	Yes	172	263	1.90 (1.43, 2.52)	0.85 (0.56, 1.28)
	No	203	163	1.0	1.0
Distance from living room	≤ 6m	221	161	2.36 (1.77, 3.13)***	1.56 (1.09, 2.25)**
	>6m	154	265	1.0	1.0
Reasons for latrine construction	Advice from HW	289	213	1.72 (1.18, 2.50)	1.38 (0.84, 2.29)
	Self-initiation	23	133	0.22 (0.12, 0.38)	0.86 (0.42, 1.78)
	Fear of punishment	63	80	1.0	1.0
Benefits of latrine utilization	Disease prevention	323	238	14.38 (5.66, 6.53)***	3.64 (1.13, 11.67)**
	Privacy	47	135	3.69 (1.39, 9.78)	1.96 (0.62, 6.20)
	No benefits	5	53	1.0	1.0
Hand washing facility	Available	202	134	2.54 (1.90, 3.39)	1.32 (0.88, 1.97)
	Not available	173	292	1.0	1.0
Hand washing practice	Yes	242	158	3.08 (2.31, 4.12)	1.40 (0.96, 2.04)
	No	133	268	1.0	1.0

Statistically significant at ***P-value <.001, **P-value <.01. HW, healthcare worker.

Hosmer and Lemeshow goodness of fit test was 0.795 (ie, >0.05) and the test result of VIF was <10 for each independent variables in the final model. Therefore, the actual test result (≤3) is confirmed that no multicollinearity was observed.

of school children in household members, latrine distance from living room, latrine cleanliness, and understand the health benefit of latrine were statistically significant

predictors for the utilization of latrine at household level. For the consistent utilization of latrines, therefore, motivating health extension workers integrated with in the district

schools pay special attention for frequent follow up to households to promote and improve the proper utilization of latrine at household levels.

Acknowledgements

We are highly indebted to the College of Medicine and Health Sciences, University of Gondar, for supporting this research project. We would like to extend our thanks to Takussa woreda administrative for giving us permission to conduct this study. We would also like to extend our acknowledgments to the study participants, data collectors, and supervisors.

Authors' Contributions

All stated authors NO, BDB, GTE, AG are involved in the study from the inception to design, acquisition of data, analysis and interpretation and drafting of the manuscript. All authors read and approved the final manuscript.

Data Availability

We, all the authors do have the data of this study and the corresponding author can provide it as per the request.

Ethical Consideration

Ethical clearance was approved and obtained from the Institutional Review Board of the University of Gondar, College of Medicine and Health Science, Institute of Public Health. Then an official permission letter was collected from the central Gondar zone health department and from the district admin offices. Written informed consent was obtained from each study participant after they were included in this study. The purpose of the study was explained to study participants before giving consent. We deliver information on the rights to interrupt the interview. The interview was conducted using anonymous questionnaires. Confidentiality was maintained to protect their personal information.

ORCID iD

Bikes Destaw Bitew  <https://orcid.org/0000-0003-4106-509X>

REFERENCES

- Freeman MC, Garn JV, Sclar GD, et al. The impact of sanitation on infectious disease and nutritional status: a systematic review and meta-analysis. *Int J Hyg Environ Health*. 2017;220:928-949.
- Sphere P. *The Sphere Project: Humanitarian Charter and Minimum Standards in Humanitarian Response*. The Sphere Project; 2011.
- Bartram J, Brocklehurst C, Fisher MB, et al. Global monitoring of water supply and sanitation: history, methods and future challenges. *Int J Environ Res Public Health*. 2014;11:8137-8165.
- Ababa A, Calverton E. *Central Statistical Agency (Ethiopia) and ICF International*. Ethiopia Demographic and Health Survey; 2011.
- UNICEF. Strategy for water, sanitation and hygiene 2016-2030. UNICEF; 2016.
- Hailu Debela T. Monitoring water supplies and sanitation in Ethiopia. Paper presented at: PowerPoint presentation at the IRC Symposium; 2013.
- Beyene A, Hailu T, Faris K, Kloos H. Current state and trends of access to sanitation in Ethiopia and the need to revise indicators to monitor progress in the Post-2015 era. *BMC Public Health*. 2015;15:451-458.
- Hailemariam W. *Water Supply Sanitation and Hygiene Promotion Project Proposal in Alefa Takusa and Lay-Gayint*. Revised ORDA Charity water Project main doc. 2017.
- Chare Koyra H, Mensa Sorato M, Shiferaw Unasho Y, Zema Kanche Z. Latrine utilization and associated factors in rural community of Chencha District, southern Ethiopia: a community based cross-sectional study. *Am J Public Health Res*. 2017;5:98-104.
- World Health Organization. *Achieving Quality Universal Health Coverage Through Better Water, Sanitation and Hygiene Services in Health Care Facilities: A Focus on Ethiopia*. World Health Organization; 2017.
- Oljira D, Berkessa T. Latrine use and determinant factors in southwest Ethiopia. *J Epidemiol Public Health Rev*. 2017;1:1-5.
- Kelbessa Z, Baraki N, Egata G. Level of health extension service utilization and associated factors among community in Abuna Gindeberet District, West Shoa Zone, Oromia Regional State, Ethiopia. *BMC Health Serv Res*. 2014;14:324-329.
- Ashebir Y, Rai Sharma H, Alemu K, Kebede G. Latrine use among rural households in northern Ethiopia: a case study in Hawzien district, Tigray. *Int J Environ Stud*. 2013;70:629-636.
- Chanie T, Gedefaw M, Ketema K. Latrine utilization and associated factors in rural community of aneded district, North West Ethiopia, 2014. *J Community Med Health Educ*. 2016;06:1-8.
- Gedefaw M, Amsalu Y, Tarekegn M, Awoke W. Opportunities, and challenges of latrine utilization among rural communities of Awabel District, Northwest Ethiopia, 2014. *Open J Epidemiol*. 2015;05:98-106.
- Anteneh A, Kumie A. Assessment of the impact of latrine utilization on diarrhoeal diseases in the rural community of Hulet Ejju Enessie Woreda, East Gojjam Zone, Amhara Region. *Ethiop J Health Dev*. 2010;24:110-118.
- Hilu D, Faris K, Adimassu M, Tassew S. *Housing and Institutional Health*. Lecture Notes. Degree and Diploma Programs for Environmental Health Students. Hawassa University in collaboration with the Ethiopia Public Health Training Initiative, The Carter Center, the Ethiopia Ministry of Health, and the Ethiopia Ministry of Education; 2002.
- Yimam YT, Gelaye KA, Chercos DH. Latrine utilization and associated factors among people living in rural areas of Denbia district, Northwest Ethiopia, 2013, a cross-sectional study. *Pan Afr Med J*. 2014;18:334.
- Cowman G, Otipu S, Njeru I, et al. Factors associated with cholera in Kenya, 2008-2013. *Pan Afr Med J*. 2017;28:156-156.
- Kema K, Semali I, Mkuwa S, et al. Factors affecting the utilisation of improved ventilated latrines among communities in Mtwara Rural District, Tanzania. *Pan Afr Med J*. 2012;13 Suppl 1:4.
- Kumie A, Ali A. An overview of environmental health status in Ethiopia with particular emphasis to its organisation, drinking water and sanitation: a literature survey. *Ethiop J Health Dev*. 2005;19:89.
- World Health Organization, Unicef. *Progress on Sanitation and Drinking-Water*. World Health Organization; 2013.
- Awoke W, Muche S. A cross sectional study: latrine coverage and associated factors among rural communities in the District of Bahir dar Zuria, Ethiopia. *BMC Public Health*. 2013;13:99-106.
- Sara S, Graham J. Ending open defecation in rural Tanzania: which factors facilitate latrine adoption? *Int J Environ Res Public Health*. 2014;11:9854-9870.
- Thys S, Mwape KE, Lefèvre P, et al. Why latrines are not used: communities' perceptions and practices regarding latrines in a Taenia solium endemic rural area in eastern Zambia. *PLoS Negl Trop Dis*. 2015;9:e0003570.