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Determinants of Basic Sanitation Service Coverage Among Households in Shashogo District, Hadiya Zone, Central Ethiopia: A Case Control Study

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ABSTRACT

BACKGROUND: Basic sanitation services and practices are crucial for the well-being and health of a community. However, little is known about the determinants of basic sanitation services in Ethiopia, particularly in the study area.

OBJECTIVES: To identify the determinants of basic sanitation service coverage among households in the Shashogo district, Hadiya Zone, and Central Ethiopia in 2023.

METHODS: A case–control investigation was carried out in households in Shashogo District from August 8, 2023, to December 10, 2023. Ten Kebeles were chosen randomly from a total of 34 Kebeles in the district. A total of 579 households (193 cases and 386 controls) were included in the study. The data were gathered with pretested and structured questionnaires in digital form with a smartphone. The data were analyzed with SPSS. Independent *t* tests and regression models were used to determine predictors of basic sanitation services.

RESULTS: The mean (±SD) age of the study participants was 38.2 (±8.9) years. After controlling for confounders in the multivariate analysis, the adoption of improved latrine services among households was found to be associated with greater average monthly income (AOR = 1.841, 95% CI (1.043, 3.251)), the study respondents who had access to the necessary materials for latrine construction/upgrade were approximately 3.5 times more likely to adopt improved latrine services among households with (AOR = 3.477 (95% CI = 1.314, 9.202) than among those who lacked access to the necessary materials for latrine construction, the study respondents who had training in sanitation and hygiene (AOR = 4.744, 95% CI (2.984, 7.542)) and who had sufficient knowledge about the adoption of improved latrine services (AOR = 2.020, 95% CI (1.125, 3.628)) were found to be determinants of the adoption of improved latrine services among households.

CONCLUSION: This study revealed that economics, knowledge, attitudes and practices, infrastructure, and culture were identified as determinants of the adoption of improved latrines in the study area. Poor sanitation significantly impacts economic, social, environmental and many other direct and indirect impacts on the well-being of citizens. Therefore, policies on sanitation and contextual initiatives and focused actions are needed by stakeholders and policy implementers to improve knowledge gaps, access to necessary materials and the income capacity of those lagging to adopt services.

KEYWORDS: Adoption, case control study, determinants, improved latrine, Shashogo, Ethiopia

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Introduction

Basic sanitation refers to the provision of facilities and services for the safe disposal of human excreta, including urine and feces. It also encompasses the maintenance of hygienic conditions through services such as garbage collection, wastewater disposal, and the management of industrial and hazardous waste.[1] Sanitation and hygiene are among the fundamental human rights inalienably linked to the maintenance of health and dignity.[2]

The proper institution and utilization of basic sanitation provide a multitude of benefits, impacting individuals' lives and the global community.[3] By breaking the cycle of infectious disease transmission, basic sanitation significantly reduces morbidity and mortality, thereby increasing quality of life. Additionally, it contributes to social and economic development and plays a vital role in achieving the Sustainable Development Goals (SDGs).[1,4-7] The United Nations' Sustainable Development Goals (SDGs), specifically Goal 6.2, emphasize the importance of achieving universal access to adequate and equitable sanitation by 2030.[8] The SDGs highlight the need to provide proper sanitation facilities and promote good hygiene practices, especially in areas where open defecation remains prevalent and access to adequate sanitation services is lacking.[9]

Ensuring the benefits of such practices requires a well-established system and service access. Consequently, a Community-Led Total Sanitation and Hygiene (CLTSH) approach has been widely adopted at the community level

through health extension programs. These efforts, combined with community mobilization, print publications, mass media, and targeted campaigns, have led to significant progress in increasing awareness and increasing community ownership of toilet construction and usage. As a result, latrine coverage at the household level increased from less than 10% in 2006, at the beginning of the CLTSH program, to 68% in 2015.[10]

Despite the well-established benefits of basic sanitation, there is a stark disparity in access to these essential services across the globe.[6,7] Reports indicate that a significant portion of the world's population lacks access to proper sanitation facilities.[1] The World Health Organization (WHO) estimates that approximately 4.2 billion people do not have access to safely managed sanitation services.[4] Moreover, 892 million people still practice open defecation, and 856 million rely on out dated facilities such as bucket latrines, pit latrines without a platform or slab, or hanging latrines. An additional 600 million people use shared but improved sanitary facilities.[7]

Low- and middle-income countries face significant challenges in achieving basic sanitation service coverage. For example, sub-Saharan Africa bears the highest burden, with over half the population lacking access to basic sanitation services.[6] In 2018, the WHO and UNICEF Joint Monitoring Program for Water Supply and Sanitation (JMP) reported that approximately 61% of the population in sub-Saharan Africa did not have access to safely managed sanitation services.[11] The practice of open defecation persists, posing a direct threat to water sources and increasing the risk of waterborne diseases.[12]

In Ethiopia, the situation is dire, with only approximately 6% of households using improved toilet facilities (16% in urban areas and 4% in rural areas). More than half (56%) of rural households used unimproved toilet facilities, and a significant portion of urban households (35%) share toilet facilities, compared with only 2% in rural areas. Shockingly, 1 in 3 households in Ethiopia lacks any toilet facilities (39% in rural areas and 7% in urban areas).[12] As a result, 38.1 million people in Ethiopia still defecate in open fields, and 82% of the population uses inadequate sanitary facilities.[13] This situation is strongly correlated with the high incidence of human intestinal helminthic infections.[14] Shashogo district, 1 of 13 districts in the Hadiya zone of central Ethiopia, has poor sanitation and hygiene practices with frequent disease outbreaks.

According to the WHO and UNICEF joint monitoring programs, 63% of the latrines in low-income countries are still considered unimproved, offering minimal public health benefits.[3] Additionally, there has been a regression in latrine usage, partly due to limited access to advanced sanitation products and services. Communities often rely on locally available materials to build latrines, and there is fatigue in maintaining momentum from both health professionals and community members.[10]

Poor sanitation conditions can lead to various infectious diseases, including typhoid fever, cholera, trachoma, and scabies. These diseases pose significant health risks, particularly for children under 5 years of age.[15] Rural and urban slum residents are at heightened risk due to the lack of basic sanitation facilities and proper waste disposal management.[16] The absence of latrines can expose children to diseases, parasites, and worms, further weakening their immune system.[17] Inadequate hygiene and sanitation not only threaten children's health but also impede their overall development and well-being. Therefore, improving basic sanitation coverage is essential for addressing these health challenges, reducing child mortality in rural communities, and driving socioeconomic development to meet the SDGs.[18]

The combination of poor sanitation facilities and the prevalence of WASH-related diseases call for urgent action. Addressing this issue requires strategies to increase basic sanitation coverage and mitigate the risk of disease transmission. Despite on-going efforts to improve sanitation practices, Shashogo District continues to struggle with low basic sanitation coverage and a high incidence of WASH-related diseases. Diarrhea remains one of the top 10 most common diseases in the district and is a leading cause of death among children under five, which is directly linked to the low coverage of basic sanitation facilities.[19] Despite the presence of some information in the country related to sanitation and hygiene practices, there is a paucity of local evidence on factors contributing to poor sanitation and hygiene practices between current users and non-users and how to sustain these practices among current users.

To address sanitation challenges effectively in Shashogo District and similar areas, identifying the factors associated with low basic sanitation coverage from a local perspective is essential. Understanding these factors will provide valuable insights into the barriers to constructing improved latrines and achieving basic sanitation standards. This study aims to identify the determinants of basic sanitation coverage in Shashogo district, Ethiopia, to inform strategies that can sustainably improve sanitation services and public health outcomes. The global scientific community could benefit from this study's findings by obtaining more evidence from small rural districts in resource-limited areas on local factors affecting service access and utilization and on how to sustain practices by removing the drawbacks thereof.

Methods and Materials

Study setting

This study was carried out in Shashogo District, which is located in the Hadiya zone of the central Ethiopian region. The district is characterized by plain topographic elevations of 1500 and 2200 m above mean sea level. The main economic activities in the district are mixed agriculture (crop production and animal husbandry) and trading.

The Shashogo district is selected because of its relatively low basic sanitation service coverage with several ODF kebeles (the smallest administration unit). For district wash-related diseases, diarrhea is reportedly the leading cause of death among children under 5 years of age. The district has 34 rural kebeles and a total population of 141 830.

Study design and study data

An unmatched case–control study was conducted at the community level to identify the determinants of basic sanitation service coverage among households in Shashogo, Ethiopia. The study period was from 5th August 2023 to 20th December 2023.

Source population and study population

All households in the Shashogo district were the source population for this study.

Cases: "Model households that have achieved basic sanitation services at the household level."

Controls: "Households that have not attained basic sanitation services at the household level."

Inclusion and exclusion criteria

For cases, households that were officially registered for basic sanitation services (improved sanitation facilities) were chosen. All households located in the designated Kebeles of Shashogo district with no and limited sanitation services were used as controls. The study excluded households that were renting and had a residency duration of less than 6 months.

Sample size determination and sampling technique and procedure

In our study, we used the double proportion formula for sample size determination and then calculated the results by using STATA version 15, with the following assumption: a case–control study with a confidence level of 95%, power = 80%, ratio (unexposed: exposed), a 1:2 proportion of unexposed individuals with outcomes from the study, and a 10% nonresponse rate. The estimated sample size for determining basic sanitation services was family size < 5, with the expected proportion of individuals exposed in controls (0.27),[19] female-headed households,[17] and urban residences.[20] The largest sample size was 579 (193 cases and 386 controls), which were included in this study.

In the Shashogo district, which has a total of 34 kebeles, 10 kebeles were randomly selected. A total of 579 households in the Shashogo district were included in the study. Ten kebeles were randomly selected, and 193 households (33.3%) with improved latrine coverage were included in the case group, whereas 386 households (66.7%) without improved latrine coverage were assigned to the control group. Each category of the sample was then proportionally allocated on the basis of their improved latrine coverage in each kebele. The households were subsequently grouped into 2 groups: cases (households with improved latrines) and controls (households without improved latrines). This categorization was based on information from the health post family folder and a survey assessment conducted to determine the status of the latrine facilities in each household. The cases and controls were selected via simple random sampling methods at each level.

Data collection method

The data collection for this study involved interviewer-guided surveys, and interviews were conducted with individual household heads to gather information on demographic characteristics; latrine construction and use; and knowledge, attitudes, and practices related to sanitation.

The survey data were collected through face to face interviews with selected households via a structured questionnaire. The questionnaire was developed on the basis of the specific objectives of the study and covered household socio-demographic and economic characteristics; sanitation facilities; and knowledge, attitudes, and practices related to sanitation.

A structured questionnaire was developed in English and translated into the local language by experts. The questionnaires (see Supplemental Material 1) was designed in the Kobo collection kit, and it was pretested with a small sample of households to identify any issues with clarity, wording, or sequence of questions.

Variables

Dependent variables. Adoption of improved latrine.

Independent variables. Socioeconomic factors, HH income level, educational level, and employment status; demographic factors, such as age, sex, and marital status; infrastructural factors, such as access to land, access to water supply, and lack of construction materials; topographical problems; cultural factors, such as social norms and beliefs and religious practices; knowledge and awareness of the importance of latrine, health education and awareness programs; and sources of information on sanitation.

Data quality assurance

First, the data-collecting instruments were designed in English, translated into the local language Hadiya, and then returned to English to guarantee their consistency. Supervisors and data collectors received suitable training. The training covered the basic objectives of the research, technique of contacting study participants, clarity of each item in the instrument, data collection process, including or excluding the desired data source,

timeliness of data submission, data handling, and time management. Before real data collection, the pre-test was conducted outside of a research area at 5% of the sample size; therefore, based on the pre-test results, minor correction was performed to prevent any ambiguity and guarantee better question responses. Every day, the gathered data were examined for completeness and reviewed. Moreover, we invited experts to review our data collection tools and items and determine whether it was appropriate for assessing our variable of interest to determine face validity.

Data analysis and management

The gathered data were exported and imported into SPSS v27. The data were checked and cleaned before analysis. Descriptive statistics, namely, continuous variables (mean. standard deviation) categorical variables (frequencies and percentages), and a logistic regression model was used to explore relationships between variables. Bivariate analysis was performed to investigate the connection between factors and basic sanitation service coverage. Logistic regression analysis was performed to determine important factors related to basic sanitation service coverage after controlling for any confounding variables. Variables with $P < .2$ in the bivariate analysis were candidates for multivariate analysis. Furthermore, to control for confounding variables, multivariate analysis was performed via a stepwise backwards likelihood ratio. In multivariable binary logistic regression, factors with a $P < .05$ at the 95% confidence interval were considered to be significantly linked with the outcome variables. In addition, we used an independent sample t test to compare the variance similarities and differences in means between the controls and cases concerning the exposure factors. Levene's test for equality of variances was used to determine if the variation between cases and controls was comparable. Moreover, the Hosmer and Lemeshow test was used to determine the goodness of fit ($P = .70$). Furthermore, multicollinearity was examined for each variable, with variance inflation factor (VIF) values less than 10.

Operational definitions

Latrine coverage: A percentage of homes possess basic toilet service facilities.

Basic sanitation services refer to essential facilities and infrastructure that ensure the proper management of human waste and the promotion of hygiene and cleanliness to safeguard the environment and public health.

Basic sanitation service coverage—Basic sanitation service coverage refers to the percentage or proportion of households within a specific area or community that have access to a basic sanitation service facility. Improved latrines often have features such as a ventilated pit, a water seal, and a well-constructed superstructure to promote cleanliness, privacy, and proper waste management. Basic sanitation service coverage is an important indicator of the level of sanitation infrastructure and practices within a community or region and is closely linked to public health outcomes, environmental protection, and overall well-being.

Case: A household that fulfils basic sanitation services and meets specific criteria established for improved sanitation facilities, such as a washable floor, a hand washing facility, a ventilated pit, a water seal, and a well-constructed superstructure to promote cleanliness, privacy, and proper waste management.

Control: A household that lacks basic sanitation facilities may have limited sanitation services, traditional or unimproved latrine facilities, or even no latrine.

Results

The study included 579 households from the Shashogo district, resulting in a 100% response rate. Among these, 193 households were categorized as cases, whereas 386 were designated as controls. The analysis focused on demographic features, basic sanitation coverage, knowledge, attitudes, and practices, emphasizing the primary determinants of basic sanitation facilities.

Socio-demographic characteristics of the respondents

The mean and standard deviation (±SD) age of the study participants were 38.2 (±8.9) years. Among them, 39.6 (±8.9) years were from households with improved latrines/cases, whereas 37.5 (±8.9) years were from households without improved latrines/control groups. With respect to the educational status of the participants, 286 (49.4%) had no formal education, 152 (26.3%) had primary education, and 141 (24.4%) had secondary education or above. When further disaggregating the study participants with no formal education, 80 (28.0%) were in the case category, and the remaining 206 (72.0%) were in the control category. Among the total sample of 579 participants, 64.6% were farmers and 14.5% were business owners; among the cases group, 26.0% were farmers and 34.6% were business owners; and among the controls group, 74.0% were farmers and 25.6% were business owners. The mean (±SD) family size was 6.8 (3.4), and 205 (35.4%) had a family size of 5 or more, with 53 (25.9%) in the case group and 152 (74.1%) in the control group. More than one-third (236, 40.8%) had a monthly income between 3000 and 5365 ETB, and 243 (42.0%) had a monthly income of more than 5365 ETB. Specifically, among the cases, 68 (28.8%) had a monthly income between 3000 and 5365 ETB, whereas 87 (15.8%) had a monthly income of more than 5365 ETB. Among the controls, 168 (71.2%) had a monthly income between 3000 and 5365 ETB, and 156 (64.2%) had a monthly income of more than 5365 ETB (Table 1).

The reasons for constructing/upgrading latrines among households

As indicated in Table 3 below, the primary reasons for constructing/upgrading latrines were reported by a total of 169 individuals (60.8%). Among them, 92 individuals (54.4%) were from households with improved latrines (cases), whereas 77 individuals

Table 1. Socio-demographic characteristics of households in Shashogo district, Hadiya Zone, Central Ethiopia Regional State, Ethiopia, 2023.

VARIABLES	RESPONSE	CASE (N = 193)		CONTROL (N = 386)		TOTAL (N = 579)	
		NO.	(%)	NO.	(%)	NO.	(%)
Age (y)	⩽34	49	(27.2)	131	(72.8)	180	(31.1)
	35-44	93	(35.1)	172	(64.9)	265	(45.8)
	>44	51	(38.1)	83	(61.9)	134	(23.1)
Gender	Male	116	(33.6)	229	(66.4)	345	(61.7)
	Female	76	(35.5)	138	(64.5)	214	(38.3)
Educational status	No formal education	80	(28.0)	206	(72.0)	286	(49.4)
	Primary education	58	(38.2)	94	(61.8)	152	(26.3)
	Secondary and above	55	(39.0)	86	(61.0)	141	(24.4)
Occupation	Farmer	94	(26.0)	268	(74.0)	362	(64.6)
	Employed	36	(59.0)	25	(41.0)	61	(10.9)
	Others	35	(62.5)	21	(37.5)	56	(10.0)
Marital status	Married	178	(34.2)	343	(65.8)	521	(93.2)
	Single	9	(31.0)	20	(69.0)	29	(5.2)
	Divorced	2	(100.0)	0	(0.0)	2	(0.4)
	Widow	4	(57.1)	3	(42.9)	7	(1.3)
Family size	<5	140	(37.4)	234	(62.6)	374	(64.6)
	⩾5	53	(25.9)	152	(74.1)	205	(35.4)
Household monthly income	<3000 ETB	38	(38.0)	62	(62.0)	100	(17.3)
	3000-5365 ETB	68	(28.8)	168	(71.2)	236	(40.8)
	>5365 ETB	87	(35.8)	156	(64.2)	243	(42.0)

(45.6%) were from households without improved latrines (control group). In addition, 97 (34.9%) reported dignity as a cause for 92 (94.8%) patients, and 5 (5.2%) were in the control group. Among the participants who reported latrine ownership in their household to improve their lives and environment, 110 (98.2%) were in the case group, and 2 (1.8%) were in the control group. On the other hand, among 374 (66.8%) participants who provided this reason for not having a latrine or not having an improved latrine, 115 (30.7%) cases and 259 (69.3%) controls reported not having a latrine because they did not have a place to construct one. A total of 230 (41.1%) patients could easily share information with their neighbors; 78 (33.9%) patients and 152 (66.1%) controls were included in the study.

Knowledge, attitudes, and practices related to sanitation

With respect to the participants' knowledge of the issue under consideration, only 208 (37.1%) participants reported having participated in different training activities, such as latrine construction and basic sanitation services; 114 (54.8%) participants and 94 (45.2%) controls reported participating in latrine construction or sanitation training, respectively. Among the total sample of 579 participants, a significant proportion (25.7%) of the cases and 75 (74.3%) controls did not recognize the importance of having a better understanding of the adoption of improved latrines for health and related benefits. On the other hand, 156 (36.9%) cases and 267 (63.1%) controls reported that they considered it to be very important.

In total, 423 (75.5%) participants acknowledged the importance of using a latrine. On the other hand, 442 (79.2%) participants responded positively to this variable; 174 (39.4%) participants and 268 (60.6%) controls reported positive community attitudes toward latrine use and sanitation. Only 251 (44.8%) of the participants reported facing this social pressure or stigma; among these 101 (40.2%) patients and 150 (59.8%) controls reported experiencing social pressure or stigma from not having or using a latrine. In total, 358 (63.9%) participants

reported being influenced by religion in their sanitation practices; among these 151 (42.2%) cases and 207 (57.8%) controls reported that religious influence played a role in their sanitation practices.

As shown in the table below, 391 (70.2%) of the 579 participants reported using the latrine always; among these participants, 138 (35.3%) were in cases, and 253 (64.7%) in the control group reported always using the latrine. Among the study participants, 92 (16.5%) reported using bushes or field defaces, whereas 347 (62.3%) reported using a neighbor's latrine. Among the total sample, 205 (36.6%) reported the presence of a hand washing station near the latrine, 135 (65.9%) reported the presence of a hand washing station near the latrine, and 70 (34.1%) reported the presence of a hand washing station near the latrine.

On the other hand, 73 (13.1%) participants reported facing challenges in their household in terms of sanitation and hygiene. Among them, 50 (68.5%) were cases, and 23 (31.5%) were controls, indicating that cases were more likely to face challenges in this regard. The reported challenges varied, with 13 (18.1%) participants reporting a lack of water for hygiene. This challenge was more prevalent among patients, with 11 (84.6%) patients reporting it compared with only 2 (15.4%) controls. Another challenge reported was a lack of awareness about latrine use and sanitation, with 15 (20.8%) participants reporting it. Among them, 8 (53.3%) were cases, and 7 (46.7%) were controls. Limited materials for latrine construction were identified as a challenge by 27 (37.5%) participants, with 18 (66.7%) cases and 9 (33.3%) controls facing this issue. Finally, social pressure and stigma affecting hygiene practices were reported as challenges by 17 participants for those who were not constructing and using latrines properly (23.6%), with 12 (70.6%) participants and 5 (29.4%) controls experiencing this challenge. These findings highlight the various challenges related to sanitation and hygiene in households, with cases being more affected in some areas (Table 2).

Patients and controls with a mean difference

We used an independent sample t test to compare the variance similarities and differences in means between the controls and cases concerning the exposure factors. Levene's test for equality of variances was used to determine if the variation between cases and controls was comparable. More precisely, if the variances were determined to be the same ($P > .05$), they were deemed comparable. However, if the variances were unequal ($P < .05$), they were presumed to be different. To ascertain the mean difference between controls and patients, a t test was used similarly. The significance of the differences was evaluated via various P-values. When the P-value was less than .05, there was a statistically significant difference between the means of the 2 sample groups (controls and cases). Since almost every test variable had a variance larger than 4, we used a one-sample t test under the assumption of unequal variance.[21] Exposures related to the adaptation of improved latrine coverage among households, attitudes toward the adoption of improved latrines ($P < .000$), knowledge about the adoption of improved latrines ($P < .000$), receiving training on sanitation and hygiene ($P < .000$), lack of necessary materials for latrine construction ($P < .000$), access to land for latrine construction ($P < .000$), family size ($P < .004$), educational status ($P < .033$), topographical challenges for latrine availability ($P < .000$), social pressure/stigma not having/using latrines ($P < .010$), religious influence on sanitation practices ($P < .000$), traditional beliefs/practices and attitudes toward sanitation ($P < .002$), government support for latrine construction ($P < .000$), and support from local organizations for latrines ($P < .000$) (Table 3).

Determinants of the adoption of an improved latrine

We studied the relationships between the variables affecting the adoption of improved latrines among families in the Shashogo district and the associations with behavioral and environmental factors and socio-demographic factors influencing the adoption of improved latrines. According to the bivariate analysis, variables such as age, educational status, family size, household monthly income, access to land for latrine construction, lack of necessary materials for latrine construction/upgrade, training on sanitation and hygiene, knowledge about the adoption of improved latrines, and attitudes toward the adoption of improved latrines had $P < .25$. Therefore, these variables were transferred for multivariate regression to explore their associations with the adoption of improved latrines. After controlling for confounders in the multivariate analysis, the adoption of improved latrines among households was found to be associated with a greater average monthly income (AOR = 1.841, 95% CI (1.043, 3.251)) for the heads of household who earned 5365 ETB and a higher average monthly income than for those who earned low monthly income.

The study participants who had access to the necessary materials for latrine construction/upgrade were approximately 3.5 times more likely to adopt improved latrines among households with AOR = 3.477 (95% CI = 1.314, 9.202) than among those who lacked access to the necessary materials for latrine construction. In addition, a study participant who had training in sanitation and hygiene (AOR = 4.744, 95% CI (2.984, 7.542)) and who had sufficient knowledge about the adoption of improved latrine (AOR = 2.020, 95% CI (1.125, 3.628)) was found to be a determinant of the adoption of improved latrine among households (Table 4).

Discussion

This study evaluated the determinants of improved household latrine coverage in Shashogo District, Hadiya Zone, Central Ethiopia. Exposures associated with increased adaptation to improve latrine coverage among households included attitudes

Table 2. Practices related to sanitation among households in Shashogo district, Hadiya zone, Central Ethiopia Regional State, Ethiopia, 2023.

PRACTICES RELATED TO SANITATION		CASE (N = 193)		CONTROL (N = 386)		TOTAL (N = 579)	
	RESPONSE	NO.	(%)	NO.	(%)	NO.	(%)
Frequency of latrine use	Rarely or never	1	(2.0)	48	(98.0)	49	(8.8)
	Sometimes	36	(41.4)	51	(58.6)	87	(15.6)
	Most of the time	16	(53.3)	14	(46.7)	30	(5.4)
	Always	138	(35.3)	253	(64.7)	391	(70.2)
Actions when no latrine available	Use the bushes or fields	36	(39.1)	56	(60.9)	92	(16.5)
	Use a neighbor's latrine	100	(28.8)	247	(71.2)	347	(62.3)
	Hold it in until available	47	(45.2)	57	(54.8)	104	(18.7)
	Other	8	(57.1)	6	(42.9)	14	(2.5)
Safe disposal of waste	No, never	9	(10.0)	81	(90.0)	90	(16.1)
	Sometimes,	36	(75.0)	12	(25.0)	48	(8.6)
	Yes, most of the time	17	(29.3)	41	(70.7)	58	(10.4)
	Yes, always	131	(36.1)	232	(63.9)	363	(64.9)
Frequency of latrine cleaning	Daily	138	(44.7)	171	(55.3)	309	(58.4)
	Weekly	18	(20.0)	72	(80.0)	90	(17.0)
	Monthly	11	(21.6)	40	(78.4)	51	(9.6)
	Other	26	(32.9)	53	(67.1)	79	(14.9)
Responsibility for latrine cleaning	Adult male	25	(26.3)	70	(73.7)	95	(17.0)
	Adult female	34	(34.7)	64	(65.3)	98	(17.6)
	All adults	120	(35.1)	222	(64.9)	342	(61.3)
	All family members	13	(72.2)	5	(27.8)	18	(3.2)
	Hired help	1	(20.0)	4	(80.0)	5	(0.9)
Presence of hand washing station near latrine	No	58	(16.3)	297	(83.7)	355	(63.4)
	Yes	135	(65.9)	70	(34.1)	205	(36.6)
Challenges faced in sanitation and hygiene	No	142	(29.2)	344	(70.8)	486	(86.9)
	Yes	50	(68.5)	23	(31.5)	73	(13.1)

toward the adoption of improved latrines ($P < .000$), knowledge about the adoption of improved latrines ($P < .000$), training on sanitation and hygiene ($P < .000$), lack of necessary materials for latrine construction ($P < .000$), access to land for latrine construction ($P < .000$), family size ($P < .004$), educational status ($P < .033$), topographical challenges for latrine availability ($P < .000$), social pressure/stigma not having/using latrines ($P < .010$), religious influence on sanitation practices ($P < .000$), traditional belief/practice and attitudes toward sanitation ($P < .002$), government support for latrine construction ($P < .000$), and support from local organizations for latrines ($P < .000$), which were significantly associated with the adoption of improved latrines.

This study presented contemporary knowledge and practices related to latrine use. A quarter of the study participants did not acknowledge the importance of using a latrine, and nearly one-third of them had not yet used a latrine. This study's findings are greater than those of similar studies in southern Ethiopia and the Amhara region.[25,26] A possible explanation could be the temporal issue, as the studies in both areas were conducted earlier than ours, and the intervention over time has produced some improvements.

This study revealed that the adoption of improved latrines among households was more likely to be associated with heads of household earning 5365 ETB and having a higher average monthly income than with heads of household earning low

Table 3. Independent *t* test analysis of predictors of improved latrine quality among households in Shashogo district, Central Ethiopia Region, Ethiopia, 2023.

INDEPENDENT SAMPLES TEST										
INDEPENDENT SAMPLES TEST		LEVENE'S TEST FOR EQUALITY OF VARIANCES		*T* TEST FOR EQUALITY OF MEANS						
		F	SIG.	*T*	DF	SIG. (TWO-TAILED)	MEAN DIFFERENCE	STD. ERROR DIFFERENCE	95% CONFIDENCE INTERVAL OF THE DIFFERENCE	
									LOWER	UPPER
Occupations	EVA	7.548	0.006	−1.567	441	0.118	−.086	0.055	−0.194	0.022
	EVAN			−1.484	112.093	0.141	−.086	0.058	−0.201	0.029
Attitude toward adoption of improved latrine	EVA	202.054	0.000	−6.489	577	0.000	−0.252	0.039	−0.329	−0.176
	EVNA			−6.868	553.396	0.000	−0.252	0.037	−0.325	−0.180
Knowledge about the adoption of improved latrine	EVA	241.921	0.000	−6.170	577	0.000	−0.254	0.041	−0.335	−0.173
	EVNA			−6.907	448.996	0.000	−0.254	0.037	−0.326	−0.182
Received training on sanitation and hygiene	EVA	97.526	0.000	−10.261	577	0.000	−0.387	0.038	−0.461	−0.313
	EVNA			−9.642	352.603	0.000	−0.387	0.040	−0.466	−0.308
Lack of necessary materials for latrine construction	EVA	918.844	0.000	−7.796	577	0.000	−0.354	0.045	−0.443	−0.265
	EVNA			−11.414	440.101	0.000	−0.354	0.031	−0.415	−0.293
Access to land for latrine construction	EVA	366.076	0.000	−7.177	577	0.000	−0.293	0.041	−0.373	−0.213
	EVNA			−8.282	478.834	0.000	−0.293	0.035	−0.362	−0.223
Household monthly income	EVA	8.680	0.003	1.659	334	0.098	0.092	0.055	−0.017	0.201
	EVNA			1.611	175.018	0.109	0.092	0.057	−0.021	0.204
Family size	EVA	37.579	0.000	2.841	577	0.005	0.116	0.041	0.036	0.196
	EVNA			2.925	456.289	0.004	0.116	0.040	0.038	0.194
Educational status	EVA	15.612	0.000	−2.191	436	0.029	−0.102	0.046	−0.193	−0.011
	EVNA			−2.138	287.358	0.033	−0.102	0.048	−0.196	−0.008

(Continued)

Table 3. (Continued)

INDEPENDENT SAMPLES TEST										
INDEPENDENT SAMPLES TEST		LEVENE'S TEST FOR EQUALITY OF VARIANCES		*T* TEST FOR EQUALITY OF MEANS						
		F	SIG.	*T*	DF	SIG. (TWO-TAILED)	MEAN DIFFERENCE	STD. ERROR DIFFERENCE	95% CONFIDENCE INTERVAL OF THE DIFFERENCE	
									LOWER	UPPER
Age	EVA	13.094	0.000	−1.751	443	0.081	−0.079	0.045	−0.167	0.010
	EVNA			−1.774	401.447	0.077	−0.079	0.044	−0.166	0.009
Access to safe water supply for latrine use	EVA	4.892	0.027	−1.119	558	0.264	−0.045	0.040	−0.124	0.034
	EVNA			−1.118	551.369	0.264	−0.045	0.040	−0.124	0.034
Topographical challenges for latrine availability	EVA	0.354	0.552	−7.423	558	0.000	−0.409	0.055	−0.518	−0.301
	EVNA			−7.307	104.031	0.000	−0.409	0.056	−0.520	−0.298
Social pressure/stigma not having/using latrine	EVA	23.652	0.000	−2.603	558	0.009	−0.105	0.040	−0.184	−0.026
	EVAN			−2.584	517.983	0.010	−0.105	0.041	−0.184	−0.025
Religion's influence on sanitation practice	EVA	134.014	0.000	−5.228	558	0.000	−0.214	0.041	−0.294	−0.134
	EVNA			−5.517	485.772	0.000	−0.214	0.039	−0.290	−0.138
Traditional beliefs/ practices and attitudes toward sanitation	EVA	32.094	0.000	−3.086	558	0.002	−0.124	0.040	−0.203	−0.045
	EVNA			−3.060	516.603	0.002	−0.124	0.040	−0.203	−0.044
Government support for latrine construction	EVA	287.410	0.000	−8.604	558	0.000	−0.329	0.038	−0.404	−0.254
	EVNA			−9.015	557.821	0.000	−0.329	0.036	−0.401	−0.257
Support from local organizations for latrine		277.096	0.000	−7.565	558	0.000	−0.299	0.039	−0.376	−0.221
				−8.126	539.970	0.000	−0.299	0.037	−0.371	−0.226

Abbreviations: EVA, equal variances assumed; EVNA, equal variances not assumed.

Table 4. Determinants of the adoption of improved latrine among households in Shashogo district, Hadiya zone, Central Ethiopia Regional State, Ethiopia, 2023.

	CASE		CONTROL		BIVARIATE	MULTIVARIATE	*P*-VALUE
	NO.	(%)	NO.	(%)	COR (95% CI)	AOR (95% CI)	
Age (y)							
⩽34	49	(27.2)	131	(72.8)	1	1	
35-44	93	(35.1)	172	(64.9)	1.643 (1.018, 2.652)	1.630 (.933, 2.848)	0.086
>44	51	(38.1)	83	(61.9)	1.136 (0.739, 1.748)	1.462 (0.879, 2.430)	0.143
Educational status							
No formal education	80	(28.0)	206	(72.0)	1	1	
Primary education	58	(38.2)	94	(61.8)	1.647 (1.076, 2.521)	1.252 (0.727, 2.155)	0.417
Secondary & above	55	(39.0)	86	(61.0)	1.036 (0.647, 1.660)	1.147 (0.657, 2.002)	0.631
Family size							
<5	140	(37.4)	234	(62.6)	1.716 (1.178, 2.500)	1.254 (0.796, 1.977)	0.329
⩾5	53	(25.9)	152	(74.1)	1	1	
Household monthly income							
<3000 ETB	68	(28.8)	168	(71.2)	1	1	
3000-5365 ETB	87	(35.8)	156	(64.2)	1.099 (0.679, 1.779)	1.476 (0.847, 2.572)	0.169
>5365 ETB	38	(38.0)	62	(62.0)	1.514 (0.925, 2.478)	1.841 (1.043, 3.251)	0.035*
Access to land for latrine construction							
No	23	(13.0)	154	(87.0)	1	1	
Yes	170	(42.3)	232	(57.7)	4.906 (3.034, 7.935)	1.807 (0.947, 3.450)	0.073
Lack of necessary materials for latrine construction/upgrade							
Yes	7	(5.6)	118	(94.4)	1	1	
No	186	(41.0)	268	(59.0)	11.699 (5.336, 25.651)	3.477 (1.314, 9.202)	0.012*
Had training on sanitation and hygiene							
No	73	(19.6)	300	(80.4)	1	1	
Yes	120	(58.3)	86	(41.7)	5.734 (3.933, 8.360)	4.744 (2.984, 7.542)	<0.001*
Knowledge about adoption improved latrine							
Insufficient	28	(15.7)	150	(84.3)	1	1	
Sufficient	165	(41.1)	236	(58.9)	3.745 (2.389, 5.873)	2.020 (1.125, 3.628)	0.019*
Attitude toward adoption improved latrine							
Negative	40	(17.9)	184	(82.1)	1	1	
Positive	153	(43.1)	202	(56.9)	3.484 (2.332, 5.204)	1.021 (0.586, 1.780)	0.940

NB.
*$P < .05$ was considered to indicate statistical significance for multiple variables.

monthly income. This finding was consistent with the findings of studies from the Gurage Zone, Southern Ethiopia,[22] Kombolcha Town, Northeast Ethiopia,[23] and Ethiopia demographic and survey analysis[20] in a rural village of Eastern Nepal,[24] Lusaka Zambia,[25] and India.[26] This could be because the association between higher income and the adoption of

improved latrines among households could be that the better the income is, the greater the degree of investment in the adoption of improved income. Having a higher income allows households to afford the necessary materials and construction costs associated with improved latrines.

This study revealed that the study participants who had access to the necessary materials for latrine construction/upgrading were more likely to adopt improved latrines among households than those who lacked access to the necessary materials for latrine construction. This study finding was in line with reports from the Machakel district in Ethiopia,[17] Ambo town, West Shoa Zone, Ethiopia,[27] and Negele Town, Southeast Ethiopia.[14] The possible reason for this could be the association between having access to necessary materials for latrine construction or upgrades and the adoption of improved latrines among households. If households do not have access to the necessary materials, it becomes difficult for them to construct or upgrade their latrines.

In addition, training on sanitation and hygiene and having sufficient knowledge about the adoption of improved latrines were found to be strong determinants of the adoption of improved latrines among households compared with their counterparts. These findings are consistent with findings from similar studies in other rural parts of Ethiopia,[28] such as Kombolcha Town, Northeast Ethiopia[23]; Northeast Amhara, Ethiopia[19]; and households in Bishoftu Town, Ethiopia.[29] This could be due to the association between receiving training on sanitation and hygiene, creating sufficient awareness and knowledge about the importance of sanitation and hence leading to the adoption of improved latrines. When individuals receive training on sanitation and hygiene, they gain knowledge about the importance of improved latrines and how to properly use and maintain them. This knowledge empowers them to make informed decisions and act in adopting improved latrines.

In our study, knowledge about improved latrines was identified as a determinant of the adoption of improved latrines among households compared with their counterparts. This finding was significantly associated with the dependent variable. This result was comparable to those of other studies.[19,30,31] A possible explanation could be that households that are aware of and knowledgeable about infectious disease and control may better practice hygiene by constructing improved latrines.

Compared with illiterate households, households with better educational status ($P < .033$) practised greater adoption of improved latrine. This result was consistent with existing evidence from Amhara, Ethiopia,[31,32] the EDHS data analysis report,[20] and southern Ethiopia.[30] A possible justification might be that more educated households may have the opportunity to access information about communicable diseases and how to prevent and control them and then may accept counseling about improved latrine construction offered by community health workers and easily adopt improved latrines. The findings of this study imply the need for multiple-sector coordinated and collaborative actions, as the factors influencing the adoption of improved sanitation are multidimensional. Therefore, strengthening the strategic direction for multi-sectoral collaboration is one of the policy priorities for effective intervention.

Strengths and limitations of the study

In this study, we used an observational study design, and for data collection, we utilized standard data collection tools. To increase data quality, we considered a digital data collection form, namely, the Kobo tool, which provides a digital platform for efficient and accurate data collection, management, and analysis. The limitation of the case–control study design is that it relies on retrospective data collection, which may introduce recall bias and social desirability bias.

Conclusions and Recommendations

This study revealed that the adoption of improved latrines in the study area was progressive but still lower than that reported in other studies. However, households with better income, access to necessary materials, training on sanitation and hygiene, and sufficient knowledge about improved latrine adoption presented higher rates of adoption. Moreover, the study has also identified challenges in addition to adoption and sustainable use, which include a lack of water supply, lack of awareness about latrine use and sanitation, limited materials for latrine construction, and social pressure and stigma affecting hygiene practices. This was a case–control study, which indicated that the cases had better adoption than the controls did. As such, the findings highlight the need for government and health officials' actions to address these challenges by focusing on financial resources and access to materials and raising human awareness to promote the adoption of basic sanitation services for better sanitation and hygiene practices among households by taking the lessons of the cases of how they adopted better to their counterpart controls.

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Author Contributions

All the authors contributed equally (research design, data collection, supervision, funding requests, data analysis, management, report writing, draft manuscript writing, and approval of the final manuscript).

Ethical Considerations

Ethical approval was granted from the Yanet-Liyana College of Health Sciences ethical review committee (Ref.# LHC/YLCHS/OGL/1252/16 and Date 25/10/2023), and permission letters were taken from the Hadiya zone to the Shashogo district. Confidentiality and anonymity were ensured by removing any personally identifiable information from the collected data.

Supplemental Material

Supplemental material for this article is available online.

Data Availability

We confirm that we have the original data from the corresponding author.

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