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# Latrine Utilization and its Associated Factors in Urban Slums Dwellers of Gondar City, Northwest Ethiopia: A Community-Based Cross-Sectional Study

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## ABSTRACT

**BACKGROUND:** Sanitation facilities are critical for interrupting the transmission of feco-oral disease through proper use, not simply their physical presence. Latrine utilization is the actual behavior in a practice of regularly using existing latrines for the safe disposal of excreta. In slum regions of developing nations, such as Ethiopia, poor latrine use is a prevalent concern. As a result, the purpose of this study was to examine the state of latrine utilization and its determinant factors in the urban slums of Gondar City, Northwest Ethiopia.

**METHODS:** A cross-sectional survey was done in slum regions of Gondar City from March 1 to April 30, 2021, with a total of 422 systematically chosen households. A structured pre-tested questionnaire and on-the-spot observational checklists were used to collect the data from each household.

**RESULT:** Latrine utilization was observed among 31.5% of households. Latrine utilization was also significantly associated with the age of the latrine (age  $\leq 10$  years) (AOR: 2.31; 95% CI (1.15, 4.63)), cleanliness of the latrine (AOR: 3.70; 95% CI (1.16, 11.78)), pit being lined (AOR: 6.33; 95% CI (2.09, 19.15)), depth of latrine ( $\leq 3$ m) (AOR: 0.43; 95% CI (0.24, 0.77)), and cleaning materials for handwashing (AOR: 0.33; 95% CI (0.15, 0.75)).

**CONCLUSION:** Based on the present finding, most households didn't have proper latrine utilization practices. The age of the latrine, cleanliness of the latrine, pit being lined, depth of the pit, and cleaning materials for handwashing were associated factors of latrine utilization. As a result, sanitation interventions such as health education about improving the cleanliness and sanitary condition of existing latrine facilities and constructing lined and deep new latrines as the goal's standard should be implemented.

**KEYWORDS:** Latrine utilization, associated factors, slum areas, Gondar town, Ethiopia

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## Introduction

The United Nations has considered good sanitation to be a human right.<sup>1</sup> But poor sanitation and hygiene remain a challenge in slum areas around the world.<sup>2-4</sup> The sustainable development goal (SDG) 6 has targeted to achieve universal access to proper sanitation by 2030.<sup>4</sup> Diarrhea, cholera, typhoid, amoebic dysentery, and Cryptosporidiosis are all associated with considerable morbidity when sanitation is lacking.<sup>5-7</sup> It was noted that having a toilet and properly using it is a preventive factor against infectious diseases.<sup>8,9</sup> More than 2.5 billion individuals worldwide still lack access to adequate sanitation, posing serious health hazards to the urban poor living in slums, with more than half of these individuals residing in low and middle-income nations.<sup>10-13</sup> Around 1.1 billion individuals worldwide perform open defecation, putting themselves and their communities in danger.<sup>11</sup> Nowadays, more than 700 million people live in cities throughout the world without basic sanitation, with 80

million resorting to open defecation. Inadequate water, sanitation, and hygiene are reported to be responsible for 4.0% of all fatalities and 5.7% of the worldwide disease burden.<sup>5,14</sup> In Africa, access to adequate sanitary services and facilities is a major problem.<sup>15,16</sup> Due to the increasing population, the urban inhabitants in Sub-Saharan Africa lacking adequate sanitary services had exceeded 215 million by 2015.<sup>16</sup> This region, including Ethiopia, covers 81% of the people practicing open defecation.<sup>5</sup> Diarrhea is a primary cause of mortality in Sub-Saharan Africa, owing to a lack of proper sanitation facilities and services, and individuals who defecate in the open fields are the most vulnerable to infectious diseases.<sup>17</sup> In developing nations, particularly Ethiopia, latrine use remains low.<sup>16</sup> According to the 2019 Ethiopia Mini Demographic and Health Survey assessment of 2664 urban and 5999 rural households, more than 1 in 4 households (27%) in Ethiopia have no toilet facility (35% in rural areas and 10% in urban areas).<sup>18</sup>



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Although Ethiopia developed the National Sanitation Strategy in 2005 to achieve 100% latrine coverage to enhance sanitation and hygiene, it was stated that the coverage had improved only slightly (less than 50%) in 2015.<sup>16,19,20</sup> At the national level, the low sanitation coverage also resulted in the significant magnitude of the diarrhea illnesses.<sup>16</sup> With the delivery of adequate water, sanitation, and hygiene, ultimate child mortality may be decreased by 55%.<sup>21</sup> Provision of proper sanitation facilities in Ethiopia remains among the least in Sub-Saharan Africa. The metropolitan slums are distinguished by large population size and occupancy, as well as significant sanitary problems.<sup>10,22</sup> In rapidly growing urban slums, where poverty-stricken people live, latrine availability is very low and the type of sanitation is also sub-standard. Latrine utilization in these slum areas can be adversely affected by a scarcity of available land for the building of new latrines, inaccessibility to latrine emptying vehicles, and lack of water facilities.<sup>23-25</sup> In Ethiopia, a rising number of slum inhabitants and the inadequacy of sanitation drove millions to exercise open defecation, causing the loss of lives.<sup>25-28</sup> Studies reported that latrine utilization is less than the coverage or availability of latrines.<sup>6,29,30</sup> Open defecation remains common in houses with latrines. Due to gaps in latrine coverage and prevalent open defecation, people will continue to be exposed to human excreta, limiting the capability for health improvements.<sup>29</sup>

Nearly half of the population of Ethiopia don't utilize the existing latrines properly.<sup>31</sup> The community from low-income countries such as Ethiopia faces double burden concerns, which are first adoption of latrines and then sustainable and proper use of the existing latrines. If there is a low latrine adoption or unsustainable access, the community may resort to practicing open defecation.<sup>32,33</sup> Previous studies found that age of families, education status, household family size, presence of school-age children, family monthly income, duration of owning latrine by the household (age of latrine), type of latrine, functional latrine, frequency of latrine cleaning, and latrine constructed with self-initiation were some of the determinants of latrine utilization.<sup>2,11,34-36</sup> In addition, studies like this targeting to identify the major contributing factors for improper latrine utilization should be done particularly among urban slum dwellers.

Various reports revealed that the problem of poor sanitation may arise from inadequate access to a latrine or lack of proper utilization of the existing latrine.<sup>34,37,38</sup> Despite years of effort to increase the availability of latrine facilities, finding a village free of open defecation remains difficult. The report highlights a significant disparity in the availability and utilization of latrine facilities.<sup>30</sup> In Ethiopia, recently numerous studies have been undertaken on establishing the latrine coverage levels<sup>13,30</sup> but little is known about the utilization of the existing latrine, particularly in slum areas. In this study area, the proportion of household latrine utilization and its determinant factors have never been reported. Understanding the state of latrine use in this slum region would aid in

the accomplishment of the SDGs, notably Goal 6, which encompasses the goal of attaining universal access to basic sanitation,<sup>30</sup> by directing the development of specific intervention initiatives to enhance family latrine usage. It will also fill the gap of information and be used to take proper intervention measures to improve the sanitary condition and subsequently improve community health in the slum areas. Thus, the purpose of this study was to examine the state of latrine utilization and its determinant factors in the urban slums of Gondar City, Northwest Ethiopia.

## Method

### *Study design, study area, and period*

Community-based cross-sectional research was carried out in slum regions of Gondar City from March 01, 2021 to April 30, 2021. Gondar City is located about 750 km northwest of the national capital, Addis Ababa, and about 180 km from Bahir Dar City, the regional capital of the Amhara. This study was conducted among households that are found in kebeles selected as slum areas, namely Lideta (17 088 households), Keba (9689 households), Fasile des (10 729 households), and Gebral (8415 households), for a total of 45 921 households. These kebeles were considered slum areas because they fulfilled the criteria set for this study to consider whether it is a slum or not (see operational definition part 2.6). Latrine coverage in the areas is 90% (Gondar City Administration Health Office, unpublished document data, 2020).

### *Source and study population*

The source population included all households found in slum regions of Gondar City that have a private latrine facility, whereas the study population consisted of all systematically selected households.

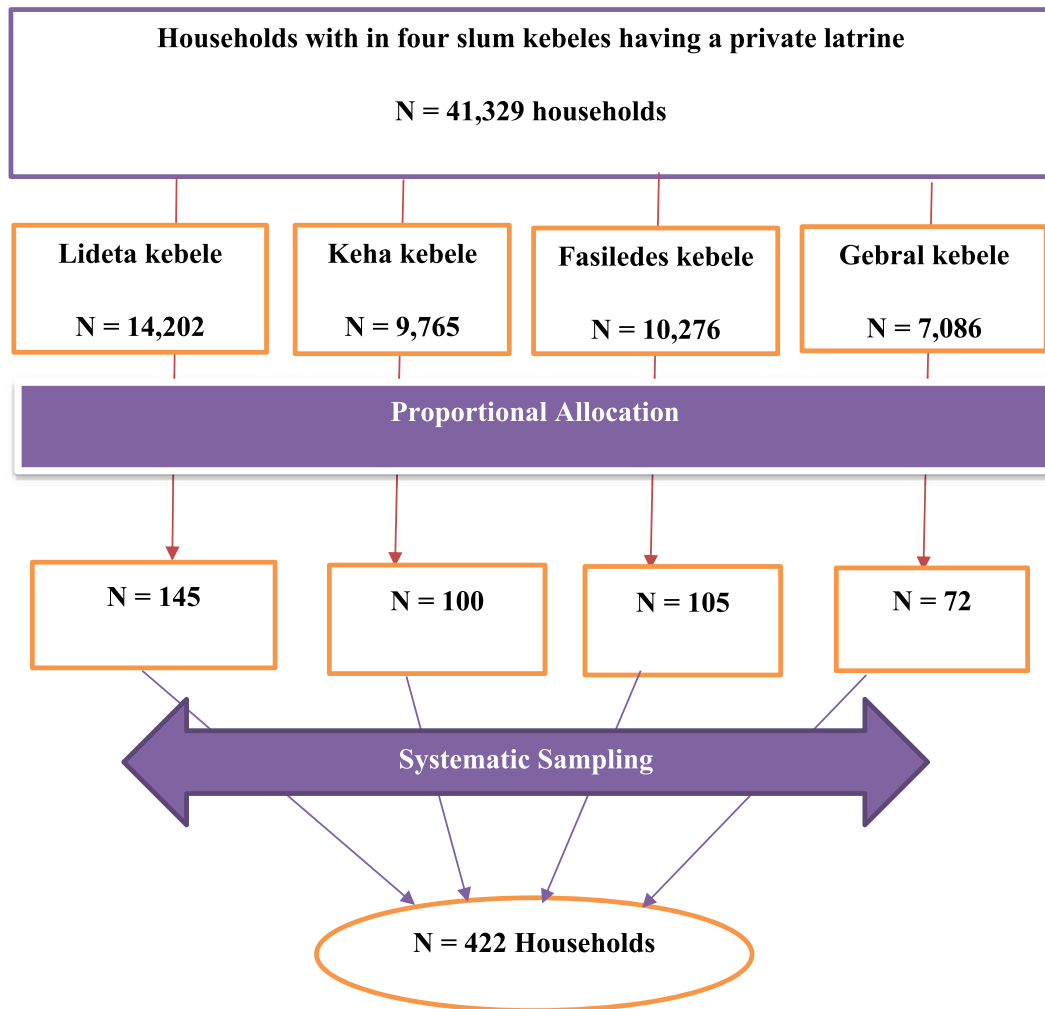
### *Inclusion and exclusion criteria*

All households that are found within the slum areas of Gondar City and owned private latrines were included, and family members 18 and above years old were interviewed for the study.

The households with respondents who were not available during data collection and/or who refused to participate in the study were excluded. The family members who were less than 18 years old were excluded.

### *Sample size calculation and sampling procedures*

The total sample size was calculated using the single population proportion formula while keeping the following assumptions in mind:  $P = 50\%$  (0.5) (since there have been no existing studies on a comparable population), with a margin of error ( $d$ ) 0.05 and confidence level of 95%. With 10% non-response, the final sample size became 422 households. Then, the proportional allocation of households per selected kebele (Keba, Gebral, Fasiledes, and Lideta) followed by systematic sampling



**Figure 1.** A sampling process to determine latrine utilization and its determinant factors in slum regions of Gondar City, Northwest Ethiopia, 2021.

with a constant interval ( $k = N/n$ ) for each kebele was employed to select the households (Figure 1). The sampling frame for each study population was prepared by taking a list of the name of the head of the household for each kebele from the Gondar City administration Health office and the respective  $k$  value were determined as follow: Lideta (98), Keha (97), Fasiledes (98), and Gebral (98). Then, based on their accessibility, the family head (mother/father) or a family member who was greater than or equal to 18 years old was interviewed to assess the latrine use practices and associated factors.

#### Study variables

The dependent variable is latrine utilization (yes/no), which is a binary outcome denoted as “yes” for latrine utilized or “no” for latrine not utilized. Independent variables included socio-demographic factors, latrine characteristics, and behavioral factors. Sociodemographic variables such as head of household age, sex, marital status, religion, educational status, occupational status, monthly income, family size, and presence of primary or secondary school students in the household were measured by face-to-face interviews.

Latrine characteristics such as type of latrine, lined pit, sloppy floor surface, latrine slab sealed with mud/cement, presence of latrine walls, roof, and door, ventilated & lighting, presence of latrine squat hole cover, accessibility of latrine for safe fecal sludge management, location of latrine, and feces observed around the hole/roof of latrine were measured by on-the-spot observation.

The latrine variable that was measured using self-reported data was the age of the latrine. The area of the inside space of the latrine room was computed by measuring the width and length of the inside space of the latrine room in meters, and the distance of the latrine from the house was also measured in meters. The depth of the latrine was measured by dipping a metal rod in the latrine, then the length of the metal rod was measured by meters.

Behavioral variables such as the reason for constructing the latrine, frequency of latrine cleaning, and reason for not utilizing the latrines were measured using self-reports of the study participants, while variables such as cleanness of the latrine, presence of handwashing facilities in/near latrines, and type of cleaning material available for handwashing were measured through on-the-spot observation.

### Operational definition

**Slum area:** Household or group of individuals in an urban area that lacks the following: (a) durable housing of a permanent nature that protects against extreme climate conditions; (b) sufficient living space, which means not more than 3 people sharing the same room; (c) easy access to safe water in sufficient amounts at an affordable price; (d) access to adequate sanitation in the form of a private or public toilet shared by a reasonable number of people; and (e) security of tenure that prevents forced evictions.<sup>39</sup>

**Latrine utilization:** The use of the latrine by all the family members (above 5 years) in the households, that own private latrines.<sup>40</sup>

**Proper latrine utilization:** Households that have functional latrines, children's feces being safely disposed of, no visible feces in the compound, and show at least one sign of use (the foot-path to the toilet is not grass-covered, the latrine is stinky, there is anal cleansing material, there is fresh feces in the sitting hole, and there is a moist slab).<sup>34,37,40,41</sup>

**Improper latrine utilization:** A household with a latrine did not fulfill the criteria of proper latrine utilization.<sup>40</sup>

**Functional latrine:** A latrine that is physically benign to use; the hole isn't full of trash; it provides privacy and shelter; it has adequate ventilation and lighting; and it provides services at the time of data collection even if the latrine requires maintenance.<sup>37,42</sup>

**Dirty latrine:** A latrine that has visible feces and/or urine on the floor around the latrine and a latrine that was not brushed or cleaned at the time of data collection.

**Clean latrine:** A latrine with a pit that is not full, no fecal matter observed around the pit latrine, the area well brushed or cleaned and does not smell bad at the time of data collection.<sup>34,43</sup>

**Safe fecal sludge management:** A latrine that has an accessible vacuum tanker for extracting pit waste, is physically accessible to the emptying service.<sup>42</sup>

### Data collection tools and data quality control

Data were collected using an interviewer-administered structured questionnaire that included both open-ended and closed-ended questions, which were developed through a review of the literature.<sup>17,34,35,37,41,43-45</sup> The questionnaire contains questions related to socio-demographic factors, latrine characteristics, and behavioral factors associated with latrine utilization. Moreover, an on-the-spot observation checklist was used to collect some of the latrine characteristics and behavioral factors.

The questionnaire was prepared initially in English and then transformed into the native language (Amharic) and back-translated to English to verify the accuracy of the data. To verify the consistency and clarity of the questions, a pre-test of the questionnaire was employed among 36 slum households (5% of the sample size, 422) located in the Arada sub-city (not

included in the study) before the actual data collection. One day of training was given to the 4 data collectors and a supervisor about the purpose of the study, the content of the questionnaires and checklists, how the questionnaires and checklists should be completed, data collection procedures, and ethical guidelines they should follow. All the data collectors and a supervisor were environmental health professionals. During data collection, each questionnaire was verified for completeness and logical coherence by data collectors and supervisors, and the principal investigator double-checked each questionnaire at the finish of each day in the field.

### Data processing and statistical analysis

The Statistical Package for the Social Sciences (SPSS) software version 20 was used to analyze the data. To describe the study subjects, descriptive statistics were given in the form of tables, figures, and texts. The variables for the multivariable logistic regression analysis were chosen using bivariate logistic regression analysis. After that, variables with a  $P$ -value  $\leq .25$  in the bivariate analysis were included in multivariable logistic regression to find determinant factors to latrine use. Then, factors having a  $P$ -value of less than .05 were deemed statistically significant associated variables.

## Results

### Socio-demographic characteristics

The research comprised a total of 422 households with latrines, with a 100% response rate. The mean  $\pm$  SD age of the participant was  $39.0 \pm 17.0$  years and the majority 288 (68.2%) of the participants were females. Most of the study respondents 258 (61.1%) were married and about 140 (33.2%) attended primary school. The majority of respondents 146 (34.6%) were government employees followed by merchants 118 (28.0%), and 141 (33.4%) respondents had a monthly income of less than 1500 Ethiopian Birr. Two hundred thirty-three (55.2%) of the respondents had children in primary or secondary school (Table 1).

### Latrine characteristics

In the study area, most of the latrines 171 (40.5%) were ventilated improved pit latrines followed by pit latrines with a slab which accounts for 127 (30.1%) households. About 320 (75.8%) latrines had a pit lined with cement. The mean ( $\pm$  SD) age of latrines was  $7.396 \pm 4.786$  years. The mean depth of the pit was  $4.23 \pm 1.63$  meters. Two hundred ninety-eight (70.6%) latrines had slabs sealed with mud/cement. Most of the latrines 397 (94.1%), 265 (62.8%), and 381 (90.3%) had a wall, roof, and door, respectively. Nearly four-fifth of the latrines (78.4%) were located in the compound and separated from houses, and about 404 (95.7%) latrines were located near (within a 10 m distance) the household (Table 2).

**Table 1.** Socio-demographic factors of study participants in slum regions of Gondar City, March 01 to April 30, 2021 (N=422).

VARIABLE	FREQUENCY	PERCENT
<b>Age</b>		
<30	87	20.6
30-44	180	42.7
>44	155	36.7
<b>Sex</b>		
Male	134	31.8
Female	288	68.2
<b>Marital status</b>		
Single	70	16.6
Married	258	61.1
Divorced	53	12.6
Widowed	41	9.7
<b>Educational status</b>		
Never been to school	78	18.5
Primary school	140	33.2
Secondary school	71	16.8
Diploma and above	133	31.5
<b>Occupational status</b>		
Government employee	146	34.6
Merchant	118	28.0
Housewife	78	18.5
Farmer	42	9.9
Daily laborer	38	9.0
<b>Monthly income</b>		
<1500 ETB	141	33.4
1500-3000 ETB	89	21.1
>3000 ETB	192	45.5
<b>Family size</b>		
≤5	240	56.9
>5	182	43.1
<b>Presence of primary or secondary school students in the household</b>		
Yes	233	55.2
No	189	44.8

Abbreviations: ETB, Ethiopian Birr.

<sup>1</sup>ETB=0.025 US dollar as on 05 March 2021.

### *Behavioral factors*

The most common reason reported by the respondents, 146 (34.6%), was that they had constructed their latrines due to the enforcement by local governing administrators (other than health personnel) to construct a latrine. Most latrines 333 (78.9%) had clean hygienic conditions. In most of the latrines, 121 (82.2%) had water and soap for cleaning their hands after using the latrine. Nearly one-third of respondents, 88 (30.4%) and 86 (29.8%) declared the bad smell and wastefulness of the latrines as the reason for didn't use the latrine, respectively (Table 3).

### *Latrine utilization*

The magnitude of latrine utilization in this study was found to be 31.5% for households with proper latrine utilization [95% CI (27.3%, 36.0%)], and the rest of the households have improper utilization of latrines.

### *Determinants of latrine utilization*

Based on the bivariable logistic analysis, educational status, family monthly income, age of latrine, cleanness of latrine, area of the inside space of latrine room, pit being lined, depth of the pit, cleaning materials for handwashing, and accessibility of latrine for safe fecal sludge management were eligible for multivariable logistic regression. From the multivariable analysis, the age of the latrine, cleanness, pit being lined, depth of latrine, and type of cleaning used for handwashing were significantly associated with proper latrine use in slum areas of Gondar City.

Individuals with newer latrines aged less than or equal to 10 years were 2.31 (AOR: 2.31, 95% CI (1.15, 4.63)) times more likely to use them properly. Individuals with cleaner latrines were 3.70 (AOR: 3.70, 95% CI (1.16, 11.78)) times more likely to utilize latrines properly than those who owned dirt latrines. Households with lined pit latrines are 6.33 (AOR: 6.33, 95% CI (2.09, 19.15)) times more likely than those without lined pit latrines to use the latrine properly. This study found that households with shallower latrines (≤3m) were 57% (AOR: 0.43, 95% CI (0.24, 0.77)) less likely to use them properly than those with deeper latrines. The likelihood of proper latrine utilization was 67% (AOR: 0.33, 95% CI (0.15, 0.75)) times lower among households that use water only for handwashing than those which use soap (Table 4).

### **Discussion**

The findings of the present study revealed a lower proportion (31.5%) of the households had utilized latrines. This is also trailing behind the fulfillment of Sustainable Development Goal 6, which aims to guarantee universal access to water and sanitation by 2030. This could be owing to a cultural attitude toward open defecation, in which persons who practice open

**Table 2.** Latrine characteristics of each study household in slum regions of Gondar City March 01 to April 30, 2021 (N=422).

VARIABLE	FREQUENCY	%
Type of household latrine		
Ventilated improved latrine	171	40.5
Pit latrine with slab	127	30.1
Pit latrine without a slab	124	29.4
Lined pit		
Yes	320	75.8
No	102	24.2
Sloppy floor surface		
Yes	251	59.5
No	171	40.5
Latrine slab sealed with mud/cement		
Yes	298	70.6
No	124	29.4
Latrine has wall		
Yes	397	94.1
No	25	5.9
Latrine has roof		
Yes	265	62.8
No	157	37.2
Latrine has door		
Yes	381	90.3
No	41	9.7
Ventilated and lighting		
Yes	379	89.8
No	43	10.2
The latrine squat hole has a cover		
Yes	103	24.4
No	319	75.6
Age of latrine		
≤10y	336	79.6
>10y	86	20.4
Depth of pit		
0-3m	165	39.1
>3m	257	60.9

(Continued)

**Table 2.** (Continued)

VARIABLE	FREQUENCY	%
Inside space of latrine room		
Narrow (area <1 m <sup>2</sup> )	129	30.6
Wide (area ≥ 1-m <sup>2</sup> )	293	69.4
Feces observed around the hole/roof of the latrine		
Yes	151	35.8
No	271	64.2
Accessibility of latrine for safe fecal sludge management		
Not accessible	268	63.5
Accessible	154	36.5
Location of latrine		
Attached to the house	91	21.6
Distant from the house	331	78.4
Distance of latrine from the house		
<10m	404	95.7
10-15m	10	2.4
>15m	8	1.9

defecation are not stigmatized, or it could be because of the poor quality and smell of the existing toilet.<sup>33,46</sup> This means that local health extension workers and other relevant entities must pay close attention to and monitor the use of existing latrines. This finding was also consistent with other studies conducted in Bahir Dar Zuria, Ethiopia (38.0).<sup>13</sup> This consistency might be because of the socio-cultural similarities between the study populations. However, the result of the study was lower as compared to the study done in slum communities in Addis Ababa (97.6%),<sup>47</sup> the East Gojjam Zone, Ethiopia (86.7%),<sup>48</sup> in Southwest Ethiopia (98.9%)<sup>44</sup> and among a rural village of Eastern Nepal (89.9%).<sup>11</sup> The reason for variations might also be linked to the difference in the methodology used to measure latrine utilization. The present study employed indicators to measure utilization such as “functional latrines, children’s feces being safely disposed of, no visible feces in the compound and show at least one sign of use (the footpath to the toilet is not grass-covered, the latrine is stinky, presence of anal cleansing material, presence of fresh feces in the sitting hole, and having a moisten slab),” whereas other studies define utilization as the facility providing service at the time of data collection. The other possible reason might be related to the difference in demographic characteristics and socio-economic status of the study population in the areas mentioned above.

**Table 3.** Behavioral characteristics of each study household in slum regions of Gondar City March 01 to April 30, 2021 (N=422).

VARIABLE	FREQUENCY	%
Reason for constructing the latrine		
Ordered by local governing administrators (other than health personnel)	146	34.6
Recommended by health professionals	112	26.5
For the protection and privacy during defecation	107	25.4
For disease prevention	57	13.5
Frequency of latrine cleaning		
Daily	27	6.4
Twice a week	102	24.2
Weekly	208	49.3
Rarely	85	20.1
Cleanness of the latrine		
Clean	333	78.9
Dirty	89	21.1
Presence of handwashing facilities		
Yes	167	39.6
No	255	60.4
Cleaning material for handwashing		
Only water	75	17.8
Soap	121	82.2
Reason for not utilized latrines (N=289) <sup>a</sup>		
Latrine has a bad smell	88	30.4
Latrine is full	86	29.8
Convenient of open field	68	23.5
Insect nuisance	47	16.3

<sup>a</sup>Percentages are computed from respondents who didn't utilize latrine (N=289).

The age of the latrine, cleanness of the latrine, pit being lined, depth of the pit, and cleaning materials used for handwashing were significantly associated with the utilization of latrines among urban residents in slum regions.

Proper latrine utilization was significantly associated with the age of the latrine [2.31, 95% CI= (1.15, 4.63)]. This might be due to the natural fadeout of the latrines when it gets older and becomes unpleasant to use. This finding was inconsistent with the latrine utilization studies conducted among the rural community of Chench District,<sup>20</sup> in the Tigray Region,<sup>36</sup> Laelai Maichew District, Tigray,<sup>49</sup> and Southwest Ethiopia,<sup>44</sup> Ethiopia. This may be due to older latrines losing their structural units and needing maintenance or due to their filling of waste.<sup>42,44</sup> This implies continuous maintenance and emptying of old latrines are needed to increase the latrine use in the study area.

Cleanliness of the latrine was also significantly associated with latrine utilization [3.70, 95% CI (1.16, 11.78)]. This finding is consistent with studies conducted in North West Ethiopia AOR=4.1(1.7, 10.0),<sup>35</sup> in Laelai Maichew Woreda of Tigray, northwest Ethiopia AOR=11.91 (4.65, 30.512)<sup>5</sup> and rural areas of Denbia district, Northwest Ethiopia.<sup>37</sup> The explanation for this might be ascribed to the fact that the behavior of individuals will be motivated by an attractive and clean environment of the latrine. As a result, continuous cleaning of existing latrines is necessary to make them more appealing and satisfying to users, which increases latrine utilization.

Latrine utilization was associated with households with latrines being lined [6.33, 95% CI (2.09, 19.15)]. This might be because latrines that are lined have a greater chance to remain structurally safe to use and remain attractive and functional to be for utilization.



**Table 4.** A multivariable logistic regression of selected determinants of utilization of latrines in slum regions of Gondar City, March to April, 2021.

VARIABLES	LATRINE UTILIZATION		COR (95% CI)	AOR (95% CI)
	PROPER	IMPROPER		
<b>Educational status</b>				
Never been to school	36 (8.5%)	42 (10.0%)	2.07 (1.16,3.69)	1.59 (0.62,4.04)
Primary school	33 (7.8%)	107 (25.4%)	0.74 (0.43,1.28)	0.49 (0.23,1.07)
Secondary school	25 (5.9%)	46 (10.9%)	1.31 (0.71,2.42)	0.71 (0.30,1.65)
Diploma and above	39 (9.2%)	94 (22.3%)	1	1
<b>Monthly income</b>				
<1500 ETB	46 (10.9%)	95 (22.5%)	1.21 (0.75,1.93)	1.16 (0.58,2.31)
1500-3000 ETB	32 (7.6%)	57 (13.5%)	1.40 (0.82,2.39)	1.66 (0.81,3.38)
>3000 ETB	55 (13.0%)	137 (32.5%)	1	1
<b>Age of latrine</b>				
≤10y	115 (27.2%)	221 (52.4%)	1.97 (1.12,3.46)	2.31 (1.15,4.63)*
>10y	18 (4.3%)	68 (16.1%)	1	1
<b>Cleanness of latrine</b>				
Clean	128 (30.3%)	205 (48.6%)	10.49 (4.14, 26.56)	3.70 (1.16, 11.78)*
Dirty	5 (1.2%)	84 (19.9%)	1	1
<b>Inside space of latrine room</b>				
Narrow (area <1 m <sup>2</sup> )	29 (6.9%)	100 (23.7%)	0.53 (0.33,0.85)	0.71 (0.37,1.37)
Wide (area ≥ 1-m <sup>2</sup> )	104 (24.6%)	189 (44.8%)	1	1
<b>Lined pit</b>				
Yes	127 (30.1%)	193 (45.7%)	10.53 (4.48, 24.75)	6.33 (2.09, 19.15)***
No	6 (1.4%)	96 (22.8%)	1	1
<b>Depth of pit</b>				
0-3m	40 (9.5%)	125 (29.6%)	0.56 (0.36,0.87)	0.43 (0.24,0.77)**
>3m	93 (22.0%)	164 (38.9%)	1	1
<b>Cleaning materials for handwashing</b>				
Only water	12 (2.8%)	63 (14.9%)	0.36 (0.19,0.69)	0.33 (0.15,0.75)**
Soap/ash	121 (28.7%)	226 (53.6%)	1	1
<b>Accessibility of latrine for safe fecal sludge management</b>				
Accessible	57 (13.5%)	97 (23.0%)	1	1
Not accessible	76 (18.0%)	192 (45.5%)	1.48 (0.97, 2.26)	1.42 (0.85,2.12)

Abbreviations: ETB, Ethiopian Birr.

<sup>1</sup>ETB=0.025 US dollar as on 05 March 2021, Hosmer and Lemeshow test=0.477 showed that the model fitted well.

\*Statistically significant at  $P < .05$ . \*\*Statistically significant at  $P < .01$ . \*\*\*Statistically significant at  $P < .001$ .

In this study, the depth of latrine was significantly associated with latrine utilization [0.43, 95% CI (0.24, 0.77)]. The finding was also consistent with the study done in Eastern

Nepal.<sup>11</sup> The reason might be that fewer-depth latrines may be full of waste in a short period, resulting in a decrease in the cleanliness and attractive nature of latrines and making them

unpleasant for utilization. This implies constructing new latrines when the existing one is full or emptying the latrines regularly and making arrangements to make the latrines accessible for emptying vehicles is important for improving proper utilization of latrines in slum areas.

In this study, cleaning material for handwashing was a significant predictor for latrine utilization [0.33, 95% CI (0.15, 0.75)]. This is higher than the findings from Southwest Ethiopia (11.3%)<sup>44</sup> and Eastern Ethiopia (5.1%)<sup>50</sup> and Bahir Dar Zuria (6.2%).<sup>13</sup> This might be because the variation in demographic characteristics and residential areas means that the participants in this study have access to purchasing handwashing cleaning material (specifically soap). This finding was roughly in line with a study conducted in Southwest Ethiopia<sup>44</sup> and with the study conducted in Tigray, northwest Ethiopia.<sup>5</sup>

## Conclusion

This study concluded that most households lack proper latrine utilization. The age of the latrine, cleanness of the latrine, being lined the pit, depth of the pit, and cleaning materials used for handwashing were significantly associated with proper utilization of latrines among urban residents in slum areas. The finding showed that the proper utilization of latrines was also very low and far from the SDG goal which is targeted to be achieved in 2030 to address safe, sustainable, and functional sanitation facilities for all. Therefore, sanitation workers and other stakeholders should make significant efforts to improve the hygienic condition of existing latrines and to increase the construction of lined and deep latrines that meet the standards. Health education targeting the improvement of the cleanliness of the latrine and materials used for hand washing is also important. Qualitative studies that examine the behavioral, cultural, and psychosocial determinants of latrine use are recommended to implement wholesome interventions to increase latrine utilization in the study area.

## Limitations of the study

One of the major limitations of this study was related to the nature of the cross-sectional study design, which may be exposed to bias due to self-reporting and may result in social desirability bias. It is also difficult to establish a causal relationship between latrine utilization and independent factors. In the absence of follow-up observational data, this work may greatly underestimate or overestimate the magnitude of latrine utilization and other independent variables. Although the latrine utilization during the study period was determined by using on-the-spot observation, it was difficult to determine whether there was consistent use of the latrine using a cross-sectional study.

Also, our study was conducted during March and April, a period that is in a relatively dry season in the study area, and further studies that considered latrine utilization during seasonal variation are recommended.

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## Availability of Data and Materials

Data will be made available upon request to the corresponding author.

## Ethics Approval and Consent to Participate

Ethical approval of the research was obtained from the institutional review board of the University of Gondar. Permission letters were taken from each Kebele administration to have a cooperative environment during data collection. The study participants were provided with full information regarding the purpose and nature of the research then written consent was obtained from each participant. Participation in the study was voluntary, and participants were informed about their right not to participate in the study or withdraw at any time. Moreover, the confidentiality of the information was assured by using an anonymous questionnaire.

## Consent for Publication

Not applicable.

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