

## Utilization of Latrine and Associated Factors among Residents in Tourism Destination Area of Debarq Town, Northwest Ethiopia: A community-based Cross-Sectional Study

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### Abstract

**Background:** Though the Ethiopian government continues to support increased access to improved latrine facilities, high access rates to household latrines are often not matched by high usage rates and open defecation still remains the predominant practice in rural and pre-urban households. However, little research has been conducted to identify potential factors associated with low latrine use. Therefore, the purpose of this study was to assess latrine utilization and its associated factors in Debarq town, northwest Ethiopia.

**Methods:** A community-based cross-sectional study was employed to collect data from 5-17 June 2016. A simple random sampling technique was used to select a total of 383 households that were included in the study. The data were collected using a pretested structured questionnaire and observational checklists through face-to-face interviews. The completed data were analyzed using SPSS version 20. A binary logistic regression model was used to compute bivariate and multivariable analysis of the data. An adjusted odds ratio with 95% CI was used for the interpretation of the data after controlling the confounders. In addition, P-value <0.05 was used to declare statistically significant associations.

**Results:** Among the residents in Debarq town, the utilization of latrine was 80.5% with 95% CI: (76.3, 84.4%). The head of households having a diploma and above (AOR: 2.40, 95%CI: (1.54, 10.71)), households whose service year of latrine was less than two years (AOR: 2.46, 95%CI: (1.13, 5.35)), absence of flies (AOR: 3.24, 95%CI: (1.23, 8.69)) and cleanliness of the slab (AOR: 4.96, 95%CI (1.76-13.94)) were significantly associated predictors for higher latrine utilization. However, lack of regular cleaning of the latrine hindered its utilization (AOR: 0.18, 95%CI (0.05, 0.73)),

**Conclusion:** Latrine utilization was found to be substantially high among residents in Debarq town. Better educational levels, no visible nuisance flies in the latrine and no faeces on the latrine floor, short years of use, and frequency of latrine cleaning were the five statistically associated factors for effective utilization of latrines. To maintain consistent latrine utilization, health education through urban health extension programs could be strengthened. However, additional measures could also be recommended to address households without latrines.

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## Introduction

World Health Organization (WHO) in 2006 defined sanitation as an arrangement to protect public health, supply clean potable water, and disposal of sewage(1). Baum and Bartram in 2013 (2) estimated that only 40% of the world population (2.8 billion people) used improved sanitation, which includes flush to piped sewer systems, septic tanks, ventilated-improved pit latrines, or pit latrines with slab hygienically separate human waste from human contact. That is 4.1 billion people who lacked access to improved sanitation facilities globally. Moreover, about 40% of the globe population does not have toilet facilities(3). About 15% of the world's people are practicing open field defecation(4).

According to the WHO report, the absence of access to adequate sanitation, use of unclean water, and poor hygiene contribute about 88% of cases of diarrhea, including cholera, typhoid, and dysentery problems in developing countries. However, more than 673 million people still use open-pit latrines due to mismanagement, and insufficient public funding (5). On the other hand, improved sanitation can reduce the world's diarrheal disease incidence by one third(6). In the rural area of sub-Saharan Africa, only 24% of the populations have access to improved sanitation facility(7). United Nations member countries in Geneva noted that increasing the standard of sanitation in such poor countries should be a matter of human dignity(3).

The Federal Ministry of Health reported that about 60% of the disease burden in Ethiopia results from poor sanitation in which 15% of total deaths are caused by diarrhea, most commonly in children under-five years of age(8). In sanitation facilities, nationwide inventory (2014) data show that more than half of Ethiopian populations (52.1%) are using unimproved sanitation facilities. Many people (35.6%) practiced open defecation. Furthermore, most urban slums (88.6%) used unimproved sanitation facilities (9). The majority of households, 82% (91% rural and 54% urban) used unimproved latrine facilities (10). All these results suggest that Ethiopia is far from fulfilling the target of Sustainable Development Goal 6 that aimed to enable 56% of the population to access improved sanitation(11).

In Amhara Administrative Region, sanitation coverage was enhanced from 4% in 2004(12) to 63% in 2010 (13). Of this (63%), the non-functional latrines estimated at more than 80% (14). Unless interventions were taken, the rate of child mortality due to inadequate sanitation would likely increase. In Denbia district, Central Gondar Zone, Yimam, et al.(15) explored factors that included the presence of children under five years of age, the jobs of mothers (farmers), and less frequent cleaning of latrine as negatively associated with latrine utilization. On the other hand, factors including the presence of secondary school children, educated mothers, the presence of functional superstructures with doors and hygienic conditions of latrines were positively associated with latrine utilization.

While the government has been focused on construction of latrines in each household, the status of utilization of available latrines has not been studied(16). Therefore, this study was conducted to provide information on the status of latrine utilization and associated factors in Debarq town, which is a tourism destination area for nearby Semien National Park.

## Method

### Study area

The study was conducted in Debarq town which is a tourism center in Debarq district in North Gondar Zone, Amhara National Administrative Regional State. Debarq town is the capital of Debarq district that is 830Km from Addis Ababa and 100Km in the north of Gondar city, in northwest Ethiopia [17]. Its elevation range is from 2712 to 3122 meters above sea level. The total population of the district is estimated at 169,835, of which 85,594 are males and 84,242 are females. Based on the data from Debarq town administrative office during 2016, the town is divided into three kebeles (the smallest administrative area in Ethiopia) having a total population of 25,000 and 4,803 households.

Debarq town is not only a tourism center, it is also one of the oldest team training program (TTP) sites of University of Gondar. Here Medicine and other Health Science students are deployed in teams to work with local communities for three consecutive months per each year. Some of the TTP activities include facilitating latrine construction, promoting latrine utilization, and health education.

### Study design and period

A community-based cross-sectional study design was used to

assess latrine utilization and related factors in Debarq town from 5-17 June, 2016.

### Sample size determination

A single population proportion formula was used to determine sample size by considering the proportion of latrine utilization found in Denbia district (61.2%) [15], including the following assumptions: with 95% CI ( $Z=1.96$ ), marginal error ( $d$ ) 5%, the non-response rate of 5%, and using the following formula  $n=Z_{\alpha/2}^2 * P(1-P)/d^2$ , the final sample size( $n$ ) needed for this study was determined to be 383 households.

### Sampling techniques and procedures

Simple random sampling was used to select the households that were included in the study. The total sample size (383) was allocated proportionally to population size in each kebele. The number of study households in each Kebele were: 116 households in Kebele-01, 131 households in Kebele-02 and 136 households in Kebele-03.

### Data collection methods and tools

Data were collected by using face-to-face interviews with pre-tested structured questionnaires and observational checklists. These instruments were prepared in English and translated into the local language, Amharic. These structured questionnaires addressed four categories of questions: socio-demographic factors, environmental factors, sanitation-related behavioral factors including latrine utilization status, and latrine cleanliness and condition.

### Operational definition

**Latrine utilization:** is positive when households have functional latrines, no observable faeces in the compound, and show at least one sign of use (a foot path to the latrine is not covered by grass, the latrine is smelly, anal cleansing material and fresh faeces are present in the squatting hole, or the slab is wet)[18].

**Functional latrine:** is a latrine that can be used at the time of data collection even if it requires maintenance. It assures that the latrine structure is adequate to prevent surface contamination, vector infestation, and user's privacy [19]

### Data quality control

To ensure data quality, six data collectors and two supervisors received two days of training, including demonstrations, on the objectives and contents of data collection tools, interview techniques, and approaches to heads of households. To check

the reliability of the questionnaires, pre-tests were conducted on 5% (20 questionnaires) of the total sample size on households in Dabat town, which has similar characteristics to the study households in Debarq town. This pre-test experience was used to amend the final questionnaires. Close supervision, daily cross-checking of filled questionnaires for completeness and consistency, editing, coding, and clearance of data were done for data quality assurance.

### Data management and analysis

The data entry and cleaning were performed using EPI Info version 3.5.3. statistical software and exported to the Statistical Package for the Social Sciences (SPSS) version 20.0 for analysis of the data using descriptive statistics (frequency, percentage, mean and standard deviation). Further analysis was performed using bivariate analysis for selection of potential candidate variables to multivariable analysis of the final model to determine the association of various factors on the outcome variables by controlling for possible confounders. The degree of association between independent and dependent variables were assessed using an odds ratio with 95% confidence interval and  $p$ -value  $\leq 0.05$ . The dichotomous variable was defined as 1 = "Yes" for utilization of latrine and 0 = "No" for non-utilization of latrines. Finally, model fitness was tested by using the Hosmer and Lemeshow test.

## Results

### Socio-demographic characteristics

A total of 383 households were invited to participate in the study and all of them accepted, making the response rate 100%. Most of the respondents, 257 (67.1%), were males. The mean ( $\pm$ SD) age of the respondents was 35( $\pm$ 9) years, 169 (44.1%) respondents were of ages 25-34 years. The majority of the respondents, 311 (81.2%), were Orthodox Christians followed by Muslims, 64 (16.7%). Most of the respondents (294 (76.8%)) were married. Around a quarter of respondents, (85(22.3%)) did not have an educational background. Nearly three-fourth of households, (280 (73.1%)) had less than five family members (**Table 1**).

### Environmental characteristics

Most of the households included in the study, 359 (93.7%), had latrines. More than three-fourths of households (288 (80.2%)), had simple pit latrines, most of which, 263 (73.3%) were constructed at their own expense. Fifty-five (15.3%)

were built with the support of the University of Gondar team training program (TTP) students and of the remainder, 23 (6.3%) and 18 (5%) were built by government and nongovernmental organizations (NGOs) respectively. Ninety-five percent of latrines had superstructure and nearly 90% had

proper slabs. Among the survey households, slightly more than 80% had functional latrines which were used on a daily basis (289 (80.5%)). More than half, 212 (59.1%), of the households had latrines with hand washing facilities in which 210 (58.5%) used water and soap (**Table 2**).

**Table1:** Socio-demographic characteristics of respondents in Debarq town, Northwest Ethiopia, June 2016 (n = 383)

Characteristics	Categories	Number	Percent (%)
Sex	Male	257	67.1
	Female	126	32.9
Age	18-24	29	7.6
	25-34	169	44.1
	35-44	131	23.8
	>44	54	34.2
	Religion	Orthodox	311
	Muslim	64	16.7
	Catholic/ Protestant	8	2.1
Marital status	Married	294	76.8
	Unmarried	49	12.8
	Divorced	25	6.5
	Windowed	15	3.9
Education	No education	85	22.2
	Only read and write	77	20.1
	Elementary school	64	16.7
	Secondary school	69	18.0
	Certificate and above	88	23.0
Occupation	House wife	105	27.4
	Government employee	102	26.6
	Merchant	88	23.0
	Daily laborer	39	10.1
	student	30	7.8
	Farmer	19	5.0
Family number	≤5	280	73.1
	>5	103	26.9
Income	<500	91	23.8
	500-1500	104	27.2
	1500-2500	83	21.7
	>2500	105	27.4

*Certificate* means a minimum educational requirement for “diploma” award or 10<sup>+3</sup> level

**Table 2:** Environmental characteristics of study households with respect to condition of latrine in Debark town, Northwest Ethiopia, June 2016. (n=383)

Characteristics	Categories	Number	Percent (%)
<b>Latrine availability</b>	Yes	359	93.7
	No	24	6.3
<b>Type of latrine (n=359)</b>	Simple pit latrine	288	80.2
	water closet	55	15.3
	VIP	16	4.5
<b>Constructed by(359)</b>	Their own	263	73.3
	TTP students	55	15.3
	Government office	23	6.4
	NGOs	18	5.0
<b>Service year (n=359)</b>	<2 years	98	27.3
	≥2years	261	72.7
<b>Having superstructure (n=359)</b>	Yes	341	95.0
	No	18	5.0
<b>Proper slab (n=359)</b>	Yes	319	89.0
	No	40	11.0
<b>Functional (n=359)</b>	Yes	289	80.5
	No	70	19.5
<b>Hand washing facilities (n=359)</b>	Present	212	59.1
	Absent	147	40.9
<b>hand-washing agent (n=359)</b>	Water and soap	210	58.5
	Water only	149	41.5
<b>Distance from kitchen (n=359)</b>	<6m	194	53.8
	≥6m	165	46.2
<b>Electric light (n=359)</b>	Yes	213	59.3
	No	146	40.7

*VIP=Ventilated Improved Pit latrine; TTP=Team Training Program; NGOs=Non-governmental organizations*

### Behavioral characteristics

The proportion of latrine utilization was 80.5% with 95%CI (76.3-84.4). In the practice of cleaning, among the indicators of latrine cleanliness, most of the latrines 242 (67.7%) did not

show common house flies, no bad odor was present in 262 (73%) latrines, and nearly 45% of households (114 (44.0%)) cleaned their latrines at least once a week (**Table 3**).

**Table 3:** Behavioral characteristics with respect to latrine cleanliness in Debarq Town, Northwest Ethiopia, June 2016

Characteristics	Categories	Number	Percent
<b>Visible flies around the latrine</b>	Yes	116	32.3
	No	243	67.7
<b>Bad odor around the latrine</b>	Yes	97	27.0
	No	262	73.0
<b>Latrine cleaning</b>	Yes	259	72.0
	No	100	28.0
<b>Frequency of cleaning (n=259)</b>	Daily	94	36.3
	Twice a day	11	4.3
	Per week	114	44.0
	Twice a week	40	15.4
<b>Latrine Utilization (n=359)</b>	Yes	289	80.5
	No	70	19.5

#### Factors associated with latrine utilization

The processes of variables entered into the bivariate analysis model were characterized with each variable P-values <0.25 associated from latrine utilization outcome. After adjusting variables in the multivariable analysis, only educational status, presence of flies and faeces, service year, and frequency of cleaning were resisted the model and remained significant predictors of latrine utilization after controlling potential confounders. The holders of diploma and above were 2.4 times more likely to utilize latrine than households with no education [AOR: 2.40, 95% CI (1.54, 10.71)]. Households whose service year of their latrine less than two years were 2.46 times more likely to utilize their latrine than that of households with service year of latrine greater than two years [AOR:2.46 ,95% CI (1.13,5.35)].

When cleaning frequency of latrines was done just weekly, households were 0.18 times less likely to utilize latrines compared with households whose latrines were cleaned twice a week [AOR: 0.18, 95% CI (0.05-0.70)]. Absence of flies [AOR: 3.24, 95%CI (1.22-8.69)] and no presence of faeces around the latrine [AOR: 4.96, 95% CI (1.76, 13.94)] remained significant positive predictors of latrine utilization (Table 4).

**Table 4:** Bivariate and multivariable analysis of factors associated with latrine utilization among households in Debarok town, northwest Ethiopia, June 2016(n=383).

Variables	Latrine utilization		COR(95%CI)	AOR(95%CI)
	Yes n (%)	No n (%)		
<b>Educational status of respondent</b>				
No education	55(75.3)	18(24.7)	1.0	1.0
Only read and write	56(81.2)	13(18.8)	1.41(0.63,3.15)	0.751(0.27,2.13)
Elementary school	48(78.7)	13(21.3)	1.21(0.54,2.72)	1.04(0.38,2.85)
Secondary school	51(75)	17(25)	0.98(0.46,2.11)	0.76(0.25,2.29)
Diploma and above	79(89.8)	9(10.2)	2.87(1.20,6.86)	<b>2.40(1.54,10.71)*</b>
<b>Occupation</b>				
House wife	75(78.1)	21(21.9)	0.65(0.30-1.38)	0.81(0.31,2.16)
Farmer	10(62.5)	6(37.5)	<b>0.30(0.09,0.97)*</b>	0.28(0.07,1.23)
Student	22(75.9)	7(24.1)	0.57(0.20,1.16)	0.59(0.15,2.35)
Daily laborer	24(77.4)	7(22.6)	0.62(0.22,1.73)	1.27(0.37,4.38)
Government employer	86(84.3)	16(15.7)	0.67(0.44,2.15)	0.44(0.14,1.39)
Merchant	72(84.7)	13(15.3)	1.0	1.0
<b>Income</b>				
<500	57(73.1)	21(26.9)	1.0	1.0
500-1500	77(79.4)	20(20.6)	1.42(0.70,2.86)	1.47(0.63,3.45)
1500-2500	63(78.8)	17(21.2)	1.37(0.66,2.84)	0.99(0.38,2.59)
≥2500	92(88.5)	12(11.5)	2.83(1.29,6.18)	1.11(0.35,3.50)
<b>Bad odor around latrine</b>				
Yes	59(60.8)	38(39.2)	1.0	
No	230(87.8)	32(12.2)	<b>4.63(2.67,8.03)*</b>	0.78(0.25,2.42)
<b>Visible flies</b>				
Yes	73(61.9)	45(38.1)	1.0	1.0
No	216(89.6)	25(10.4)	<b>5.33(3.05,9.29) *</b>	<b>3.24(1.21,8.69)*</b>
<b>Faeces</b>				
Yes	46(53.5)	40(46.5)	0.142(0.80,0.251)	<b>0.23(0.09,0.62)**</b>
No	243(89)	30(11.0)	1.0	1.0
<b>Service year</b>				
<2years	86(87.8)	12(12.2)	<b>2.05(1.05,4.01)*</b>	<b>2.46(1.13,5.35)*</b>
≥2years	203(77.8)	58(22.2)	1.0	1.0
<b>Distance from house</b>				
<6meter	160(82.9)	33(17.1)	<b>1.391(1.02,2.35)*</b>	0.92(0.47,1.78)
≥6meter	129(77.7)	37(22.3)	1.0	1.0
<b>Frequency of cleaning</b>				
Daily	75(82.5)	16(17.5)	0.38(0.10,1.38)	0.278(0.70,1.11)
Twice per day	9(90.0)	1(10.0)	0.73(0.07,0.87)	0.37(0.31,4.36)
Per week	89(78.1)	25(21.9)	0.289(0.08,1.01)	<b>0.18(0.05,0.70)**</b>
Twice a week	37(92.5)	3(7.5)	1.0	1.0

\*P-value <0.05 \*\*P-value <0.05 Hosmer and Lemeshow model fitness test was 0.624 (i.e., P>0.05.

Therefore, the model is adequately fit for analysis)



## Discussion

The findings of this study revealed that among residents in Debark town, the utilization of latrines was 80.5% with 95% (76.3-84.4). Better educational levels, no visible nuisance flies in the latrine and no faeces on the latrine floor, short service years, and frequency of latrine cleaning were the five statistically associated factors for regular utilization of latrines.

This finding (80.5%) is higher than findings the studies conducted in Bahir Dar Zuria district (62%)(20) and rural communities of Gulomekada district in Tigray region (57.3%) (21). However, it is slightly lower than the studies conducted in Denbia district in central Gondar zone (86.8%) (13) and Hulet Eju Enessie district in west Gojam (86.7%) (22). This difference might be explained by a difference in the socio-cultural setting of the study area and the performance of health extension workers in each district. Moreover, the high latrine utilization might be because Debark town is a destination of both the University of Gondar team training program and the Semien park tourism center. Due to frequent visitors, the community may be exposed to better health education about sanitation along with relatively greater involvement of governmental interventions such as community-led sanitation and hygiene instruction and health-extension workers promoting the utilization of latrines.

Simple pit latrines are a temporary sanitation solution because of their limited capacity(12). The proportion of latrines surveyed with hand-washing facilities was 59.1%. This finding was much higher than the finding in Awabel district of east Gojjam where only 7% of latrines surveyed had hand washing facilities(23). This difference might be due to the proactive efforts of health extension workers to motivate the households to construct latrines with hand washing facilities.

Of the surveyed socio-demographic factors, educational status was a statistically significant predictor of latrine utilization. Household owners having diploma and above were 2.4 times more likely to utilize latrine than households with no education. This finding is in agreement with a study done in Gulomekada district, Tigray region(21). The possible reason for this agreement is that educated people can more easily be exposed to information and understand the advantages of latrine utilization.

Among environmental factors, the service year of the latrines was a significant predictor of latrine utilization. Households whose service year of their latrine was less than two years were more than two times more likely to utilize their latrine than older latrines. This was also seen in a similar study in the Hulet Eju Enessie district (22). This might be because newly constructed latrines are more often clean, free from odor and insects, and attract more users than older latrines.

Good environmental sanitation of any type of latrine encourages household members to utilize latrines properly. Frequent cleaning of latrines, reduction of fly populations in the latrine and a clean floor and squat hole are important factors that inspire family members to use latrines without interruption. In contrast, only weekly cleaning of latrines and latrine floors with faeces reduced the proper utilization of latrines by 82%, and 77%, respectively (Table4). Absence of flies is associated with 3.24 times greater utilization of latrines [AOR: 3.24, 95% CI (1.21, 8.69)]. This is comparable with the study conducted in Denbia district in North Gondar zone (13). This might be due to the fact that latrines should be cleaned daily to prevent disease transmission through contact with faeces and flies, and to reduce unsanitary conditions and odors which may deter people from using them (24).

Limitations of this study: Assessment of behavioral factors may not be sufficient to quantify latrine utilization quantitatively but it can be a first step toward considering a qualitative study to explore factors contributing to latrine use.

## Conclusion

Latrine utilization was found to be substantially high among residents in Debark town. Better educational levels, no visible nuisance flies in the latrine and no faeces in the latrine floor, short service years and frequency of latrine cleaning were the five statistically associated factors for proper utilization of latrines. To maintain consistent latrine utilization, health education through urban health extension programs should be strengthened. Moreover, promoting an open defecation-free environment in the town is likely to attract more visits from domestic and foreign tourists.

### List of abbreviations

AOR: Adjusted Odds Ratio; CI: Confidence Interval; COR: Crude Odds Ratio; SDG: Sustainable Development Goal;



**SPSS:** Statistical Package for Social Sciences; **UNICEF:** United Nations International Children's Emergency Fund; **WHO:** World Health Organization

#### **Declarations:**

#### **Ethical consideration**

The study was conducted after an ethical review was obtained from the Institutional Review Committee of Environmental and Occupational Health and Safety Department, University of Gondar. Official letter was submitted to Debarq town health office and Kebeles' administrative offices and then permission was secured from these two offices. There were no risks due to participation in this research project and the collected data were used only for this research purpose. Then verbal consent was obtained from each study participants. Participants were ensured the confidentiality of the information they gave. No identifiers were included in the data collection tools.

#### **Consent for publication**

This manuscript does not contain any personal image data.

#### **Availability of data and material**

Data will be made available upon requesting the primary author.

#### **Competing Interest**

The authors declare that there is no both financial and non-financial competing interest.

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#### **Authors' Contributions**

Authors engaged for inception, design, data collection and analysis of the data in this study and manuscript preparation. All authors read and approved the final manuscript.

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