Latrine Utilization and Associated Factors Among Rural Households in Southwest Ethiopia: Risk, Attitude, Norms, Ability, and Self-Regulation Behavioral Model

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ABSTRACT

BACKGROUND: Consistent latrine utilization remains a challenge in most rural areas of poor and middle-income countries including Ethiopia. Therefore; the objective of this study was to determine the magnitude of latrine utilization and its associated factors among rural households in open defecation-free declared (ODF) and non-ODF kebeles, Southwest Ethiopia, 2022.

METHODS: A community-based comparative cross sectional study design was employed from May 16 to June 14, 2022 among 682 (341 ODF and 341 non-ODF) rural households which were selected by multistage systematic random sampling technique. Data were collected by face to face using a pretested structured questionnaire and an observational checklist through Open data kit. SPSS version 26 was used to analysis the data and separate logistic regression models; ODF and non-ODF were run to identify the associated factors. *P*-values <.05 with 95% CI were set as statistical significant.

RESULT: The overall magnitude of latrine utilization in the study area was 67.1% (95% CI: 63.71, 70.49). Latrine utilization was higher in ODF declared households (71.6%) than in non-ODF households (62.5%). In ODF; Graduated as model households [AOR = 5.1, 95% CI: 2.14, 12.84], visited by health extension works (HEWs) [AOR = 3.5, 95% CI: 1.67, 7.25], and latrine with privacy [AOR = 3.0, 95% CI: 1.37, 6.65] and also in non-ODF; households visited by HEWs [AOR = 2.9, 95% CI: 1.34, 6.06], latrine with privacy [AOR = 2.5, 95% CI: 1.24, 5.07], positive attitude [AOR = 3.2, 95% CI: 1.52, 6.59], and descriptive norm [AOR = 2.7, 95% CI: 1.27, 5.53] were significantly associated with latrine utilization.

CONCLUSION: This study found that rural households declared as ODF utilize their latrine higher than non-ODF. Constructing latrine without privacy, lack of follow up, Attitude and societal norms were factors that limited the utilization of latrine and the sustainability of ODF. Therefore, health extension follow-up, latrine construction with privacy, normative and persuasive behavior change approach should be encouraged.

KEYWORDS: Latrine utilization, open defecation free, RANAS model, Ethiopia

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Introduction

Latrine utilization is defined as the use of the existing latrines by all family members on a regular basis for safe excreta disposal. If all households in a community have latrines with superstructure and cover, hand washing facilities with water and soap, or ash, and evidence that no open defecation is practiced in the community, the community is declared as Open defecation free (ODF).[1,2]

United Nations (UN) call to action to solve sanitation related problems with Sustainable Development Goal (SDG) which encompasses an ambitious goal to end open defecation worldwide by 2030.[3] Why because unimproved sanitation together with unsafely disposed of human excreta causes major public health problems globally which were even worse in South Asia and Sub Saharan Africa (SSA). Public health is at stake because open defecation enables transmission of infectious disease via fecal-oral route.[4,5]

As a result of unimproved sanitation, an estimated 1.8 billion people globally consume water contaminated with feces, leading to an estimated 361 000 sanitation-related deaths among children under the age of 5.[1,6] However of this burden, according to World Health Organization (WHO) and United Nations Children's Fund (UNICEF) Joint Monitoring Program (JMP) report in 2020, globally nearly 616 million people use unimproved latrine facilities and 494 million people practiced open defecation, of which 90% of these practices occur in the rural area. Oceania (15%), South Asia (14%), and Sub-Saharan Africa (18%) have the highest proportions of this practice, lagging far behind the rest of the world.[7] Situational assessment for fecal sludge management in major

cities of Pakistan also showed that national level sanitation program was widely applied but were limited to reduce open defecation.[8]

South Asia showed 14% increments in the utilization of improved latrine from 2015 to 2020, whereas Sub-Saharan Africa (SSA) showed slower progress, reaching 21% from 19% in the same period. Therefore, to be able to achieve the SDG 2030 the target of ending the practice of open defecation (OD) and to decrease disease burden in SSA; at least 4 times the current progress (8%) need to stop practicing OD every year between 2020 and 2030.[9]

Ethiopia in the JMP sanitation ladder is globally the lowest, with only 22% of households (42% in urban and 10% rural) fulfilling the requirement for improved latrine facility and more than half (56%) of households in rural setting use unimproved latrine facilities. It also identified that, 1 in 4 households (27%) in Ethiopia with access to latrines defecated in the open, and some open defecation free (ODF) declared kebeles (small administrative units) were slipped back to Open defecation (15.9%).[10,11]

This showed that despite the effort put by governments and different NGOs by adopting Community-led total sanitation (CLTS) and other sanitation and hygiene interventions, the change in latrine utilization (50.2%) was not as required by the national target (100%) and was off-track to achieve SDG on sanitation program particularly target 6.2 to end open defecation.[12,13] Health and Health-related Indicator report of Ethiopia for example, indicated that childhood diarrhea is still the top 5 leading cause of death-causing 23% (40 000) of deaths in children under the age of 5, by which evidence in Ethiopia indicate that this could be decreased by 45% to 60% if latrine was properly utilized.[14]

In the study area, latrine coverage is about 96% and about 44% kebeles were declared as ODF but according to its report in the district; childhood diarrhea remains one of the top leading causes of morbidity among under-five children, and Cholera was also reported as an outbreak in 2020.[15] This showed that there was gap on latrine utilization as cholera and diarrhea are the proximal indicators of not utilizing latrine properly. Therefore; health improvement comes from the proper use of sanitation facilities, not simply their physical presence. Thus; evidence on the magnitude of latrine utilization and identifying the major factors associated with latrine utilization in the study area was crucial which were not studied before.

The use of likert scale measurement that is developed from the RANAS (Risk, Attitude, Norm, Ability, and Self-regulation) model which is derived from health theories and integrated behavioral model of WASH comprises the behavioral, social, normative or psychological determinants which enables for selecting behavior change interventions based on behavioral determinants identified in the target populations. Several studies have successfully applied the RANAS approach for different health-related behaviors in water and sanitation sector in developing countries and have shown the added value to develop appropriate practical strategies for intervention programs. But there are limited studies in our countries that applied RANAS models for understanding the relationship between latrine use with psychosocial factors to design specific intervention strategies for specific factors to increase latrine utilization, which was a gap in previous studies.[16-18]

Therefore, this study aimed to determine the magnitude of latrine utilization and identify its associated factors including psychosocial factors using RANAS behavioral model among rural households in ODF and non-ODF kebeles, Southwest Ethiopia.

Method and Materials

Study area and period

The study was conducted from May 16 to June 14, 2022 in Loma district, which is 1 of the 11 districts in Dawuro Zone in southwestern Ethiopia located 471 km to southwest of Addis Ababa, the capital city of Ethiopia. According to 2007 national population and housing census projection; the district has an estimated Population of 101 735 (50 664 males and 51 071 female) from whom 95 300 populations, with the total of 14 640 households are living in rural area. Administratively, the district has a total of 28 small administrative units (Kebeles); 3 urban and 25 rural kebeles. The CLTS approach has been widely implemented in the district as a result according to Loma district Heath office report in 2020, latrine coverage was 96% and 11 rural kebeles have been certified ODF from verified and re-verified of kebele during the years 2017 to 2021 by kebele leader, health extension workers, Loma woreda Health Office and Zonal health department in collaboration with WASH program[15] and the map of the study setting is shown in Figure 1.

Study design and population

A community-based comparative cross-sectional study design was employed among rural households in Open defecation free (ODF) declared and non-ODF kebeles (The term kebele refers to the smallest administrative units). All rural households with latrine residing in randomly selected kebeles of Loma district were considered as the study population. Resident for more than 6 months in the study area before data collection and age >18 years of respondents were included in this study whereas respondents who were unable to respond due to critical illness were excluded from the study.

Sample size determination and sampling technique

The sample size was calculated using *Open Epi Version 3* statistical software for 2 population proportions. By assuming the difference between HHs in ODF declared and non-ODF

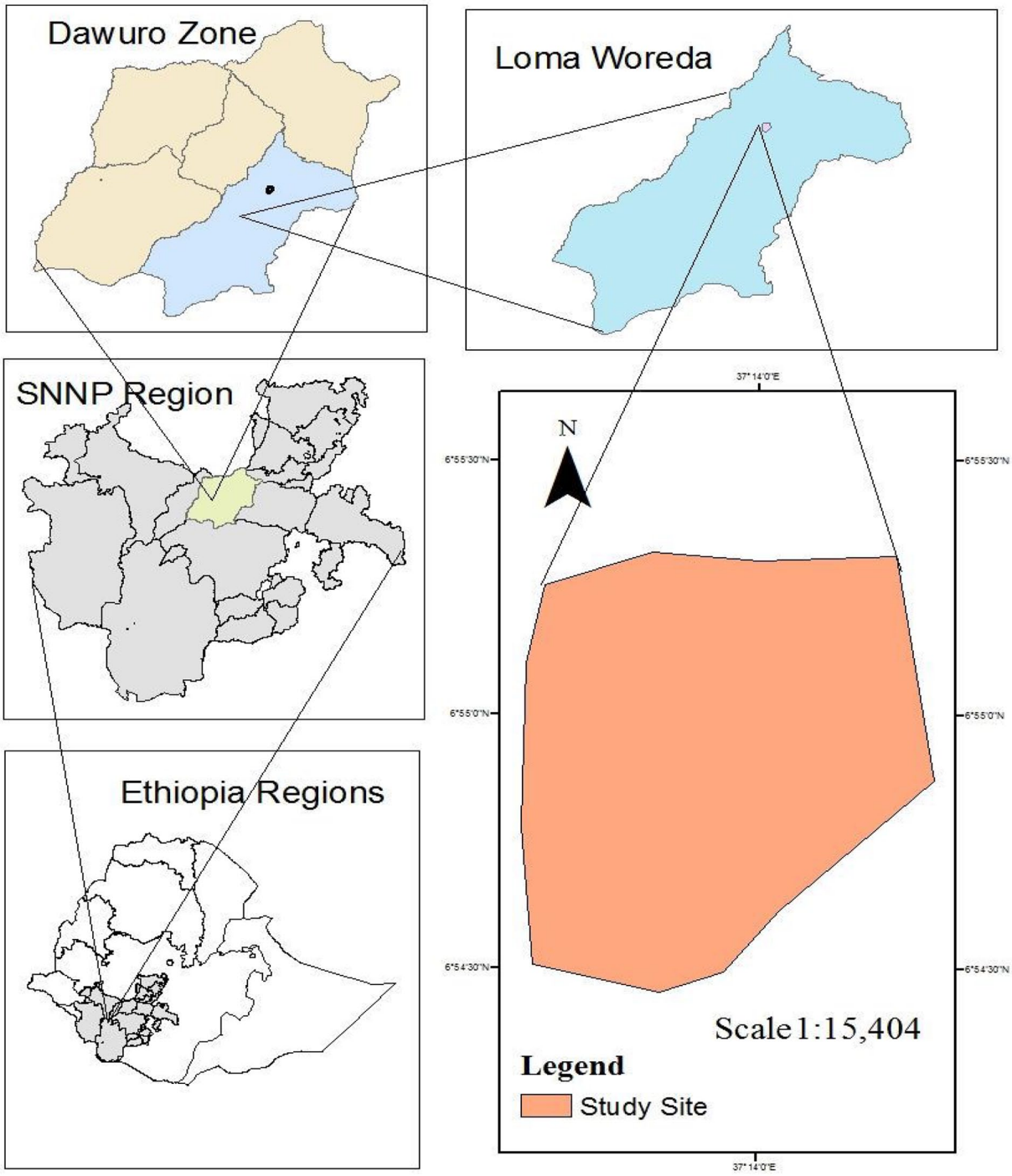

Figure 1. Geographical location of the study area, 2022.

kebele was 13%, where the proportion of latrine utilization among ODF was 88% ($P_1 = 88$) and proportion of latrine utilization among non-ODF kebele was 75% ($P_2 = 75$).[19]

Using 95% CI, 80% power of the test, Design effect of 2, 10% non-response rate, and ratio between ODF declared and non-ODF kebeles 1:1. Then 682 HHs (341 HHs from ODF and 341 HHs from NODF) were taken as the final sample size. A multistage systematic sampling technique was then employed to reach the study participants. In the first stage 25 rural kebeles of the districts was stratified by their defecation status (OD) into Open defecation free (ODF) and non-open defecation (non-ODF) kebeles (11 ODF and 14 non-ODF kebeles). Then 3 ODF and 3 non-ODF kebeles were selected using simple random sampling technique. Within each kebele again, 5 villages were selected randomly by taking the name and list of all villages as a sampling frame. After that the sample size was allocated proportionally to the size of HHs with latrine for each selected village. In the second stage, interval (*K*th) was calculated by dividing the number of households with the sample size allocated for each village ($k = 3$). After the

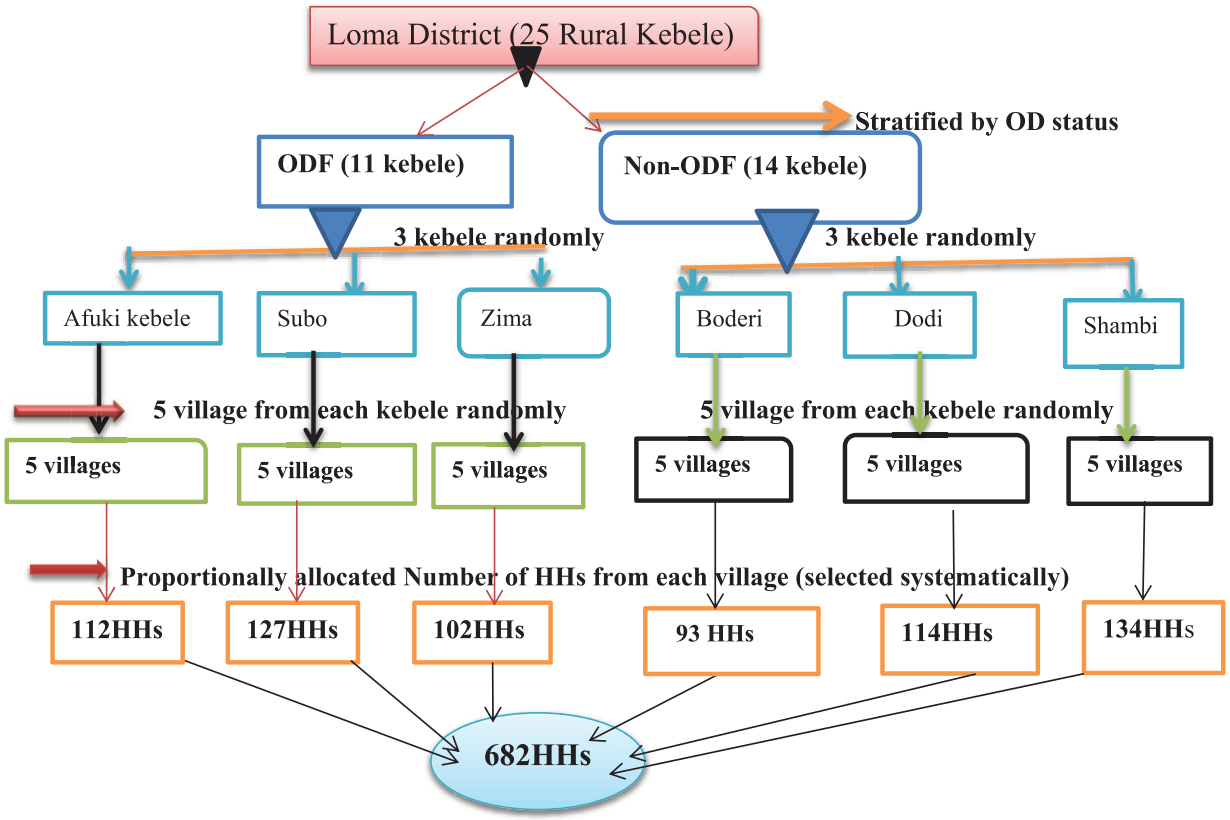

Figure 2. Sampling procedure on magnitude of latrine utilization and associated factors among rural households in ODF declared & non-ODF declared kebele, Loma district, Ethiopia, 2022.

*K*th-value was determined as an interval; the study HHs was systematically selected after selecting the first household randomly and continued by *Kth an* interval that was calculated (Figure 2).

Operational definition

Latrine utilization. Functional latrine with no observable feces in the compound and at least 2 signs of latrine use from observation were seen (fresh feces in the pit, visible footpath to the latrine, wet slab, smelly latrine, and visibly used anal cleansing material).[20]

Open defecation free (ODF). Governmental officials approved that all households in a community have a latrine with a superstructure with cover, and hand washing facilities with water and soap or ash and evidence that no open defecation is practiced in the community finally they declared as Open defecation free.[21]

Model households. Household members those who had taken basic training on health extension programs and are recognized and certified by governmental officials.[22]

Cleanliness. Latrine was categorized as "clean" if the latrine was clean and tidy and no visible feces on the floor is observed whereas recorded as unclean if visible feces or some dirt on the floor is observed.[16]

Privacy. The response for latrine has adequate privacy if the wall and superstructure were made of brick and cement, metal sheets, stone, stone/mud, sheets of bamboo matting, wood, etc., and "No" when the wall was made of leaves or if there was no wall by observation.[16]

Risk perception. In this study, perceived susceptibility is defined as the person's beliefs about the susceptibility to diarrheal disease due to contamination from open defecation; and perceived severity is the perception of the seriousness of the diarrheal illness and its consequences. A Likert scale that ranges from 1 to 5 was adapted to measure perceived susceptibility and perceived severity. Responses of 1 to 3 were recorded as low perceived susceptibility and perceived severity whereas a response of 4 to 5 was recorded as high perceived susceptibility and severity.[16-18]

Norm perception. In this study, the descriptive social norm about latrine utilization is defined as his or her perception as to which latrine utilization is practiced whereas injunctive norm on another way is defined as perception as to which utilizing a latrine is approved or disapproved by referents. These were measured using 3 items with a Likert scale that ranges from 1 to 5 for each item which was adopted from social norm studies. Then it was recorded into a high Descriptive norm and Injunctive norm for the score greater than 10, and low for the score less than and equal to 10.[16-18]

Attitude. Was assessed using 3 items that ask the participants' feeling about using latrine, the composite score of the 3 items scored 3 to 15, then recoded into positive attitude for the score greater than 10, and negative attitude for the score 3 to 10.[16-18]

Perceived ability. Three items that ask the participants' confidence to use a latrine was asked, the composite score of the 3 items scored 3 to 15, then recoded into high perceived ability for the score greater than 10, and low perceived ability for the score 3 to 10.[16-18]

Social dilemma. Participants were asked about perceptions that his/her village intensely working together in improving sanitation. The responses of 1 to 3 were recorded as low social dilemmas whereas a response of 4 or 5 was recorded as high social dilemmas.[16-18]

Social identity *(In* group tie). Participants were asked about perceptions that his/her has a commonality with other village members in terms of latrine utilization. The responses of 1 to 3 were recorded as low whereas a response of 4 or 5 was recorded as high social identity[17]

Data collection procedures

A structured questionnaire and observational checklist was developed after reviewing relevant literatures.[13,14,16,20,22,23] The questions to assess psychosocial variables was adapted from RANAS, and from a other behavioral studies that applied the same model by which its applicability was confirmed in many previous studies.[16,24,25] Then 6 diploma data collectors (1 Environmental health and 5 Nurses) who have smart (android) phone, were collect the data by face to face with household head or housewife using a prepared tool by Open data kit (ODK) data collect, and latrine utilization was verified through observation of at least 2 signs from sign of latrine use. Two supervisors (1 BSc in Environmental health and 1 public health officer professional) were involved as supervisors. Data were collected from household heads and if unfortunately we did not get the household head we revisited the house 3 times but if our trial is failed after 3 visits, we collected the data from mother/housewife or from family members whose age is greater than 18 years.

Data quality control

The questionnaire and observational checklist were first prepared in English and then translated into the local language Dawurogna by language expert (has BA degree in Dawurogna language) and again back to English for consistency. A pretest was conducted in similar setting on 5% (34 HHs) of the sample size in nearby non-selected kebele and the data collected from the pretest was not included in the study. To check the internal reliability of Likert scale question, *Cronbach's alpha*, α was computed and was acceptable ($\alpha = .863$). Training for data collectors and supervisors was given by Environmental health professional and by principal investigator for 2 consecutive days on the purpose of the study, the contents of the questionnaire, observation of latrine, Open Data Kit (ODK) data collect and particularly on issues related to the confidentiality of the responses and the rights of respondents. As the questionnaires were entered to excel and uploaded to XLS form on Kobo tool box humanitarian response and then were send to Open Data Kit (ODK) software mobile application from user's server, it increase the quality of data as the system remove incorrect or duplicate data entries, allows for monitoring of the collection progress, and facilitates the gathering of data. Data completeness and consistency was checked by the data collectors, supervisors, and principal investigator every day. After checking for completeness, consistency and accuracy data collector send to the principal investigator's server.

Data processing and analysis

Data were collected by open data kit (ODK) collect v2022.2.3 software through smart phone. Then data was exported to SPSS version 26 for cleaning and statistical analysis. Percentage, frequency distribution, mean and standard deviation were computed to describe the data. Chi-square test was computed to determine whether there was a significant difference in latrine utilization among households declared as ODF and non-ODF kebeles.

Binary logistic regression analysis was then performed to identify factors associated with latrine utilization among households in ODF and non-ODF kebeles. First, bi-variable logistic regressions was done to see the crude significant relation of each independent variable with latrine utilization, and to select the candidate variables for the multivariable analysis. To minimize confounding factors, variables with a P-value $\leqslant .2$ at bi-variable logistic analysis were included in the multivariable logistic analysis model.

Before inclusion of factors to the final logistic regression model, multi-co linearity between independent variables was checked using variance inflation factors (VIFs) and the models indicated acceptable multi-co linearity ($VIF < 2$). The final model showed that 37.9% (Cox and Snell R-square) to 54.4% (Nagelkerke R-square) of the total variability in the outcome was explained by the model. The model has also good fit since Hosmer Lemeshow goodness of test could not reject the hypothesis of the model fitness as $P = .271$. The adjusted odds ratio (AOR) and its 95% confidence interval were used to measure the strength and significance of the association. Statistical significance was set at P-value $< .05$. Finally, the finding of the study was presented by texts, tables, and graphs accordingly.

Results

Socio- demographic characteristics of the respondents

A total of 665 (331 households from open defecation free (ODF) and 334 from non-ODF) participated in this study which makes the response rate 97.51%. The majority of the respondents 296 (89.4%) HHs in ODF and 293 (87.7%) in non-ODF were from male-headed households with a mean age of 36.43 ± 10.23 and 37.69 ± 11.92 years respectively. A large proportion of participants 300 (90.6%) and 304 (91%) from ODF and non-ODF kebeles respectively were married. More than three fourth of households that participated in the study on both ODF and non-ODF did not attend formal education (75.8% HHs from ODF and 75.1% from non-ODF).

Relating to the family size, 229(69.2%) and 158 (47.3%) households had <5 family members in ODF and non-ODF kebeles respectively. About 53 (30.6%) HHs in ODF and 69 (41.8%) in non-ODF kebeles had more than 2 under 5-year children. On the other hand, about 54.4% of households in ODF and 54.7% in non-ODF kebeles had at least 1 child, who attended formal education (Table 1).

Latrine related characteristics of the households

Among all latrines observed in this study, about 307 (92.7%) of the type of latrines mostly available per household found in ODF were pit latrines with slabs made of wood which was the same in non-ODF kebeles 312 (93.4%). About 227 (68.6%) in ODF and 180 (55.1%) in non-ODF latrines were constructed within the last 3 years with mean duration years of 1.97 ± 0.81 and 2.26 ± 0.759 respectively. The proportion of latrines that had walls for privacy was 258 (77.9%) in ODF and 213 (63.8%) in non-ODF kebeles respectively. About 214 (64.7.5%) latrines in ODF and 160 (49.7%) in non-ODF kebeles were adequately clean. There was a higher proportion of latrine which needs maintenance in non- ODF kebele 187 (66%) than in ODF kebeles 115 (34.7%). Related to latrines with hand washing facilities, about 16 (16.8%) in ODF and 10 (16.1%) in non-ODF latrines had hand washing facilities with water (Table 2).

Institutional/service-related characteristics

The proportion of HHs visited by HEWs at least 2 times in the last month was about 58.6% in ODF and 48.8% in non-ODF kebeles. One hundred seventy-seven (53.5%) HHs in ODF and 112 (33.5%) in non-ODF kebeles had participated in community-led total sanitation (CLTSH). Of households that participated in this study, we observed that 128 (38.7%) HHs in ODF had been certified as model households by government officials but in non-ODF 83 (24.9%) HHs were certified as a model which was significantly higher among HHs in ODF than non-ODF kebele ($P = .000$) (Figure 3).

Table 1. Socio-demographic characteristics of the respondents by kebeles' ODF status, Loma district, Southwest, Ethiopia, 2022.

CHARACTERISTICS	ODF (N = 331)	NON-ODF (N = 334)
	FREQUENCY (%)	FREQUENCY (%)
Sex of HH head		
Male	296 (89.4)	293 (87.7)
Female	35 (10.6)	41 (12.3)
Age (years)		
18-29	92 (27.8)	100 (29.9)
30-39	116 (35.0)	103 (30.8)
40-49	87 (26.3)	77 (23.1)
50-59	27 (8.2)	33 (9.9)
>60	9 (2.7)	21 (6.3)
Marital status		
Married	300 (90.6)	304 (91)
Never married	8 (2.4)	9(2.7)
widowed	10 (3)	13(3.9)
Divorced	13 (3.9)	8 (2.4)
Religion		
Protestant	270 (81.6)	263 (78.7)
Orthodox	51 (15.4)	63 (18.9)
Catholic	9 (2.7)	6 (1.8)
Muslim	1 (0.3)	2 (0.6)
Educational status		
No formal education	251 (75.8)	251 (75.1)
Primary (1-8)	59 (17.8)	59 (17.7)
Secondary (9-12)	15 (4.5)	18 (5.4)
College and above	6 (1.8)	6 (1.8)
Occupation status		
Farmer	274 (82.8)	304 (91)
Housewife	35 (10.6)	26 (7.8)
Gov't employ	21 (6.3)	10 (2.9)
Non gov't employed	11 (3.3)	19 (5.7)
Other	51 (15.4)	28 (8.4)
Family size (members)		
<5	229 (69.2)	158 (47.3)
⩾5	102 (30.8)	176 (52.7)
Under 5 year children		
Yes	176 (53.2)	153 (45.8)
No	155 (46.8)	181 (54.2)

(Continued)

Table 1. (Continued)

CHARACTERISTICS	ODF (N = 331)	NON-ODF (N = 334)
	FREQUENCY (%)	FREQUENCY (%)
Number of under-5 children		
<2	131 (74.4)	85 (55.6)
⩾2	45 (25.6)	68 (44.4)
Presence of student HH		
Yes	179 (54.1)	182 (54.5)
No	152 (45.9)	152 (45.5)

Abbreviation: HH, household.

Table 2. Latrine related characteristics of the households, Loma district, Southwest, Ethiopia, 2022.

VARIABLE CATEGORIES	ODF (N = 331)	NON-ODF (N = 334)
	FREQUENCY (%)	FREQUENCY (%)
Type of latrine		
Pit (cemented slab)	20 (6)	15 (4.5)
Pit (wood log and mud cover)	307 (92.7)	312 (93.4)
Composting latrine	4 (1.2)	7 (2.1)
Arrangement of latrine		
Private	290 (87.6)	296 (88.6)
Shared	41 (12.4)	38 (11.4)
Year of latrine construction		
⩽3	227 (68.6)	184 (55.1)
>3	104 (31.4)	150 (44.9)
Mean ± SD	1.97 (±0.81)	2.26 (±0.759)
Distance of latrine from home (m)		
⩽10	195 (58.9)	202 (60.4)
>10	136 (41.1)	132 (39.6)
Distance of the HH from health facility		
Near (<30 min)	199 (60.1)	183 (54.8)
Far (>30 min)	132 (39.9)	152 (45.2)
Latrine with slab		
Yes	227 (68.6)	194 (58.1)
No	104 (31.4)	140 (41.9)
Privacy		
Yes	258 (77.9)	213 (63.8)
No	73 (22.1)	121 (36.2)
Roof		
Yes	230 (69.5)	218 (65.3)
No	101 (30.5)	116 (34.7)
Latrine only 1 squat hole		
Yes	225 (68)	224 (67.1)
No	106 (32)	110 (32.9)
Squat hole with cover		
Yes	114 (50.7)	149 (66.7)
No	111 (49.3)	75 (33.3)
Latrine cleanliness		
Adequately clean	214 (64.7)	160 (47.9)
Not clean	117 (35.3)	174 (52.1)
Latrine need maintenance		
Yes	216 (65.3)	147 (44)
No	115 (34.7)	187 (66)
Handwashing facility		
Yes	16 (16.8)	10 (16.1)
No	215 (83.2)	224 (83.9)

(Continued)

Table 2. (Continued)

Abbreviation: ODF = Open defecation free.

Psycho-social related characters of the respondents

Households were asked about their risk perception, attitude, norms, perceived ability, social identity, and social dilemma (RANAS) related to latrine utilization. According to our finding about 293 (88.5%) HHs in ODF and 290 (86.8%) in non-ODF kebeles had high scores for perceived susceptibility toward the chances that they contract the diarrheal disease when defecating in the open field and 284 (85.2%). Households in ODF respondents (68%) had positive attitude to use latrines than non-ODF HHs (63.5%). Concerning their norms toward latrine utilization, a significantly higher proportion of HHs in ODF 267 (80.7) had high scores on descriptive norms, and also 263 (79.5) HHs in ODF and 202 (60.5) in non-ODF kebeles had a high score on injective norms (Table 3).

Magnitude of latrine utilization

The overall magnitude of latrine utilization in the study area was 446 (67.1%: 95% CI: 63.71, 70.49). The magnitude of latrine utilization among HHs in ODF and non-ODF kebeles was 237 (71.6%: 95% CI: 66.8, 76.4) and 209 (62.5%: 95% CI: 57.38, 67.76) respectively which was significantly higher among HHs in ODF than in non- ODF kebeles ($P = .013$) (Figure 4).

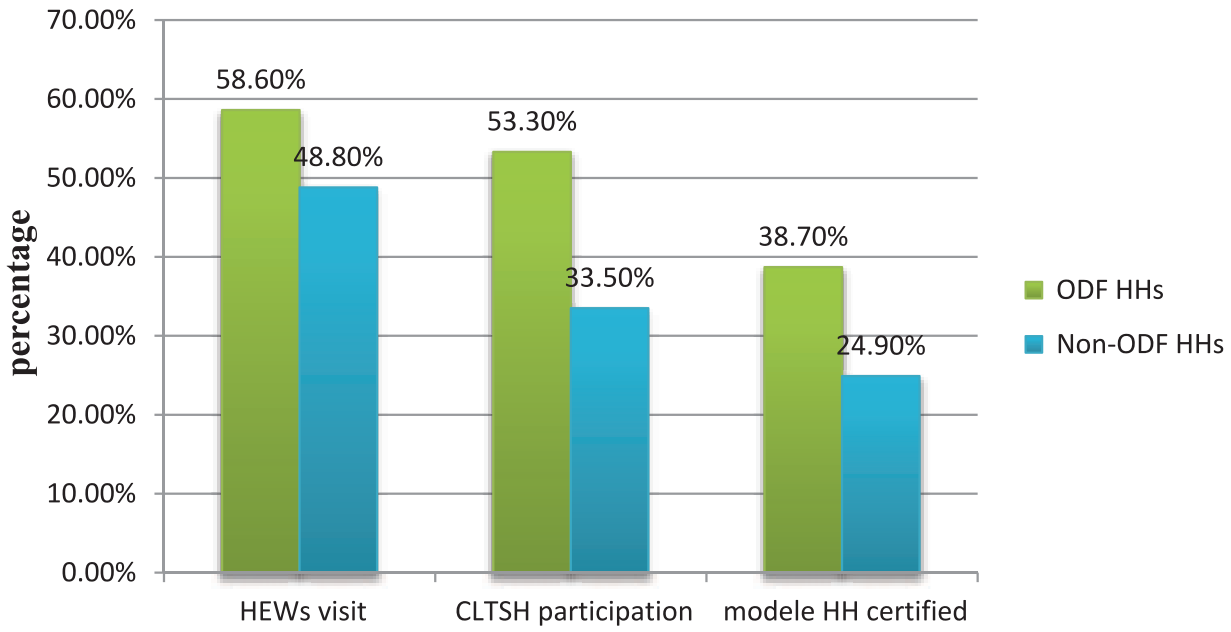

Figure 3. Service related character of rural households, Loma district, Southwest, Ethiopia, 2022 (n=665 (331 ODF and 334 non-ODF)).

Table 3. Psycho-social related characters of the respondents by kebele status, Loma district, Southwest, Ethiopia, 2022.

VARIABLE	CATEGORIES	ODF (N=331)	NON-ODF (N=334)
		FREQUENCY (%)	FREQUENCY (%)
Perceived susceptibility	Low score	38 (11.5)	44 (13.2)
	High score	293 (88.5)	290 (86.8)
Perceive severity	Low score	47 (14.2)	59 (17.7)
	High score	284 (85.2)	275 (82.3)
Attitude	Negative	107 (32.5)	122 (36.5)
	Positive	264 (67.5)	212 (63.5)
Descriptive norm	Low score	64 (19.3)	132 (39.5)
	High score	267 (80.7)	202 (60.5)
Injective norm	Low score	68 (20.5)	132 (39.5)
	High score	263 (79.5)	202 (60.5)
Perceived ability	Low score	73 (22.1)	130 (38.9)
	High score	258 (77.9)	204 (61.1)
Social identity	Low score	155 (46.4)	142 (42.4)
	High score	279(53.6)	192 (57.6)
Social dilemma	Low score	57 (13.2)	136 (40.7)
	High score	274 (86.2)	198 (50.3)

Factors associated with larine utilization among HHs in ODF and non-ODF kebeles

Since there was a significant difference in the utilization of latrines among households in ODF and non-ODF kebeles, factors associated with latrine utilization among households in ODF and non-ODF kebeles were identified separately.

Factors associated with larine utilization among HHs in ODF kebeles

In HHs of ODF kebeles: age, educational status, family size, presence of student in the family, being visited by HEWs, being graduated as a model household, participation on community led total sanitation (CLTS), years of latrine ownership,

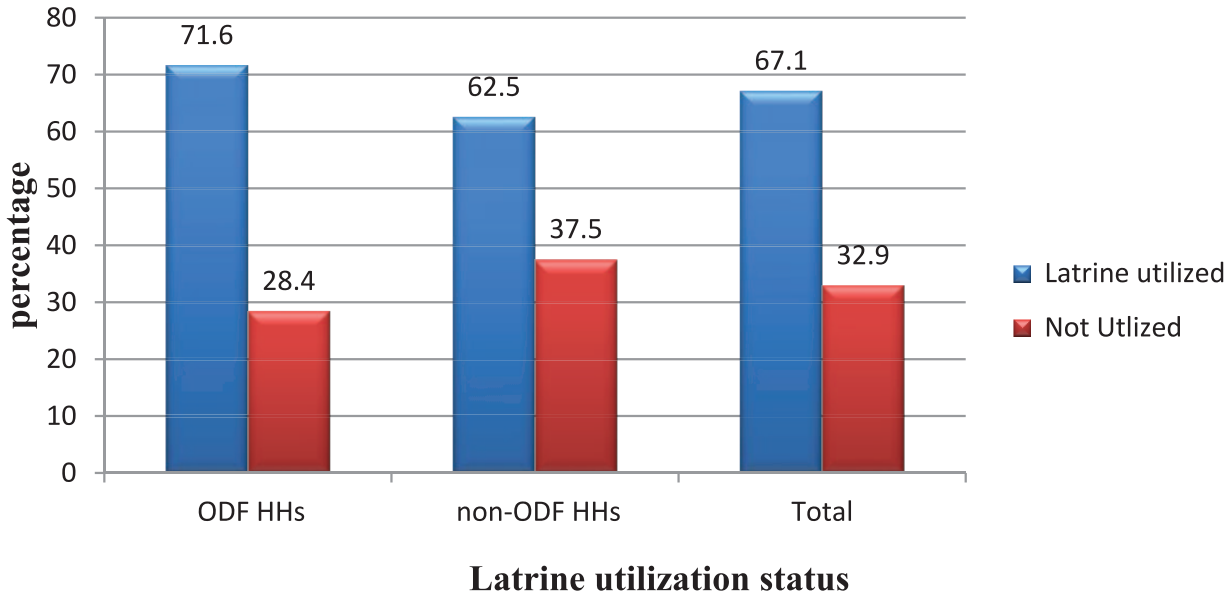

Figure 4. Latrine utilization status of rural HHS Loma district, Southwest, Ethiopia, 2022 (n = 665 (331 ODF and 334 non-ODF)).

distance of the latrine from home, latrine with slab, privacy, cleanliness of latrine, latrine condition, latrine with hand washing facility, attitude, descriptive nom, injunective norm, perceived ability, social identity and social dilemma were candidate for the final model at *P*-value less than .2.

After applying multivariable logistic regressions analysis on the final model; being graduated as a model household, households being visited by HEWs, latrine with superstructure (privacy),and latrine with slab among HHs in ODF kebele were found to be significantly associated with latrine utilization.

Households which were certified as model were 5.2 times more likely to use latrine than those who were not certified as model [AOR = 5.1, 95% CI: 2.14, 12.84], and households visited by HEWs were about 3.5 times more likely to utilize latrine than its counterparts [AOR = 3.5, 95% CI: 1.67, 7.25]. Almost 3 times higher in HHs of latrine with privacy [AOR = 3.0, 95% CI: 1.37, 6.65] than their counter parts. The odds of utilizing latrine in households of latrine with privacy were 3 times [AOR = 3.0, 95% CI: 1.37, 6.65] higher than those which did not have privacy (Table 4).

Factors associated with larine utilization among HHs in non-ODF kebeles

On bi-variable logistic regression analysis; age of household head, educational status, family size, presence of student in the family, being visited by HEWs, being graduated as a model household, informed about latrine utilization, CLTSH participation, distance of latrine from home, latrine with privacy, latrine with slab, cleanliness of latrine, latrine condition, latrine with hand washing facility, perceived susceptibility, perceived severity, attitude, descriptive nom, injunective norm, and perceived ability among HHs in non-ODF kebeles were found to be candidates variables for multivariable logistic analysis at *P*-value of less than .2.

After applying multivariable logistic regressions analysis on the final model; being visited by HEWs, informed about latrine utilization, participation on community led total sanitation (CLTSH), latrine with superstructure (Privacy), clean latrine, attitude toward latrine utilization, and descriptive norm were found to be significantly associated with latrine utilization with *P*-value less than .05.

The odds of utilizing a latrine among households being visited by Hews were about 3 times [AOR = 2.9, 95% CI: 1.34, 6.06] higher than those who did not visited. Households who had CLTSH participation were 2.4 times more likely to use the latrine than who did not participate [AOR = 2.4, 95% CI: 1.08, 5.61]. Households latrine with privacy were 2.5 times [AOR = 2.5, 95% CI: 1.24, 5.07], clean latrine were 2.3 times [AOR = 2.3, 95% CI: 1.07, 4.92] more likely to utilize their latrine than their counterparts.

Participants who perceived positive attitude toward latrine use were about 3 times more likely to utilize latrine [AOR = 3.2, 95% CI: 1.52, 6.59] .In addition the odds of larine use among participants who perceived latrine use is practiced by others (Descriptive norm) were 2.7 times higher than their counterparts [AOR = 2.7, 95% CI: 1.27, 5.53] (Table 5).

Discussion

The magnitude of latrine utilization in the study area (67.1%) was consistent with the study done in Gurage Zone, Ethiopia (65.8%) and Sebeta district, Oromia, Ethiopia (68%).[23,26] But it was higher than the study done in Takusa district, Northwest, Ethiopia (41.9%), East Gojjam zone (45.4%), and the study done at Tullo district, Eastern Ethiopia (56.1%).[27,28] Reason might be different in operational definition of the outcome variable, difference in the study period and study design.

Table 4. Bi-variable and multivariable logistic regression analysis of factors associated with latrine utilization among HHs in ODF kebele, Loma district, May to June, 2022.

VARIABLES	CATEGORIES	ODF (N=331) LATRINE UTILIZATION YES (%) NO (%)	COR (95% CI)	AOR (95% CI)
Age of HH head (years)	18-29	76 (70) 16 (30)	1.9 (0.2, 5.77)	01.5 (0.15, 5.92)
	30-39	62 (64.1) 25 (35.9)	1.1 (0.33, 9.77)	0.9 (0.25, 9.02)
	40-49	80 (59.7) 36 (40.3)	2.31 (1.01, 5.03)	1.6 (0.28,8.86)
	50-59	16 (57.6) 17 (42.4)	0.8 (0.9, 6.06)	1.2 (0.2,7.11)
	>60	19 (47.6) 17 (52.4)	1	1
Education status	Attended formal education	64 (80) 16 (20)	1.8 (0.98, 3.32)	1.2 (0.48, 2.68)
	Not attended formal education	173 (69) 78 (31)	1	1
Family size (members)	<5	180 (78.5) 49 (21.5)	2.9 (1.76, 4.79)	1.3 (0.59, 2.82)
	⩾5	57 (55.9) 45 (44.1)	1	1
Student in the HH	Yes	151 (84.4) 28 (15.6)	4.2 (2.47, 6.93)	2.1 (0.86, 5.11)
	No	86 (56.6) 66 (43.4)	1	1
Year latrine ownership (years)	<3	186 (82) 41 (18)	4.7 (2.83, 7.87)	1.1 (0.51, 2.53)
	⩾3	51 (49) 53 (51)	1	1
Distance of latrine from home (m)	<10	163 (83.6) 32 (16.4)	4.3 (2.57, 7.08)	1.2 (0.54, 2.46)
	⩾10	74 (54.4) 62 (43.6)	1	1
Latrine with slab	Yes	181 (79.7) 46 (20.3)	3.4(2.04, 5.57)	3.1 (1.53, 6.37)*
	No	56 (53.8) 48 (46.2)	1	1
Latrine superstructure (Privacy)	Yes	207 (80.2) 51 (19.8)	5.8 (3.33, 10.16)	3.0(1.37, 6.65)*
	No	30 (41.1) 43 (58.9)	1	1
Cleanliness of latrine	Adequate	205 (75.9) 65 (24.1)	2.9 (1.61, 5.08)	1.3 (0.53, 2.92)
	Poor	32 (52.5) 29 (47.5)	1	1
Latrine need maintenance	Yes	104 (90.4) 11 (39.8)	5.9 (2.99, 11.63)	2.2 (0.93, 5.34)
	No	133 (61.6) 83 (38.4)	1	1
Handwashing facility	Yes	100 (86.2) 16 (13.8)	3.6 (1.966, 6.46)	1.8 (0.8, 4.12)
	No	137 (63.7) 78 (36.3)	1	1
HEW visit	Yes	167 (86.1) 27 (13.9)	5.9 (3.5, 10.0)	3.5 (1.67, 7.25)*
	No	70 (51.1) 67 (48.9)	1	1
CLTSH participation	Yes	149 (84.2) 28 (15.8)	3.9 (2.38, 6.67) 1	1.06 (0.48, 2.23)
	No	88 (57.1) 66 (42.9)		1
Model HH status	Certified	118 (92.2) 10 (7.8)	8.3 (4.12, 16.83)	5.2 (2.14, 12.87)*
	Not certified	119 (58.6) 84 (42.4)	1	1
Attitude	Positive	167 (74.6) 57 (25.4)	1.5 (0.94, 2.55)	1.2 (0.57, 2.44)
	Negative	70 (65.4) 37 (34.6)	1	1

(Continued)

Table 4. (Continued)

VARIABLES	CATEGORIES	ODF (N=331) LATRINE UTILIZATION YES (%) NO (%)	COR (95% CI)	AOR (95% CI)
Descriptive norm	High	204 (76.4) 63 (23.7)	3.0 (1.73, 5.36)	1.3 (0.58, 3.03)
	Low	31 (51.7) 31 (48.3)	1	1
Injective norm	High	201 (76.4) 62 (23.6)	2.9 (1.66, 5.02)	1.1 (0.47, 2.71)
	Low	36 (53) 32 (47)	1	1
Ability	High	199 (77) 59 (23)	3.1 (1.8, 5.35)	1.2 (0.51, 3.03)
	Low	36 (53) 32 (47)	1	1
Social identity	High	205 (74.6) 69 (25.4)	2.3 (1.29, 4.18) 1	1.05 (0.41, 2.67)
	Low	32 (56.2) 25 (43.8)		1
Social dilemma	High	206 (73.8) 73 (26.2)	1.9 (1.03, 3.53)	0.9 (0.37, 2.41)
	Low	31 (59.6) 21 (40.4)	1	1

Abbreviations: AOR, adjusted odds ratio; CI, confidence interval; COR, crude odds ratio.
*Significant at $P < .05$.

Table 5. Bi-variable and multivariate logistic regression analysis of factors associated with latrine utilization among HHs in non-ODF kebele, Loma district, May to June, 2022.

VARIABLES	CATEGORIES	NODF (N=334) LATRINE UTILIZATION YES (%) NO (%)	COR (95% CI)	AOR (95% CI)
Age of HH head (years)	18-29	68 (70) 32 (30)	1.08 (0.73, 2.35)	1.1 (0.2, 5.77)
	30-39	51 (64.1) 26 (35.9)	1.2 (0.58, 2.04)	1.8 (033, 9.77)
	40-49	64 (59.7) 39 (40.3)	1.7 (1.01, 5.03)	1.6 (0.28, 8.86)
	50-59	16 (57.6) 17 (42.4)	1.01 (0.9, 6.06)	1.2 (0.2, 7.11)
	>60	10 (47.6) 11 (52.4)	1	1
Education status	Attended formal educated	64 (78.3) 19 (21.7)	2.46 (1.39, 4.35)	1.2 (0.49, 2.78)
	Not attended formal educated	145 (58.2) 106 (41.8)	1	1
Family size (members)	<5	109 (69) 49 (31)	1.7 (1.08, 2.65)	1.4 (0.67, 2.87)
	⩾5	100 (56.8) 76 (43.2)	1	1
Student in the HH	Yes	140 (76.9) 42 (23.1)	4.0 (2.51, 6.41)	1.9 (0.96, 3.89)
	No	69 (45.7) 83 (54.3)	1	1
Distance from home (m)	<10	161 (80.2) 41 (19.8)	6.9 (4.18, 11.25) 1	1.4 (0.63, 3.27)
	⩾10	48 (37.1) 84 (62.9)		1
Latrine with slab	Yes	130 (67.1) 64 (32.9)	1.6 (1.002, 2.46)	1.1 (0.55, 2.2)
	No	79 (56.4) 61 (43.6)	1	1
Latrine with superstructure (privacy)	Yes	150 (70.7) 62 (29.3)	2.9 (1.65, 4.17)	2.5 (1.24, 5.07)*
	No	58 (47.9) 63 (52.1)	1	1

(Continued)

Table 5. (Continued)

VARIABLES	CATEGORIES	NODF (N=334) LATRINE UTILIZATION	COR (95% CI)	AOR (95% CI)
		YES (%) NO (%)		
Cleanliness of latrine	Adequate	167 (80.3) 41 (19.7)	8.2 (4.92, 13.48)	2.3 (1.07, 4.92)*
	Poor	42 (33.3) 84 (66.7)	1	1
Latrine needs maintenance	Yes	128 (87.1) 19 (12.9)	8.8 (5.03, 15.46)	1.6 (0.65, 3.69)
	No	81 (43.3) 106 (56.7)	1	1
Handwashing facility	Yes	52 (83.7) 10 (16.3)	3.8 (1.86, 7.81)	1.1 (0.41, 2.93)
	No	157 (57.7) 115 (42.3)	1	1
HEW visit	Yes	125 (87.4) 18 (12.6) 84 (44)	8.8 (4.99, 15.65)	2.9 (1.34, 6.06)*
	No	107 (56)	1	1
Informed about latrine utilization	Yes	170 (74.2) 59 (25.8)	4.9 (2.97, 7.99)	2.3 (1.05, 4.97)*
	No	39 (37.2) 66 (62.8)		1
CLTSH participation	Yes	91 (81.2) 21 (18.8)	3.8 (2.22, 6.57)	2.4 (1.08, 5.61)*
	No	118 (53.2) 104 (46.8)	1	1
Model HH status	Certified	73 (88) 10 (12)	6.2 (3.05, 12.51)	2.1 (0.94, 6.53)
	Not certified	136 (54.2) 115 (43.4)	1	
Perceived susceptibility	High	193 (66.7) 97 (33.3)	3.5 (1.8, 6.74)	2.1 (0.84, 8.32)
	Low	16 (36.4) 28 (63.6)	1	1
Perceived severity	High	186 (67.6) 89 (32.4)	3.3 (1.83, 5.85)	1.1 (0.45, 2.75)
	Low	23 (39) 36 (61)	1	1
Attitude	Positive	168 (79.2) 44 (20.8)	7.5 (4.57, 12.45)	3.2 (1.52, 6.59)*
	Negative	41 (33.6) 81 (66.4)	1	1
Descriptive norm	High	164 (81.2) 38 (18.2)	8.3 (5.04, 13.81)	2.7 (1.27, 5.53)*
	Low	45 (34.1) 87 (65.0.9)	1	1
Injective norm	High	161 (79.7) 41 (20.3)	6.9 (4.2, 11.5)	1.1 (0.5, 2.39)
	Low	48 (36.4) 84 (63.6)	1	1
Ability	High	159 (77.6) 45 (22.4)	5.7 (3.48, 9.17)	1.9 (0.94, 4.23)
	Low	50 (40.3) 80 (59.7)	1	1

Abbreviations: AOR, adjusted odds ratio; CI, confidence interval; CLTSH, community lid total sanitation; COR, crude odds ratio; HH, households.
*Significant at $P < .05$.

However, our finding was lower when compared to studies conducted in Wondo Genet district, South Ethiopia (83%), Hetosa district, Arsi, Ethiopia (81%), and Nepal (94.3%).[19,21,24] These variations might be due to the socio-demographic and economic characteristics variation, and it might be due to frequency of visit of health extension workers vary from district to district.

There was significant difference on utilization of latrine among HHs in ODF kebeles (71.6%) when we compared to HHs in non-ODF kebele (62.57) ($P = .013$). This finding was consistent with the study done at Hetosa district, Oromia, Ethiopia with 88% and 75% latrine utilization in ODF and non-ODF kebeles utilized their latrine respectively.[19] The possible explanation for this might be due to community member's commitment to always retain their community ODF and their good mood to use their toilet.According to our finding the magnitude of latrine utilization was 71.6% after they declared as open defecation free (ODF) this estimated that 3 out of 10 households engaged in open defecation after they have certified as open defecation-free, which is consistent with a study

conducted in Machakal district showed that the magnitude of open defecation practice among households who had latrine facility was 27.8%.[19] But higher than the study done in Wondo Genet district in South Ethiopia which showed that 16.9% of the households did not use latrines after they declared open defecation free and Hetosa district (12%).[19,21] This could be even though community member's commitment to retain their community always ODF while declared as ODF, it might be weak health extension and health professionals follow up.

Regarding factors associated with latrine utilization among HHs in ODF kebeles, households visited by HEWs were about 3.5 times more likely to utilize their latrine than its counterparts. Likewise in non-ODF kebele, households being visited by HEWs were about 3 higher than those who did not visit. This finding is similar with the study conducted at Northern Ethiopia.[20] This might be because households having more interaction with health extension workers have access to information about sanitation and hygiene, including how to use latrines. This implies that frequent follow up of health extension workers can have positive impact on increasing latrine utilization.

In ODF, households which were certified as model was 5.2 times more likely to utilize their latrine compared to not certify as model. This finding is supported by comparative community based study about factors associated with latrine utilization among model and non-model families in LaelaiMaichew district, Tigray, Ethiopia and a study done at Tullo District, West Hararge, Eastern Ethiopia.[22,27] The possible reason for this might be, awareness related to latrine utilization increase as the training focus on health extension packages including latrine utilization and also those who got training might be eager to use latrine as they share experience and train with demonstration on the effect of not utilizing a latrine implies that encouraging model households training and give certification increase larine utilization. Unlike HHs in ODF, model households were not statistically significant in non-ODF kebeles.

Participating on CLTSH activities were also another service related factor significantly associated with latrine utilization in HHs of non- ODF kebeles, which was 2.4 higher than those who did not participated. This finding is supported by the finding in Tullo district, Eastern Ethiopia.[27] This is due to the fact that CLTS is a participatory approach focused on initiating and mobilizing communitiesto end open defecation. This shows that those households member who are participating on community led total sanitation triggering activity increase latrine utilization. Concerning latrine related factors, latrine should provide privacy for its user. Even if a household has a latrine, the lack of privacy or a roof may cause an individual to defecate in the open rather than using the available latrine. This study result reveled this which showed that in ODF kebeles, household latrines with wall for privacy were 3 times more likely to utilize latrine than latrines with no wall for privacy which was similar on that of non-ODF by which households latrine with privacy were 2.5 times higher than latrines with no wall for privacy. This is supported by the study done inArsi, Ethiopia,[19] Kenya,[29] and rural setting of India[30] suggested that the presence of latrine door/roof and bad odor of latrine were factors that hinders latrine utilization. The possible explanation for this could be households who had latrines with privacy may feel more private and secure to use latrine.

This implies constructing latrine with wall and roof with superstructure increase latrine utilization as it keeps privacy.

Another latrine related factor related with latrine utilization particularlyin non-ODF kebeles was cleanliness of latrine by which clean latrine were 2.3 times more likely to utilized their latrine than their counterparts which were consistent with the study conducted in Leailaimaichew, Aksum Tigray.[22] Similarly, study in Tanzania indicates that hygienic latrines were more likely to utilize latrine compared with latrines not hygienic).[31] This indicate that cleanness of the latrine initiate them to utilize latrine because it could decrease fear of contamination and odor.

Regarding psycho-social factors, this study found that participants who perceived positive attitude toward latrine use in non-ODF kebeles were about 3 times more likely to utilize latrine. In addition the odds of larine use among participants who perceived latrine use is practiced by others (Descriptive norm) were 2.7 times higher than their counterparts. This showed that the social norm influenced people's decision to use a latrine in non-ODF kebeles. This study is consistent with the study done at Becho district Ethiopia[16] and in Zambia found that individual practice open defecation as a result of societal norm.[32]

Implication of the findings

Though the Health extension program and CLTSH approach in the study area are widely applied to end open defecation; constructing latrine without privacy, lack of follow up and support during post-triggering phase, Attitude and societal norms were factors that affect the utilization of latrine and the sustainability of ODF in the study area. Therefore in addition to CLTSH approach, other behavior change communication campaign directed toward latrine utilization like normative and persuasive campaign messages needs to be integrated within the existing community structures like "Health Development Army (HAD)" or "one-to-five network" and extension channels like mass media should be strength so as to increase latrine utilization and to sustain ODF.

Strength and limitation of the study

The use of RANASS model by using a standardized Likert scale adapted from health belief and theory of reasoned action model to identify the psychosocial factors of latrine utilization as well as using comparative cross sectional study design with observation checklist to determine utilization of latrine by sign of latrine use were considered as the strength of this study.

Since latrine utilization was determined based on short time on-the-spot- observation with interview, observer bias during observation might be occurred and also our study was conducted from May to June, a period that is relatively rainy season but in rural areas, especially in the dry season and in rainy season latrine utilization may be different but this study cannot tell us the latrine utilization status in different seasons.

Conclusion and Recommendations

The overall utilization of latrine in the study area was 67.1% with significance difference among households in declared as ODF and non-ODF kebele. According to our finding it is estimated that 3 out of 10 households engaged in open defecation after they have certified as open defecation-free and even they have a latrine due to different factors. The study identified, in ODF kebeles, being visited by HEWs, being graduated as a model household, and latrine with privacy were found to be significantly associated with latrine utilization. And households being visited by HEWs, Advised about latrine utilization, participation on community led total sanitation (CLTSH), latrine with privacy, clean latrine, attitude toward latrine utilization, and descriptive norm were found to be significantly associated with latrine utilization among HHs in non-ODF kebeles. Therefore; Health extension workers, health professionals, district health office and local administrative should have to undertake post-triggering follow up after kebeles declared as ODF to have sustainable utilization. Health extension worker should have to provide technical support during latrine construction at household level to have superstructure and wall to assure privacy. They should sensitize the community to participate in community led total sanitation (CLTSH) so as to end open defecation. Model household training and certification by health extension workers should be strengthened. Policy makers and WASH sector should strength persuasive and normative behavioral approach to address the identified behavioral attributes on latrine utilization.

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Author Contributions

All stated authors 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.

Availability of Data and Materials

The datasets used and analyzed during the study available from the corresponding author on reasonable request.

Ethical Consideration

Ethical approval letter was obtained from the Wolaita Sodo University Institutional Review Board with the Ref. CRCSD 86/02/14 and an official letter was written from the School of Public health to Loma district health office. Consent and willingness from study participants by either signing or put their finger print once they agreed to be part of this study was obtained before starting interviewing. There is no anticipated harm and the right of respondent to withdraw the interview partially or completely was respected. The confidentiality of all the information given by the respondents was kept strictly by omitting the name of the respondents during the data collection procedure.

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