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Women's Access to and Utilization of Sanitation and their Determinant Factors in Some Selected Rural Areas of East Gojjam Zone, North West Ethiopia

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Abstract

This study aimed to examine women's sanitation access and utilization level and their determinants in some selected rural areas of East Gojjam Zone. The research employed cross sectional study design and data was collected from 380 women selected through multistage cluster sampling technique. Proportional odds model and partial proportional odds model were used to estimate the association between different factors and women's sanitation access and utilization level. The result indicated that out of 380 sampled women, about 42.6% have high sanitation access compared with 34.7% medium and 22.6% low respectively. Despite this however; about 50.9% respondents have low sanitation utilization suggesting a mismatch between sanitation access at household level and women's utilization status. Household size, access to sanitation facilities, and knowledge about the benefit of latrine utilization were found to be statistically significant determinants of women's sanitation utilization while marital status, district, household income, participation in women health development team, and dependency ratio were found to be determinants of sanitation access. The study suggests that besides promotions to increase sanitation facility availability, monitoring on the utilization of the facilities need to be strengthened. Income creation capacity of women and their households should be strengthened as well.

Keywords: women, sanitation, access, utilization, Machakel, Gozamin, East Gojjam zone

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Background

Sanitation access and utilization have become the most pressing development and human right concerns of the 21stc and it has long received broader international recognition including through the 1978 Alma Ata primary health care declaration, the 2000 declaration of the millennium development goals [MDG], the 2010 human right to sanitation and water framework, and the 2015 sustainable development goals [SDG] (UNICEF & WHO, 2020).

In the year 2000, United Nation [UN] and its member states have agreed to reduce the number of people who do not have access to latrine by half between the year 1990 and 2015 under the umbrella of MDG. The same community has again promised to achieve universal access to sanitation by 2030 under the SDG. The SDG in its specific target 6.2 further recognized the need to provide special attention to the sanitation needs of women and girls. Additionally, the UN in its 2010 human right to sanitation and water framework has declared universal access to sanitation and lack of access to the same was considered as a violation of human survival (Ohwo, 2019; Hall et al., 2013).

The international recognition given to sanitation and the persistent inequalities in sanitation access and utilization in the country has made Ethiopia to introduce its rural health extension program in 2004. The program aimed to provide health awareness and promotion services to the community on different issues, of which, sanitation is a part. Sanitation under this program is provided as a package consisting of different sub packages as healthy housing, construction and use of latrine, and safe solid and liquid waste disposal practices. The program also gives greater emphasis to women and targeted them as both service providers and beneficiaries. As service providers, health extension workers are deliberately made to be women and as beneficiaries, women are given greater responsibility to protect their own and their communities' health through the adoption of better health practices. In order to ignite a change in sanitation behaviour, the government further introduced community- led total sanitation and the national hygiene and environmental health strategies in 2009 and 2016 respectively. Sanitation was also incorporated in the government's long-term strategic plans namely the growth and transformation (2015-2020) and the ten year development plans (2021-2030). These global and national efforts have brought a notable achievement in improving access to sanitation worldwide. Globally, access to latrine has increased from 54% in 1990 to 68% in 2015 (UNICEF & WHO, 2015). Ethiopia has also achieved the largest decrease in the number of people practicing open defecation from 44 million (92%) in 1990 to 28 million (29%) in 2015

(WHO & UNICEF, 2015). In 2017, access to latrine was reported to be 63% (Desale, 2021).

Despite the recognitions put upon it and the progresses made so far, lack of sanitation is still a tenacious issue and a particular concern for women. Neither the world did meet its MDG of reducing the number of people without access to sanitation by half in 2015 nor did Ethiopia do it. In 2015, when MDG has come to an end and was replaced by SDG, about 946 million people worldwide were without access to any kind of sanitation facilities (UNICEF & WHO, 2015). Likewise; one in three (32%) households in Ethiopia had no toilet facility at all (39% in rural & 7% in urban areas) (CSA & ICF, 2016, p. 11; World Health Organization [WHO], 2016, para. 4). On a regional basis, Amhara region has the lowest sanitation access score compared to all regions in Ethiopia (Muluken et al., 2020).

Lack of access to sanitation facilities cost the global economy around US$182.5 billion in 2010 and this has increased to US$222.9 billion in 2015 (Oxford Economics, 2016, p. 5). Ethiopia has also incurred around US$570 million (13.5 billion birr) annually and this incurred lose is estimated to be 2.1% of the country's GDP (Hutton & Chase, 2016 cited in Desale, 2021). Lack of access to sanitation leads to vicious cycle of social, economic, and environmental costs while access to it has a multiplier effect in improving health, dignity, safety, better education attainment and achieving gender equality (Oxford Economics, 2016, p. 5).

Many researches have been conducted in Ethiopia and elsewhere to show rural-urban variations in sanitation access and utilization as well as variations among different households and determinant factors. And, yet, the required attention is not provided for women's sanitation access and utilization status and determinant factors. In many sanitation related studies made at household level, sanitation access and utilization were assumed to be equal for all household members. This, however; is not always the case. Different factors play against women's equitable access and utilization of sanitation facilities. But, there is no empirical evidence on women's sanitation access and utilization status and influencing factors in Ethiopia in general and in East Gojjam zone in particular. Given the international agreement of universal access to sanitation by 2030, and provided that women have specific sanitation needs, this gap in knowledge has created a particular concern. This study was, therefore, aimed to fill the dearth of knowledge and evidence on the issue.

Problem statement

Lack of access to sanitation remains the biggest development challenge worldwide and become a particular concern for women. Women have specific sanitation needs as an individual for themselves and as care takers of their families. Menstruation, pregnancy, childbirth and associated roles all made women to have specific sanitation needs. Traditional gender divisions of labor also make women to be responsible for the sanitation needs of their families (Sweetman & Medland, 2017). Lack of sanitation infrastructures for the whole household places the burden on women as carers of children and sick family members. In cases where sanitation facilities are not available, women are responsible for the disposal of human wastes, and this exposes them to different kinds of disease (Bill & Malinda Gates Foundation, 2018). Lack of latrine also makes women to wait for dark to eliminate their wastes and this is reported to cause urinary tract infection, stress and discomfort (SIDA, 2015). Risk of sexual violence and the stress associated with that risk increases when women travel long distances away from home to defecate (Sommer, et al., 2015 cited in Graham, et al., 2016). Pre-term births are also reported to be partly linked with open defecation practices (Badran et al., 2015 cited in Bill & Melinda Gates Foundation, 2018).

Women experience more sanitation related time poverty than men (Kilsby, 2012). Women's role in the waste management activities such as sweeping, collection, carrying and disposing of the trash is done every day and it is done together with other domestic and child care responsibilities. Lack of separate dwelling for people and domestic animals and exposure to animal faeces has been associated with increased risk of diarrhea and trachoma as it provides breeding sites for flies that transmit infection diseases (Adane et al., 2015).

In sum, women are often the most vulnerable to the effect of poor sanitation. Besides, the health risks, sanitation related activities take women's time and energy which could be used for income generating tasks for their households, and other community activities, as well as for schooling and leisure.

Irrespective of the important links women have with sanitation, empirical studies on their level of sanitation access and utilization are limited. Most available empirical studies have focused on latrine as the single most important measurement of sanitation access and utilization, and other dimensions of sanitation namely domestic wastes are ignored altogether. This study has, therefore; tried to understand women's sanitation access and utilization status and their determinant factors comprehensively covering ranges of sanitation indicators.

Objective

The general objective of this study was to examine women's sanitation access and utilization level and their determinant factors.

Significance

The study will be utilized for designing development interventions, input for tracking progress towards the achievement of sanitation related SDG, serve as a base for initiating another study and contribute theoretical and methodological knowledge to the field.

Limitation

The research has focused on the experience of women, and the experiences of men are not included. Thus, has limitation of taking the balanced view of both sexes. Besides, factor which numbers cannot measure but affects women's sanitation access and utilization such as technological and gender related factors were not considered in this article and thus has limitation of incorporating all set of factors affecting women's sanitation access and utilization status.

Literature review

Conceptualizing sanitation

The term sanitation is a poorly defined concept. In many sanitation related studies, projects and interventions, sanitation is seen as synonymous with hygiene and/or water and used interchangeably. This interchangeable usage of seemingly similar but different concepts has brought inconsistencies in defining the term. In their study of creating demand for sanitation and hygiene through community health clubs in Zimbabwe, Waterkeyn & Cairncross (2005) have used sanitation and hygiene concepts interchangeably. Though their title says sanitation and hygiene, the authors did not give any conceptual clarity about what they meant by sanitation and that of hygiene. They have used sanitation and hygiene indicators such as availability of ladle, individual cups, plates, pot racks, borehole water, rubbish pit, latrine and hand wash facility in mix and labeled them as hygiene.

Similarly, in their study of knowledge, attitude, and practices on water, sanitation, and hygiene among rural residents in Tigray region, Abera et al. (2020) have mixed the three concepts and used a generic term WASH without providing a clear conceptualization of sanitation, hygiene and water. More so, Aderajew et al. (2020) in their study of determinants of sanitation and hygiene status among food establishments in Addis Ababa have used sanitation and hygiene as alternative word and did not provide clear indicator for each of the concepts. This mixed use

of the term sanitation and hygiene altogether makes it difficult to clearly understand them, measure and know sanitation and hygiene performances separately.

Sanitation and hygiene are related concepts and they both lead to improved health status and cleanliness. The two terms are, however, different. The joint monitoring program of WHO and UNICEF has defined sanitation as the provision of latrine for safe management and disposal of human waste while hygiene is interpreted as handwashing, menstrual hygiene management and food hygiene. Similarly, Giné et al. (2013) have defined sanitation as latrine and defined hygiene as it consists of drinking-water hygiene, food hygiene, personal hygiene and domestic household hygiene. Conversely, according to United Nations Children's Fund [UNICEF] (1997), sanitation is not simply about latrines, but also includes domestic liquid and solid waste management.

Pandve (2008) and Rautanen (2010), as cited in Montoute and Cashman (2015), have also stated that sanitation falls under the broader definition of environmental sanitation and refers to issues such as flood management, collection and disposal of garbage and removal of human excreta while the World Health Organization (1988) and the rural health extension program of Ethiopia included the need to have a separate dwelling for people and domestic animals as one part of the sanitation movement.

Definitions of access and utilization

Access and utilization are the most commonly used words in development-related literature particularly in agricultural extension and health promotion fields. Their conceptual difference and similarity are, however unclear. Though, the title of many scholarly works says access and utilization, their content inside has failed to provide clarification of what access means and what utilization denotes. In some literature, access and utilization are seen as synonymous and used interchangeably while in others, they are defined and measured in their own right. Donabedian (1972), for instance, has defined health service access as "the use of services and not simply the presence of a facility" (cited in Aday & Andersen, 1974, p. 219) while Fiedler (1981) and Oliver & Mossialos (2004) stated that access should not be equated with the use of services and shows how access and utilization are different concepts. According to Fiedler, access is a prerequisite for utilization and he termed the concept of access as potential utilization (opportunity to use the facilities available) and utilization as the actual use of the facilities or realized access. Oliver & Mossialos (2004) have also argued that the availability of health facilities does not provide evidence of people's utilization of the facilities, but

indeed utilization is evidence that access has been achieved. Consistent with this, Lopez et al. (2019) stated that latrine access does not imply use as many individuals who own latrines do not consistently use them.

The concept of access itself is complex and sometimes used interchangeably with other concepts such as equity, availability, and coverage, and equating it with utilization is problematic. Penchansky & Thomas (1981), in their theory of access, have provided five dimensions of access; that includes availability, accessibility, affordability, accommodation, and acceptability. This study has also viewed access and utilization as different concepts and defined access as the availability or the physical existence of sanitation facilities while utilization is seen as the practice or the actual utilization of the facilities by women.

Measuring sanitation access and utilization

Measuring sanitation access and utilization has become a contentious, difficult and complicated endeavor. The literature presents the measurement of sanitation access and utilization in different ways, which in turn makes it difficult to measure it in a commonly accepted or standardized manner.

Many limitations have been found in the empirical literature on measuring sanitation access and utilization. Lack of direct indicators to measure sanitation utilization and the use of the term access as an alternative expression of utilization is the first limitation identified. For instance, Abate et al. (2018) have studied about the availability and utilization of sanitation facilities in Tigray region and they have used the presence of latrine, hand washing facility near the latrine and presence of improved drinking water source as indicators of sanitation access while sanitation utilization was measured by using proxy indicators of the presence of water for hand washing, presence of soap on the hand washing facility, presence of cover/slab for the latrine hole, absence of any observable faeces around the compound, absence of any observable faeces around the squat hole, and if the latrine is shared or not. The indicators used to measure utilization are not utilization measures per se. The mere presence or absence of a facility cannot prove for the fact that people are using or not using them. People in rural areas, most of the time, do not leave soap in the outdoor as it could be eaten by livestock and this could not provide reliable evidence that people are not using soap. Similarly, people could carry water to the latrine via a container instead of putting water in the handwashing facilities. The shared or unshared nature of latrine ownership does not also indicate people's utilization or otherwise.

Similarly, Sara and Graham (2014), in their study of ending open defecation in rural Tanzania, have used latrine coverage at household level as indicator of

latrine utilization. The limitation of their study is that latrine availability is not an indicator of latrine utilization as there are different factors that inhibit people's utilization of latrine.

On the contrary, Waterkeyn and Cairncross (2005) have measured access and utilization independently and the indicators used to measure them were also different. The authors have measured sanitation access by using availability of ladle, individual cups, plates, pot racks, borehole water, rubbish pit, latrine and hand wash facility as indicators while sanitation utilization was measured by whether individuals have used the ladle or not, covered their drinking water or not, swept their yard or not, and if they have used the hand wash facility or not. The limitation of their study is that they have mixed sanitation and hygiene and there is no clarity about which one is sanitation and which one is hygiene as indicated in the title of their research.

Nyanza et al. (2018) studied determinants of access to and utilization of water and sanitation facilities among pastoralists in the rural areas of northern Tanzania. The strength of their study is that they have provided clear indicators of how they have measured water and sanitation.

The use of a single indicator, latrine, to measure sanitation access and utilization is also another limitation found in the literature. The UN, in both its MDG and SDG, has identified latrine as an important indicator of measuring access to sanitation while other sanitation facilities, such as domestic waste disposal pits are ignored.

Lack of empirical evidence on women's sanitation access and utilization status particularly in a specific Ethiopian context is the third limitation found in the literature. Kiros et al. (2020), in their study of latrine ownership and its determinants in rural villages of Tigray region, have measured latrine utilization by disaggregating family members as children and adults. Though the study is a good evidence to understand the age variation in sanitation utilization, it did not show the gender aspect because all adults do not have similar latrine access and utilization experience. A similar study by Sara and Graham (2014) in rural Tanzania has measured practice of open defecation and latrine use at household level but the study did not consider gender differences in latrine utilization. The only evidence that this article was able to find regarding gender based latrine utilization experience was made by Lopez et al. (2019) in rural coastal Ecuador. The latter show within-household gender based latrine utilization variability.

Factors associated with sanitation access and utilization

Many researches have been conducted focusing on the determinants of peoples' access to and utilization of sanitation facilities in Ethiopia and elsewhere. Fikralem et al. (2017) have studied the socio-ecological barriers to the adoption and consistent use of sanitation facilities in rural Ethiopia. The authors have used a qualitative research method employing focus group discussion (FGD) and in-depth interview data collection techniques. The strength of their study is that it has identified a wide range of factors affecting people's adoption and utilization of sanitation facilities though causal relationship could not be established. Similarly, Aiggan and Abel (2021) studied about barriers to the adoption and utilization of improved latrine facilities in rural area of Wonago district in Southern Ethiopia. The authors have used a qualitative research approach employing key informant interviews and focus group discussions, and found a multitude of factors affecting latrine adoption and use though causal relationship was not established.

Shewayiref et al. (2021) also studied about the determinants of water source use, quality of water, sanitation and hygiene perceptions among urban households in North-West Ethiopia while Aderajew et al. (2020) studied about the determinants of sanitation and hygiene status among food establishments in Addis Ababa city and both studies were conducted in urban context and they are different from this study.

Theoretical framework

Universal access to sanitation has become the trending issue in the global development and in developing countries in particular. Despite the given recognitions, lack of access to sanitation facilities is still a question that remains unanswered and different scholars have proposed different factors that work against people's improved access to and utilization of sanitation facilities. For this article, however, the integrated behavioral model for water, sanitation and hygiene (IBM-WASH) developed by Dreibelbis et al. in 2013 was chosen.

IBM-WASH provided multi-level and multi-dimensional factors that influence people's access to and utilization of water, sanitation, and hygiene facilities in developing countries. The multi-dimensional factors, as provided in table-1 below work at five aggregate levels; structural/societal, community, household, individual, and habitual. The intersections of multi-level and multi-dimensional factors are depicted in the table and the model provides key concepts that give direction to the present study.

Table 1: The integrated behavioral model for water, sanitation, and hygiene

Levels	Contextual factors	Psychosocial factors	Technological factors/ attributes of a product
Habitual	Favorable environment for habit formation	Existing habitual behavior, expectation	Easy of routine use of the product
Individual	Wealth, age, education, occupation	Knowledge, perceived threat	Perceived cost, value, convenience and other strength and weakness of the product
Household	Roles & responsibilities Household structure, division of labor , available space Limited credit, poor soil conditions	Aspiration, norms	modelling/demonstration of use of products
Community	Access to market, access to resources, physical environment	Shared values, collective efficacy, stigma, social integration	Location, availability, maintenance of the product
Societal	Policy & regulation, climate & geography	Leadership/advocacy, cultural identity	Manufacturing, financing, distribution of the product, promotion of products

Source: Dreibelbis et al. (2013, p. 3).

As indicated above, contextual factors include access to markets and products, access to enabling resources, such as latrine for defecation, socioeconomic and demographic characteristics, household size and composition, and the natural environment (Dreibelbis et al., 2013).

The psychosocial factors, on the other hand, consist of factors such as interpersonal interactions and social ties, exposure to media and health promotion activities, education, knowledge or individual's understanding and awareness about the health risk of not practicing the appropriate sanitation behavior (Mosler, 2012; Sharma & Romas, 2012). People are ready to use sanitation facilities if they believe that they will acquire disease, such as trachoma and or diarrhea and if they

believe that the illness has serious consequences for causing death or injury, adverse effects on family, job or relationship. If a person does not perceive the illness or the condition as serious, he or she will not use toilets or practice safe disposal of domestic wastes (Mosler, 2012; Sharma & Romas, 2012). The technological dimension refers to the characteristics of the sanitation facilities, their location and acceptability (Dreibelbis et al., 2013).

The conceptual framework depicted in figure- 1 below provides an understanding of how sanitation access and utilization are connected with each other, and how both of them are again influenced by different individual, household, community, environmental, and societal factors. The framework further indicates that access can be one of the determinants of sanitation utilization indicating how sanitation access and utilization are influenced by different factors even though the same factors can affect both of them.

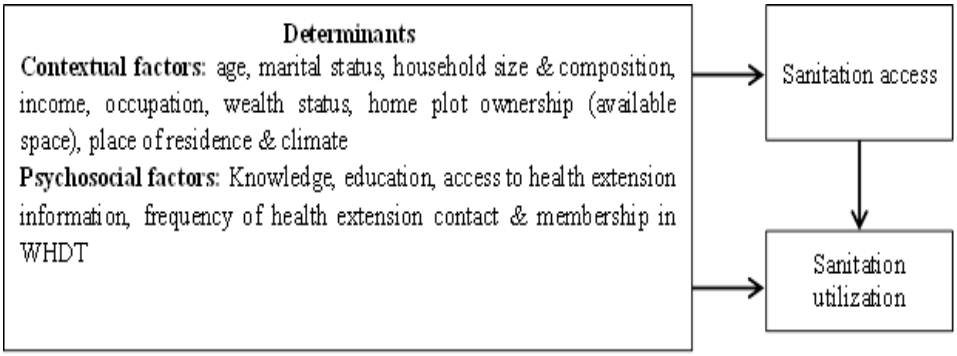

Figure 1: Conceptual framework constructed by the authors on the basis of literature

Methodology

Description of the study area

The study was conducted in Machakel and Gozamin *woredas* (district) of East Gojjam Zone in Northwestern Ethiopia. Machakel and Gozamin woredas are adjacent in terms of geographic location and have similar religious, language, climatic, and ethnic setups. Administratively, both woredas have 25 rural *kebeles* (the lowest administrative division) each and mixed agriculture is the most important economic activity in both of them. Machakel and Gozamin woredas are also the biggest woredas in terms of areal size and population among from a total of 18 woredas in the zone. In areal size, Gozamin is the second-largest woreda next to Machakel (Teshome, 2007).

Study design

The study used quantitative research approach, particularly community based cross-sectional research design and data was collected from 23 December 2018 to 24th March 2019 using interviewer-administered questionnaire.

Sample size determination

There are many approaches to determine sample size in quantitative research. The approaches include using a census for small populations, imitating a sample size of similar studies, using published tables, and applying formulas (Israel, 1992). Using a census for small populations was not applicable as the number of women residing in the two woredas was too large to address it. Applying the imitating strategy of sample size determination was not followed because there were no similar past studies with the same objective conducted in the study areas. Using published sample size tables could be applied since information on the population of kebeles to be sampled was obtained a priori. However, according to Israel (1992) sample sizes in the published sample table reflect the number of obtained responses not necessarily the number of surveys mailed. Published sample table also assumes that the attributes measured are normally distributed. Yamane formula, on the other hand, is appropriate to calculate sample size in the case of finite population. Since the selected sample kebeles had a total of 7934 households, Yamane (1967) formula for determining sample size was used as follows:-

$n = \frac{N}{1+N(e)2}$, where n=the required total sample size, N= the total household size in the selected kebeles, e= level of precision or sampling error estimated at 0.05. The formula gives a total sample of 380 households. The total sample size was calculated with the assumption of 95% confidence interval.

Sampling procedure

The study used multistage cluster sampling technique. Woreda and agroecology were used as a cluster. A total of six rural kebeles were selected using lottery method. Households from these selected rural kebeles were selected using proportion to size formula. Participant households for questionnaire administration were selected using fixed sampling interval method. The first household was picked randomly but the second and every other subsequent household was selected by adding 20th interval to the first selected household. Finally, female heads of the households were selected as study participants.

Table 1: Sample kebeles, total no of households in the sampled kebeles and the required household sample size from each sampled kebele

Woreda	**Agro ecology**	**Sampled Kebeles**	**Total no of households**	**The required household sample size from each sampled kebele**	**Sample selection interval**
Machakel	*W/ Dega*	Amanuel Zuria	1211	58	Every 20th house
	W/ dega	Amreyewbesh	890	43	Every 20th house
	Dega	Debrekelemu	1015	49	Every 20th house
Gozamin	*Dega*	Yebokla Zuria	2010	96	Every 20th house
	W/Dega	Yetjanshebalema	1538	73	Every 21st house
	W/ Dega	Qebi	1270	61	Every 20th house
Total			7934	380	

Note: *Dega* refers to highlands between 2,300 and 3,200m above sea level while *Woyna dega* refers to midland between 1500-2300m above sea level.

Source: Filed Survey, 2018

Data collection methods

The study obtained data from primary sources. A structured questionnaire was administered in a face-to-face interview with women head of households. Questions on the questionnaire were designed following WHO and UNICEF's core questions on drinking water, sanitation and hygiene guiding documents for household surveys. Sanitation related questions used by previously conducted similar studies were also adopted. The questionnaire was first prepared in English and later translated into Amharic (local language) and responses were then translated back to English. Five enumerators were recruited to administer the questionnaire (3 females & 2 males). The enumerators were selected based on their educational background (diploma and degree), knowledge of Amharic language, and familiarity with the study areas. Enumerators were given two days training on the objective of the survey, the questions themselves and how they have to approach study participants. The questionnaire was pilot tested three weeks prior to the actual data collection endeavor, and some questions were modified and amended. Data collection was conducted under the close supervision and participation of the principal investigator.

Study variables

Dependent variables: Sanitation access and utilization were the dependent variables for this study and both were categorized as low, medium and high.

Independent variables: the independent variables included in this study were selected from literature review and they are believed to influence people's access to and utilization of sanitation facilities. The variables include woreda , climate, age, education and occupational status of the respondent, household size, dependency ratio, household crowding, home plot ownership, household income and wealth, access to health extension information, frequency of health extension contact, membership in women health development team, knowledge of sanitation messages promoted by the health extension agents and knowledge about the benefit of latrine utilization.

Knowledge about sanitation messages was examined by asking respondents if they can recall any sanitation related message promoted by the health extension agents and the question had five multiple response options as 1) latrine construction and usage, 2) adoption and utilization of liquid waste disposal pit, 3) safe solid waste disposal practice such as burning, burying, and using it for compost, 4) shelf construction and usage and 5) smokeless stove construction and usage. Based on their response, respondents were grouped into two main categories; as having poor knowledge if scored between 0-3, and having high

knowledge if scored 4-5. Similarly, in order to understand women's knowledge about the benefit of latrine utilization, they were asked if they can mention any of latrine utilization benefits and the question had five multiple response options as 1) environmental cleanliness, 2) convenience and privacy, 3) improves dignity and status, 4) it is a sign of modernity, and 5) health benefits. Respondents' level of knowledge about the benefits of latrine utilization was finally categorized into two groups as having poor knowledge if scored 0-3 and having high knowledge if scored 4-5.

Operational definitions

Household liquid waste: greywater that emanates from domestic activities (yeast, utensil wash, hand and cloth washes)

Household solid waste: waste from house sweeping, cattle shed and ash

Sanitation access: presence or availability of sanitation facilities

Sanitation utilization: A woman's self-reported utilization of sanitation facilities

Data processing and analysis

The collected data was coded and entered into IBM SPSS version 20, edited, cleaned, stored, and later transferred into Stata version 14 to perform ordered and generalized ordered logistic regression. Descriptive analysis such as percentages, frequencies, mean, standard deviation, maximum and minimum were used to describe respondents' characteristics as well as their level of sanitation access and utilization.

Chi-Square statistics namely, Gamma and contingency coefficients, were used to identify significant variables that should be included in the final model. Based on the chi-square test of association, categorical independent variables having significant association with the dependent variable at $p \leq 0.05$, $p \leq 0.01$, and $p \leq 0.1$ were included into the final model. Variables having significant association with the dependent variable at a p-value below 20% ($P < 0.20$) were also taken into the final model. The inclusion criterion of 20% significance level was set so that important variables that do not have a significant association at $p \leq 0.05$, $p \leq 0.01$, and $p \leq 0.1$ should not be excluded from the analysis. Variables that fail to meet all these thresholds were removed from the final regression analysis. All continuous independent variables were included in the final model automatically and their association was tested using regressing analysis.

Once, the relationship between independent and dependent variables were checked using chi-square tests of association and variables that will go into the final model were identified, a multicollinearity test was conducted using Kendall

tau-b correlation and Variance Inflation Factor (VIF) based on the nature of the independent variables. Kendall tau-b was used to test if categorical independent variables were statistically independent of each other while Variance Inflation Factor (VIF) was used for detecting multicollinearity among continuous independent variables. Both test results indicate that there was no multicollinearity problem.

After multicollinearity test was conducted, the next step was to run ordered logistic regression model (Ologit) also known as proportional odds model (POM). Ologit was chosen because a three-category ordinal dependent variable; sanitation access and utilization (low, medium, and high) were constructed under the assumption that the levels of sanitation access and utilization have a natural ordering as low, medium and high. When dependent variables are measured on an ordinal scale, there are many options for their analysis such as Ordinary least-squares (OLS) and multinomial logistic regression. OLS regression, however, treats the dependent variable as though it is continuous while multinomial logistic regression treats the dependent variable as nominal and ignores its ordinality. Ologit, on the other hand, treats the dependent variable as it is measured on an ordinal scale (Williams, 2016).

However, Ologit assumes that the independent variables have the same coefficients and odds ratio across the different response variables and rejection of this assumption also known as proportional odds assumption indicates that at least one of the independent variables has a differential effect (odds ratio) across the outcome levels. Brant test is the most widely used test to measure this assumption and a significant Brant test indicates that Ologit assumption is rejected and an alternative model has to be used (Liu, 2016; Williams, 2008, Brant, 1990, & Petrson & Harrell, 1990). In cases where proportional odds assumption is rejected, Peterson & Harrell (1990) and Williams (2016) recommended using generalized ordered logistic regression (Gologit2) also known as partial proportional odds model (PPO). As to Williams (2016), gologit2 assumes the presence of both the same odds ratio and different odds ratios across the different categories of the outcome variables. Gologit2 also restricts some coefficients to be the same for every cut point while other coefficients are free to be different. Given this assumption, the study has used both Ologit and gologit2 to estimate the association between the independent and dependent variables. The statistical significance of each independent variable was finally tested using likelihood ratio test and Odds ratio and associated p-values was used to interpret the model output. In all analysis, P-value less than 5% was considered statistically significant.

Results

Background characteristics of respondents

A total of 380 female heads of households have participated in the study with 100% response rate. The majority of the respondents have access to health extension information (92.6%), lives in a crowded household (92.6%), were currently married (85.5%) and have no formal education (78.9%). The mean dependency ratio was 80.73% with the implication that each respondent has at least one dependent household member. A minimum dependency ratio of zero indicates that there is no dependent member in the household while a maximum dependency ratio of 300% indicates that three people are dependents on one person in a household. Farming was found to be the dominant occupation of more than half of the respondents (65.8%) (Table 3).

Table 3: Background characteristics of study participants

Variables	Frequency	Percent
Woreda		
Machakel	150	39.5
Gozamin	230	60.5
Climate		
Dega	145	38
Woinadega	235	61.8
Age		
Young (15-24)	43	11.3
Middle adult (25-34)	84	22
Adult (35-49)	183	48
Old(≥ 50)	70	18.4

Education		
no education	300	79
Primary	63	16.6
Secondary & above	17	4.5
Occupation		
Farm only	250	65.8
non-farm only or farm plus	130	34
Marital status		
Currently married	325	85.5
Currently not married	55	14.5
Access to health extension information		
Yes	352	92.6
No	28	7.4
Participation in WHDA		
Yes	120	31.6
No	260	68.4
Home plot ownership		
Owned/ with title	267	70.3
Not owned/no title	113	29.7

Household crowding		
Crowded ((≥ 2.5 persons per room)	352	92.6
Not crowded (<2.5 persons per room)	28	7.4
Income		
≤ 20000.00 ETB	55	14.5
20000.01 - 45000.00 ETB	225	59
≥45,000.01 ETB	100	26.3
Wealth		
Lowest	76	20
Second	76	20
Middle	76	20
Fourth	76	20
Highest	76	20
Knowledge of sanitation messages promoted by health extension agents		
Poor	253	66.6
High	127	33.4
Knowledge about the benefit of latrine utilization		
Poor	176	46.3

High			204	53.7
	Mean	Min	Max	St.Dev
Household size	3.96	1	8	1.374
Dependency ratio	80.73	0	300	66.98
Frequency of health extension contact	3.11	0	6	1.681

Women's Level of Sanitation Access and Utilization

Table 4 presents women's level of sanitation access measured by the combination of three sanitation indicators. Respondents were first asked if their household has owned a latrine, separate dwelling for people and domestic animals, and liquid waste disposal pit. Based on respondent's responses for these three sanitation indicators, their level of sanitation access was estimated using a simple average method. The result indicated a minimum score of zero implying the respondent has none of the sanitation facilities and the maximum of one indicating that the respondent has all the three sanitation facilities. There are no previously defined cutoff scores in the literature that can be taken as a reference. Thus, a cut of score was defined arbitrarily and respondents were classified as having low sanitation access if their average score is between 0 and 0.50; medium if their average score is between 0.51 to 0.75 and high if their average score is between 0.76 and 1.0. Based on this categorization, the finding of the study indicated that 42.6% of the respondents have high sanitation access compared with 34.7% medium and 22.6% low. The result further showed that out of the total 79.5% respondents, who have latrine, about 5.29% have low sanitation access, 41% have medium sanitation access and 53.6% have high sanitation access. The availability of separate house for people and domestic animals is the most widely available sanitation facility followed by latrine.

Table 4: Distribution of respondents according to their level of sanitation access

Survey questions	Sanitation Access Level			Total
	Low	Medium	High	
	Frequency	Frequency	Frequency	
Own latrine				
Yes	16 (5.29%)	124(41.1%)	162(53.6%)	302(79.5%)
No	70 (89.7%)	8 (10.3%)	-	78 (20.5%)
Own liquid waste disposal facility				
Yes	1(0.6%)	11(6.3%)	162(93%)	174(45.8%)
No	85(41.3%)	121(58.7%)	-	206(54.2%)
Have separate house for people and domestic animals				
Yes	62(17.9%)	129(37.3%)	155(44.8%)	346(95.6%)
No	13 (81.3%)	3 (18.75%)	-	16(4.4%)
Total	86(22.6%)	132(34.7%)	162(42.6%)	380

Source: Own computation

Women's level of sanitation utilization was also estimated based on their response to the survey questions, if they usually use latrine, if they practice safe solid waste disposal and if they use liquid waste disposal pits to discharge household liquid waste. Following respondents' response to these three sanitation questions, their overall sanitation utilization level was estimated using the same simple arithmetic mean method as used above. The estimated result showed the minimum average sanitation utilization of zero and the maximum average sanitation utilization of one. The average sanitation utilization of zero indicated that the respondent does not use any of the three sanitation facilities while the maximum of one indicated that the respondent uses all the three sanitation facilities. Based on this score, the level of women's sanitation utilization was categorized as low if the mean score ranges from 0.00-0.50, medium if the mean score ranges from 0.51-0.75 and high if the mean score ranges from 0.76-1. Accordingly, of the total 380 sampled respondents, 50.85% have low sanitation utilization; 20.5% have medium and 28.7 % have high sanitation utilization.

The findings of this study revealed that 43.2% of the respondents have high sanitation access, but, in terms of utilization, half of the respondents have low overall sanitation utilization (50.8%) indicating a mismatch between sanitation

access at household level and women's utilization status. Alternatively stated, not all women who have sanitation facilities in their household are making use of the facilities. For instance, of the total 79.5% respondents who have latrine in their household, 92.1% (n=278) were utilizing latrine while 7.95% (n= 24) do not.

Table 5: Distribution of respondents according to their level of sanitation utilization

Survey question	Sanitation utilization			Total
	Low	**Medium**	**High**	
	Frequency	Frequency	Frequency	
Latrine utilization				
Yes	97(34.9%)	72(25.9%)	109(39.2%)	278(73.2%)
No	96 (94%)	6 (5.9%)	-	102 (26.8%)
Liquid waste pit utilization				
Yes	5 (3.5%)	30 20.8%)	109(75.7%)	144(37.9%)
No	188(79.7%)	48(20.3%)	-	236(62.1%)
Safe solid waste disposal practice				
Yes	9(5.2%)	54(31.4%)	109(63.4%)	172(45.3%)
No	184(88.5%)	24(11.5%)	-	208(54.7%)
Total	193(50.8%)	78(20.5%)	109(28.7%)	380 (100%)

Source: Researcher's own computation

Determinants of women's sanitation access

The result of gologit2 estimation (Table 6) indicates that participation in women's health development team (WHDT) is found to have positive and statistically significant association with women's sanitation access in the first panel at 5% level of significance (p=0.022). The odds ratio of 2.9865 for the variable indicates that a woman who takes part in WHDT is 2.99 times more likely to have medium or high sanitation access than a woman who does not participate. Similarly, occupation of the respondent has positive and statistically significant association with women's sanitation access level in the second panel at 1% level of significance (p=0.000). The odds ratio of 4.5254 for the variable indicates that a woman whose main

occupation is non-farm only, or nonfarm and farm plus is 4.52 times more likely to have high sanitation access than a woman whose occupation is farm only.

The independent effect of household income above Ethiopian birr 45,000 is also found to have positive and statistically significant association with women's level of sanitation access in both panels at 5% level of significance. The variable meets the proportional odds assumption and thus has the same coefficients and Odds ratio across the outcome categories. The odds ratio of 2.5725 for the variable in the first and second panel indicates that a woman whose household annual income is greater than 45,000 ETB is 2.5 times more likely to have high sanitation access than a woman whose household annual income is less than or equal to 20,000 birr.

Frequency of health extension contact has positive and statistically significant association with women's level of sanitation access at 1% level of significance (p=0.000). The variable meets the proportional odds assumption and has the same effect across the outcome levels. The odds ratio of 1.7170 for the variable indicates that as the number of health extension contact increases by one day from the mean ($\bar{x}$=3.11), the level of having high sanitation access increases by a factor of 1.7, holding all other variables constant.

Household size (HH) has positive and statistically significant association with women's sanitation access level at 5% level of significance. The variable also meets the proportional odds assumption and thus has the same effect across the outcome categories. The odds ratio of 1.4720 for the variable indicates that as HH size increases by one unit from the mean ($\bar{x}$=3.96), the probability of having high sanitation access increases by a factor of 1.5.

In contrast, dependency ratio has negative and statistically significant association with women's sanitation access in the second panel at 5% level of significance. The odds ratio of 0.9947 for the variable indicates that as dependency ratio increases by one percent from the mean ($\bar{x}$=80.73%), the probability of having high sanitation access decreases by a factor of one.

Woreda has also negative and statistically significant association with women's level of sanitation access in the first panel at 1% level of significance (p = 0.002). The odds ratio of 0.1458 for the variable indicates that a respondent who lives in Gozamin woreda is 15 times less likely to have medium and high sanitation access compared to a respondent who lives in Machakel woreda.

Table 6: Determinants of women's sanitation access (generalized ordered logit estimation)

Sanitation access			**Panel 1**			**Panel 2**			
			Low Vs. Medium & High Access			Low & Medium Vs. High Access			
Variables		Coeff.	Std. Err.	OR	P>z	Coeff.	Std. Err	OR	P>z
Woreda	Gozamin	- 1.9255	.6073	.1458	0.002***	-.2457	.3856	.7821	0.524
Climate	*Woina dega*	-.2794	.2525	.7563	0.269	-.2794	.2525	.7563	0.269
Age	middle adult	-.0839	.4679	.9195	0.858	-.0839	.4679	.9195	0.858
	Adult	-.8186	.6285	.4410	0.193	-8187	.6285	.4410	0.193
	Old	.5459	.7038	1.7262	0.438	.5459	.7038	1.7262	0.438
Marital status	currently married	.7729	.4400	2.1660	0.079*	.7729	.4400	2.1660	0.079*
Own edu.	primary	.4135	.3196	1.5121	0.196	.4135	.3196	1.5121	0.196
	secondary & above	-.0180	.6452	.9821	0.978	-0180	.6452	.9821	0.978
Own Occ.	non-farm only or farm plus	-.1905	.5075	.8265	0.707	1.5097	.3880	4.5254	0.000***
HPO	Not owned	-.3686	.4204	.6917	0.381	-.3686	.4204	.6917	0.381
Income	20000.01 - 45000.00	.1302	.3939	1.1390	0.741	.9971	.3798	2.7103	0.009***
	≥45000.01	.9448	.4432	2.5725	0.033**	.9449	.4432	2.5725	0.033**

Wealth quantile	Second	.1576	.3932	1.1708	0.688	.1576	.3932	1.1708	0.688
	Middle	1.0504	.6078	2.8587	0.084*	-7842	.5246	.4565	0.135
	Fourth	-.0908	.4966	.9132	0.855	-0908	.4966	.9132	0.855
	Highest	-.5763	.5535	.5620	0.298	-.5763	.5534	.5619	.2980
HIA	Yes	-.5568	.5401	.5731	0.303	-5568	.5402	.5731	0.303
PWHDT	Yes	1.0941	.4792	2.9865	0.022**	.1039	.3109	1.1095	0.738
FHEC		.5406	.1081	1.7170	0.000***	.5406	.1081	1.7169	.000***
HH size		.3866	.1368	1.4720	0.005**	.3866	.1368	1.4720	.005 **
DR		.0031	.0028	1.0030	0.270	-0053	.0025	.9947	0.034 **
_cons		-.3422	.9354	.7102	0.714	-.7647	.9078	.02318	0.000

Log likelihood= -296.11047; N= 380; LR chi2 (27)= 209.43; Prob > chi2= 0.0000;Pseudo R^2 =0.261

Note: significance at the *10%, ** 5% and *** 1% level. OR= odds ratio. MARSTA stands for marital status, HPO= home plot ownership, HIA= health information access, PWHDT =participation in women health development team, FHEC= frequency of health extension contact, HH size= household size, DR= dependency ratio, occu= occupation, edu= education

For the dichotomous and polytomous independent variables, one of the categories is left out as a reference category and the rest of them are used as an explanatory variable in the model. Therefore, each estimated coefficient shows the effect of the observable category relative to the base category. The base values are not shown in the table.

Determinants of women's sanitation utilization

The result in table-7 below indicates that knowledge about the benefit of latrine utilization is found to have positive and statistically significant association with women's level of sanitation utilization at 1% level of significance. The odds ratio of 3.9437 for the variable indicates that a woman who has high self-reported knowledge about the benefit of latrine utilization is 3.9 times more likely to have better sanitation utilization than a woman who has low knowledge about it.

Similarly, sanitation access has positive and statistically significant association with women's level of sanitation utilization at 1% level of significance.

The odds ratio of 47.5466 for the variable indicates that a woman who has high level of sanitation access is 47.6 times more likely to have better sanitation utilization (either medium or high) than a woman who has low level of sanitation access.

Conversely, household size has negative and statistically significant association with women's level of sanitation utilization at 5% level of significance. Holding all other variables constant, the estimated odds ratio of 0.7740 for the variable indicates that for a one unit increase in household size from the mean ($\bar{x}$=3.96), the odds of having medium and high sanitation utilization decreases by a factor of 0.8, while the odds of having low sanitation utilization increases by a factor of 0.8.

Table 7: Determinants of women's sanitation Utilization (Ologit estimate)

Variables	**Sanitation utilization**	**Coeff.**	**Std. Err.**	**Odds Ratio**	**P>z**
Woreda	Gozamin	.1106	.4138	1.1169	0.789
Climate	*Woinadega*	-.2153	.2644	.8063	0.415
Age	middle adult	0.7849	.5468	2.1923	0.151
	Adult	.5661	.5790	1.7613	0.328
	Old	-.1719	.6039	.8421	0.776
MARSTA	currently married	-.2469	.4169	.7812	0.554
Own Edu.	primary and above	-.2494	.3427	.7793	0.467
Own Occ.	non-farm only or farm plus	-.2328	.4059	.7923	0.566
HIA	Yes	.9312	.6015	2.5376	0.122
PWHDT	Yes	-.0725	.3181	.9300	0.820
San access	High	3.8598	.3221	47.4566	**0.000*****
K latrine benefit	high	1.3721	.2634	3.9437	**0.000*****
Recall	high	-.3428	0.196	.7098	0.215
HH Size		-.2562	.1294	.7740	**0.048****
FHEC		.0490	.1057	1.0502	0.643
/cut1		2.1137	.8612	2.1137	
/cut2		4.1118	.8922	4.1118	
Log likelihood = -241.05622; N =380; LR chi2(15)=298.66; Prob > chi2=0.0000; Pseudo R2= 0.3825					

Note: significance at the ** 5% and *** 1% level. MARSTA stands for marital status, Edu. Stands for education, Occ=occupation, HIA= health information access, PWHDT= participation in women health development team, San= sanitation, k= knowledge, HH = household, FHEC= Frequency of Health extension contact.

Discussion

It is somehow an encouraging finding from the study that 43.2% of respondents have high sanitation access compared with 34.7% medium and 22.6% low respectively. In terms of sanitation utilization, however, it is gloomy that half of the respondents have low sanitation utilization (50.8%) compared with 20.5% medium and 28.7% high. The evidence suggests that there is a mismatch between sanitation access at household level and women's utilization status. Not all women who have the sanitation facilities in their household are using the facilities. Mismatch between sanitation access and utilization was also observed in a study by Andualem & Abera (2010) in the rural community of Hulet Ejju Enessie woreda and by Ayichew et al. (2018) in rural communities of North Achefer district in Amhara region of Ethiopia.

Women's own occupation, their household size and income, dependency ratio, participation in women health development team, and frequency of health extension contact were found to be statistically significant determinants of women's sanitation access while statistical significant association was not found between women's own age, education, home plot ownership, access to health extension information, climate and women's level of sanitation access. Marital status and wealth at the middle quantile have statistically significant association with women's level of sanitation access but it is at 10% level of significance. Availability of sanitation facilities, household size and knowledge about the benefit of latrine utilization were found to be factors influencing women's sanitation utilization. Considering the literature, these different factors found to influence women's access to and utilization of sanitation facilities are broadly categorized and discussed as below.

Contextual factors

Occupation of the respondent was found to be among the individual level contextual factors that determine respondents' level of sanitation access. A woman, whose main occupation is farm only is less likely to have high sanitation access than a woman whose main occupation is non-farm only or non-farm plus farm. Participation in non-farm activities brings additional income that could be invested

in sanitation facilities than engaging in farm only activities. This finding corresponds with a study result brought by Osumanu et al. (2019) in Ghana and Yimam et al. (2014) in Ethiopia where households whose heads were engaged in farming were found to have a lower probability of having latrine facility than non-farmer headed households. Gross & Gunther (2014) have also found off-farm income activity as the most crucial determinant of latrine ownership in Benin.

As the evidence demonstrates, household annual income is found to be one of the household level contextual factors that determine respondents' level of sanitation access. A respondent with low level of household annual income is less likely to have high sanitation access compared with a respondent with high level of household annual income. The result is in harmony with a finding by Osumanu et al. (2019), Worku & Semahegn (2013) and Yimam et al. (2014) where they observed that households who had relatively better income were found to have better access to latrine than households who had relatively low income.

Household size is also found to be among the household level contextual factors that determine women's level of sanitation access and utilization. The relationship is however different. As household size increases, the level of having high sanitation access also increases but the level of sanitation utilization decreases. It is apparent that large households are more likely to adopt sanitation technologies as this would mean sharing labor and family resource. The likelihood of access to sanitation facilities increases with the availability of labor. The result is in agreement with a study by Nyanza et al. (2018) where households with big family size were found to have higher probability of having a sanitation facility than households with small family size. The result is, however, in dispute with Gross & Gunther (2014) finding where household size was not found to have a statistically significant association with latrine ownership.

The inverse relationship between HH size and women's sanitation utilization could be explained by that fact that sanitation facilities need to be shared and used by family members, and when there are large family members in a household, sanitation facilities need to be coordinated. The negative relation between household size and sanitation utilization was also reported by Sinha et al. (2017) in India, and Osumanu et al. (2019) in Ghana where large sized households were found to be less likely to use latrine and more likely to practice open defecation than small sized households. This may be due to the fact that dependency ratio is found to be among one of the household level contextual factors that determine respondents level of sanitation access. As dependency ratio increases, the probability of having high sanitation access decreases. Clearly, high dependency ratio means children and old members of the household will become dependents on

the productive member of the household. Thus, the productive member of the family will be vested in fulfilling other consumption needs and run short of labor to adopt sanitation technologies. Besides, as dependency ratio increases, household consumption also increases which in turn affects sanitation related investment.

Woreda or place of residence is among the community level contextual factors that determine women's access to sanitation facilities. As indicated in the finding, there is inter-woreda variation in terms of sanitation access. A woman who lives in Gozamin woreda is less likely to have better sanitation access than a woman who lives in Machakel woreda. During discussions held with *woreda* health extension program coordinators to analyze the differences between the results in the two areas, it was suggested that the active engagement of health extension workers in promoting sanitation information and technologies, strong collaborative work between the health extension agents, and education and agriculture sectors in Machakel woreda might have brought disparities in the level of sanitation access among the two woredas. It was also learnt that Machakel woreda is selected as a pilot district for promotion of sanitation marketing and this might have contributed for respondents from this woreda to have better sanitation access than the other.

Sanitation access or availability of sanitation facilities has positive and statistically significant association with women's level of sanitation utilization. A woman who has high level of sanitation access is more likely to have better sanitation utilization than a woman who has low level of sanitation access. The finding goes in line with IBM-WASH hypothesis which stated that access to enabling resources exert significant influence on people's sanitation behavior. Apart from this, Routray et al. (2015) has pointed out that lack of access to a latrine was one of the reasons for people's practice of open defecation in rural coastal Odisha. Sinha et al. (2017) also found that the presence of a latrine door and roof have significantly increased the likelihood of household members to use latrine, indicating how the presence of sanitation facilities has encouraged people's utilization of the same.

Psychosocial factors

Based on the idea of IBM-WASH, participation in women health development team, frequency of health extension contact and knowledge about the benefit of latrine utilization were among the psychosocial factors found to have statistically significant effect on women's sanitation access and utilization status. More specifically, a woman who participates in WHDT is found to have higher sanitation access than a woman who does not participate in the team. WHDT is the

main platform for the delivery of the rural health extension information in Ethiopia. Participation in this group facilitates women's linkage with their own neighbors, with health extension workers and with other stakeholders which in turn enables them to share information, skill and experience and ultimately helps sanitation technology adoption. Women will be influenced by other women within their team. If some health development team members obtain a latrine or waste disposal pit, other members in the group will be encouraged. Status-wise, they do not want to be seen behind their group members. The result is consistent with Routray et al. (2015) finding in India where women's participation in self-help group was found to help them install latrines.

Similarly, as the health extension contact number of the women increases, the probability of them having high sanitation access also increases. Health extension workers (HEW) are expected to facilitate sanitation promotion at the local level by presenting health packages to the community. Thus, the numbers of contacts they have made with the residents or the numbers of contacts residents have made with HEW has better contribution for having high sanitation access. This finding is in agreement with a study by Nigatu et al. (2017).

Knowledge about the benefit of latrine utilization was found to determine women's utilization of sanitation facilities. A woman who has high self-reported knowledge about the benefit of latrine utilization is more likely to have better sanitation utilization than a woman who has low self-reported knowledge about the benefit of latrine utilization. The result agrees with the Dreibelbis et al. (2013) hypothesis which claims that individuals will use WASH services if they are aware of the health risk of not practicing the appropriate WASH behaviour.

Conclusion and recommendation

This study was aimed to assess women's sanitation access and utilization status and their determinant factors in rural communities of Machakel and Gozamin woredas in east Gojjam zone. The study was conducted using both households and women as a unit of analysis. Sanitation access was measured at household level but utilization was measured using women's own sanitation experience. The study contributes to the ongoing international discourse of universal access to sanitation services. Based on the findings, it can be concluded that sanitation access at household level and women's utilization status in the study area are far from expected national target of 100% at the end of 2020. There is also a mismatch between sanitation access at household level and women's utilization status. Thus, it is recommended to strengthen the government's work towards promoting and monitoring not only the sanitation facilities build but also their utilization.

There is also inter-woreda variation in sanitation access indicating the need to consider these geographic variations in developing interventions to achieve the SDG of universal access to sanitation by 2030. The study further showed that women's sanitation access and utilization status are influenced by different factors even though the same factors have also affected both of them. More specifically, sanitation access was determined by women's place of residence (woreda), occupation, household size, dependency ratio, household income, and participation in health development team while utilization was determined by availability of sanitation facilities, knowledge and household size. Statistically significant association was not found between factors such as age, education, access to health extension information and climate, and women's sanitation access and utilization level. Woreda, marital status, occupation, income, wealth, and participation in women health development team were found to have statistically significant association with women's level of sanitation access but no statistically significant association with their level of sanitation utilization. The evidence suggests that women's access to sanitation could be further improved by strengthening their household income and wealth creation capacity while their utilization status could be improved by increasing the availability of sanitation facilities and behaviour change promotion or knowledge creation activities.

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