Research Article

Breast Self-Examination Practice and Associated Factors among Reproductive Age Women in North Shewa Zone, Oromia, Ethiopia, 2022: By Using Health Belief Model

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ABSTRACT

Background: Breast cancer is the leading cause of cancer death worldwide and the second most common cancer overall. Breast self examination is one of the cheapest methods used for the early detection of breast cancer in asymptomatic women. However, in Ethiopia, most of the breast self examination studies were not conducted among women in the general population. Therefore, this study aimed to assess breast self examination practice and associated factors among women of reproductive age in the North Shewa Zone, Oromia.

Methods: A community based cross sectional study was conducted in the North Shewa zone from May 18/2022 to June 18/2022. 1076 women of reproductive age were selected by simple random sampling. For the quantitative part of the study, an interviewer administered questionnaire was used, and focus group discussions were used for the qualitative part. SPSS version 26 was used for the analysis. Variables with a P-value<0.25 in the bivariable analysis were included in the multivariable logistic regression model. The degree of the association was expressed using an Adjusted Odds Ratio (AOR) with a 95% Confidence Interval (CI) at a P-value<0.05.

Results: Overall 192 (18.2%) with 95% CI (15.7, 20.5) of the participants had ever performed BSE. Among these, only 20 (10.4%) had practiced monthly. Being younger aged women (15-24) (OR=3.9, 95% CI (2.2-6.8)), having a family history of BC (AOR=6.9, 95% CI (4.6-10.3)), being knowledgeable on BSE (AOR=3, 95% CI (1.9-4.3)), having high perceived susceptibility (AOR=1.7, 95% CI (1.2-2.5)), having high self efficacy (AOR=1.5, 95% CI (1.1-2.3)) and having a high perceived benefit to BSE (AOR=1.5, 95% CI (1.1-2.3)) were factors significantly associated of BSE practice.

Conclusion: BSE practice in the North Shewa zone was very low. Age, family history of BC, knowledge of BSE practice, perceived susceptibility, benefit, and self efficacy were independent predictors of BSE practice. North Shewa Zonal Health Office and other stakeholders should disseminate teaching materials that address the benefit of BSE practice.

Keywords: Breast self examination; Health belief model; Women of reproductive age; Ethiopia

INTRODUCTION

Breast Self Examination (BSE) is one of the screening methods, which involves the woman looking at herself and feeling each breast for possible lumps, distortions, or swelling. More than 90% of cases of Breast Cancer (BC) can be detected by women themselves. This reality stresses the importance of BSE as the key BC detection mechanism. Nowadays, BC is a major women's health problem globally. Meanwhile, primary prevention for BC is still not available. New cases of BC worldwide are estimated at

252,710 with almost 459,000 related deaths. According to the American Cancer Society (ACS), 1 out of 8 United States women experiences BC in their lifetime. ACS has predicted the incidence of BC in women around the world to reach around 3.2 mil new cases per year in 2050.

According to the reports of Global Burden of Cancer (GLOBOCAN) in 2020, of the 19.3 million new cases of cancer globally, BC accounted for 24.5% of which 16.8% occurred in Sub-Saharan Africa (SSA) and also accounted for 15% of the 9.9 million mortality due to cancer worldwide, while in SSA accounting for 12.1%. In Ethiopia, in 2020 the number of new cases of cancer among females of all age were 50,598 while, BC accounts for 31.9% and also, cancer accounts for about 5.8% of total national mortality while, BC accounts for 17.5%. In Ethiopia, BC incidence is rising and becoming the foremost common cancer, causing high rates of morbidity and mortality. The incidence of BC accounts for 15,244 (22.6%) of all cases of cancer and 8,159 (17.5%) cancer mortality annually [1].

WHO recommends cancer prevention as an essential component of all cancer control plans because about 40% of all cancer deaths can be prevented. BSE has been promoted for many years as a screening method for BC at an early stage, to decrease the risk of dying from BC. BSE practice has been appreciated to enable women to take concern their health and it is a suitable and cheap means that can be implemented regularly. A country with inadequate resource facilities and poor health systems has to promote early diagnosis programs based on BSE, awareness of early signs and symptoms, and prompt referral to diagnosis and treatment [2].

The practice of BSE has been reported in different countries. 12.5% in Indonesia, 11% in Yemen, 4.0% in Saudi Arabia, 37.6% in Ghana, 15% in Cameroonian., 13.2% in Bale zone, 15% in Jimma, 51.4% in Adama, 45.8% in Gondar, and 6.25% in Adawa town women had performed BSE on regular basis (monthly).

Factors affecting the practice of BSE were reported from different countries. These are age, family history of BC, knowledge of BSE, level of education, and women's perception towards BSE practice and BC. BSE is the only feasible approach that is cheap and easily applied method across wide population. Its ultimate purpose is early detection and treatment. Despite, its importance as an early detection strategy, poor practice of women has been a major obstacle. So, increasing women's practice of BSE through creating BC awareness campaign [3].

In Ethiopia, most of the BSE studies were not conducted among women in the general population and have been conducted on university students, health care providers, and urban populations and also not added qualitative approaches and used Health Belief Model (HBM) which is more important to understand health seeking behaviour or why people not utilizing health service. Due to this, many women miss early detection, as well as treatment opportunities and also no tangible research was conducted among women of reproductive age in this study area. Thus, this study aimed to assess the BSE practice and associated factors among women of reproductive age in the North Shewa zone, oromia region [4].

MATERIALS AND METHODS

Study area design and period

The study was conducted in the North Shewa zone, Oromia region, Ethiopia. North Shewa is one zone of Oromia state, which is found in the central part of Ethiopia. A North Shewa zone has 13 districts with one town administration, 267 rural kebeles and 36 urban kebeles. Fitche is the capital town of the zone which is 112 km away from Addis Ababa. Based on the information obtained from the zonal health office, population projection of Oromia region by zone, Wereda, urban and rural as of July 1, 2020 indicates, that the population of the North Shewa zone is about 1.7 million of whom 49.9% are female and 44.2% are reproductive age women Additionally, the zone has 64 health centers and five public hospitals that provide health care services to the community. A community based cross sectional study design with a concurrent mixed method approach was conducted from May 1, 2022 to June 30, 2022 [5].

Population

All reproductive age women (15-49) living in the North Shewa zone were the source population and all randomly selected reproductive age women (15-49) living in the selected kebeles of the North Shewa zone constituted the study population. A qualitative study was conducted among purposely selected reproductive age women (15-49) living in the selected districts of the North Shewa zone [6].

Sample size determination

The sample size was determined using a single population proportion formula in epi info STAT CALC. version 7.2.4 based on the assumptions of a 95% confidence level, 3% margin of error, and a 13.2% proportion of BSE among women of reproductive age from the study conducted in Bale zone. After applying a design effect of 2 and a 10% non response rate, the final sample size obtained was 1076. For the qualitative part, a total of 46 women were involved in five FGDs. FGDs were conducted in four districts of the North Shewa zone namely: Kuyu, Degam, Girar Jarso and Jidda. Which included 6 to 10 members in each group [7].

Sampling procedures

A multistage, stratified sampling technique was used to select the study participants. In the first stage, four districts were selected randomly from 14 districts of the zone. The kebeles in the selected districts were identified and stratified into urban and rural kebele. In the second stage, 4 urban and 22 rural kebeles were randomly selected. In the third stage, from the selected kebeles, a list of all eligible reproductive age women with their Households (HH) in each selected kebeles was obtained from the kebele health post by using family folders collaborating with Health Extension Workers (HEW). The sample size for each selected kebeles was determined proportionally allocated to the number of eligible HH within each selected kebeles. Finally, a simple random sampling technique was used to select the required number of

reproductive age women from each kebele by using the HH listed as a sampling frame which was obtained from family folders [8].

In the case of more than one eligible woman being encountered in the selected HH, a lottery method was used to determine which women have to be interviewed. If eligible reproductive age women were not present at the time of data collection, a re visit would be arranged for a minimum of three times during the time of the HH survey [9].

For the qualitative part, a Purposive sampling technique was used to select participants for FGD. From each selected district, one groups of reproductive age women, being that study population and not included in the quantitative study have participated in the FGD.

Data collection tools personnel and procedures

For quantitative data collection, a data collection tool was developed after reviewing previously done studies and the revised champion's HBM. A structured and pre-tested questionnaire was used for data collection. It has four sections including; socio demographic characteristics, family and personal history of BC, knowledge of BSE, perception towards BSE practice, and BC. The questionnaire was prepared in english and translated to the local language Affaan Oromo for better understanding for both data collectors and respondents, and translated back to the English version to verify consistency. Data was collected by using face to face interview method by eight bachelor's science nurse collectors recruited [10].

Qualitative data were collected in the local language Afan Oromo by using semi structured FGD guides. The guides were prepared in English by the Principal Investigator (PI), translated into Afan Oromo, and checked by experts for more clarity. The FGDs guides had a list of a few discussion points such as knowledge about BC and BSE, barriers to BSE practice and enablers of BSE with several follow up probes used to capture beneath of the issue. The FGDs were moderated by an experienced health professional and note taker. During the discussion, notes were taken and their voices were recorded using a tape recorder. And each discussion was 60-90 min at each selected site [11].

Operational and terms definition

Breast self examination: The self examination of the breasts to identify any changes in the breasts.

BSE practice: was assessed by using an item with the responses of "Yes or No" type like "did you perform BSE in last six months?" Those who responded "Yes" were considered as if they were practicing BSE.

BSE knowledge: Knowledge was measured by the total number of correct answers to eleven questions on knowledge related to BSE practice. Participants who scored mean and above the value of the provided eleven questions were categorized as knowledgeable while those who scored below the mean value were considered not knowledgeable [12].

Measurement variables

A total of 32 questions were used to assess the perceptions of a reproductive age woman towards BSE practice. A five point likert scale response with choices ranging from "strongly disagree (scores 1 point)" to "strongly agree (scores 5 points)" was used. Based on the scales, for susceptibility of BC, the seriousness of BC, BSE benefits, and BSE self efficacy five questions were asked to assess. Items scored from 5 to 20, while BSE barriers were asked seven questions which scored from 7 to 35 and cues to action consisted of 5 items with 'yes or no questions. For all constructs of the health belief model, higher scores (mean and above) were indicated as having a high perception toward performing BSE except for barriers to BSE, in which a higher score indicated a high barrier to performing BSE [13].

The reliability coefficient for the constructs of HBM for this study were 0.8, 0.7, 0.8, 0.8, 0.7 and 0.8 for susceptibility, seriousness, benefits, barriers, cues to action and self efficacy to BSE respectively. Concerning knowledge, eleven knowledge related items were used for assessing knowledge about BSE. Reliability analysis was done and Cronbach's alpha was 0.8, which means there were consistencies between items [14].

Data quality assurance

Data quality control for quantitative study: To assure data quality, the questionnaire was pre tested on 54 reproductive age (5% of the total sample size) at Warra Jarso district before conducting the actual data collection. A pre tested result helps to see the accuracy of the tool to the required information from study participants. Internal consistency was checked by using cronbach's alpha at the value of 0.8 for knowledge and HBM constructs questions [15].

From the beginning, two days of training were given for data collectors on information about the data collection tools (kobo toolbox), research objective, eligible study subject procedures and interview methods. On each data collection day, some per cent of the collected data was examined by the PI and any forwarded problem was getting an immediate solution [16].

After the data was collected by the kobo toolbox and sent the finalized data through the server prepared by the PI it was checked for completeness, clarity and consistency by the PI before data was exported and downloaded from the kobo toolbox appropriate corrective measures were taken. Then after data was exported and downloaded from the kobo toolbox through excel and converted excel data to Statistical Package of Social Science (SPSS) to screen for outliers, missing values and fulfilment of assumptions were made through running descriptive statistics and data cleaning measures were taken accordingly before data analysis [17].

Data quality control for a qualitative study: To ensure the quality of data, the PI considered trustworthiness which is the fundamental criterion for qualitative reports as follow.

Credibility (related to internal validity)

Credibility depends upon how closely the collection, presentation and interpretation of data match the underpinning

philosophy of the research methodology chosen to address the research question. So, to maintain the credibility, of the research findings FGD guidelines were evaluated by the professionals, before the data collection. For the two individuals who participated in the FGD, orientation about the purpose of the FGD and responsibility was given before the FGD takes place to avoid unnecessary interruption and keep the rights of the participants. Triangulations were made by using multiple data sources and diversifying the study participants in terms of age, residence and educational level for a deeper understanding of the BSE practice [18].

Transferability (related to generalizability)

Transferability is about providing enough information in accessible language to enable another to answer the question to transfer in another setting. To maintain the transferability of the finding, appropriate probes were used to obtain detailed information on responses. Detailed field notes and digital audio recordings were done for all FGD before and during analysis (thick description).

Dependability (related to reliability)

Dependability can be described as making sure research questions were clear and appropriate to the study design, ensuring transparency of the researcher`s role and the use of appropriate data collection. So, to maintain the dependability of the finding the research process member checking was made by returning the preliminary findings to the participants to correct errors and challenge what was perceived as wrong interpretations. The prolonged meeting was made to address individuals with different ideas acceptance was built with participants. Furthermore, the interpretations of the researcher were challenged through discussion of the preliminary analysis in group meetings with groups of data collectors and the researcher`s supervisors [19].

Conformability (related to objectivity)

To ensure conformability of the finding the FGD guidelines were followed to make them homogeny in terms of age, educational level and residence and the discussion process were conducted by bilingual individuals (two female) to make the participant freely react to the issue under discussion. Detailed field notes and digital audio recordings were done for all FGD and data analysis in each sub study was crossed checked and the results were reviewed about themes and subthemes with which their original data were linked by the investigator and at least one other researcher [20].

Data process and analysis

For quantitative study data export and downloaded from kobo toolbox through excel and converting excel data to SPSS version

26.0 software package to edit, clean for inconsistencies and check missing values, and finally to analyses. Descriptive statistics like frequency, percentages, the mean and standard deviation was carried out to describe the data. Then, binary logistic regression was done to assess the crude relationship between the independent variables and the dependent variable. All variables having a P-value of<0.25 were a candidate for multivariable logistic regression to control for possible confounding effects [21].

To see the independent influence of each variable on the outcome variable, multivariable logistic regression was used. Multicollinearity was checked with Variance Inflation Factors (VIF) and tolerance test which was VIF less than 5 and tolerance test less than 1 used as cut off point to diagnose multicollinearity. Model fitness was checked using the Hosmer and Lemeshow goodness of fit model and it was fitted (p-value=0.8). The final results of the association were presented based on AOR at 95% CI and a p-value<0.05 was considered statistically significant

For qualitative data, audio taped, transcribed, translated and coded qualitative data was organized in categories forms after being checked for similarities and differences and analyzed under selected themes based on the question guide and summarized manually.

Ethical considerations

The study was approved by the ethical review board of salale university. It was presented to the North Shewa zonal health office to grant official permission to undertake research activities in the selected district's kebeles. Written informed consent was obtained from every study subject before the data collection and minor assent or parental permission for the study subject less than 18 years old. The entire information collected from the study participants was handled confidentially by omitting their identifiers.

RESULTS AND DISCUSSION

Socio demographic characteristics of respondents

A total of 1055 respondents have completed the study making a response rate of 98%. The median age of the respondents was 22 years with 10 IQR. Out of them, 833 (79%) of the respondents were rural, 686 (65%) were married, 677 (64.6%) were in primary education, 489 (46.4%) of them were housewives, 154 (14.6%) were farmers and 354 (33.6%) were women of poor household (Table 1).

Table 1: Socio demographic characteristics of study participants, 2022.

Variable (n=1055)	Categories	Frequency	Percent (%)
Age (years)	15-24	661	62.7
	25-34	301	28.5
	35-49	93	8.8
Residence	Urban	222	21
	Rural	833	79
Marital status	Single	335	31.8
	Married	686	65
	Divorced	34	3.2
Educational level	Unable to read and write	100	9.5
	Primary education	677	64.2
	Secondary education	225	21.3
	College and above	53	5
Occupational status	Student	166	15.7
	Housewife	489	46.4
	Marchant	89	8.4
	Gov't employed	82	7.8
	Day lobar	75	7.1
	Farmers	154	14.6
Wealth index	Lower	354	33.6
	Middle	340	32.2
	Higher	361	34.2

Family and personal history of BC

The majority of respondents 858 (81.3%) have reported they didn't have a family history of BC. Among respondents who had a family history of BC, 67 (33.5%) of them were their sisters, and 65 (32.5%) of their mothers were affected by BC (Figure 1). Only 4 (0.4%) of respondents had a personal history of BC and 693 (65.7%) knew someone who suffered from BC (Table 2).
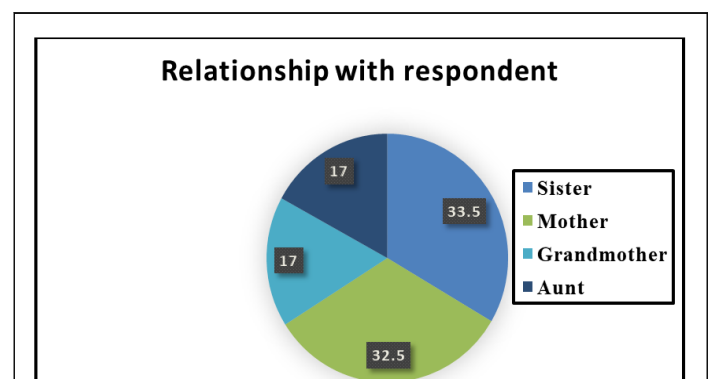

Figure 1: Relationship with respondents who had a family history of BC among reproductive age women in North Shewa zone central, Ethiopia, 2022.

Table 2: Family and personal history of breast cancer among study participants, 2022.

Variables (n=1055)	Categories	Frequency	Percent (%)
Family history of BC	Yes	197	18.7
	No	858	81.3
Knowing someone suffering from BC	Yes	693	65.7
	No	362	34.3
Having a personal history of BC	Yes	4	0.4
	No	1051	99.6

Knowledge of study participants about BSE

The majority of, the respondents 594 (56.3%) had enough knowledge about BSE. Regarding sources of information: mass media (television and radios) were the main sources, 83.6%., 17 (3.4%) heard from BC patients (Figure 2) and only 318 (30.1%) of participants knew the appropriate timing to perform BSE (Figure 3) and also, only 417 (39.5%) knew how frequent BSE practiced. Regarding knowledge about risk factors, the majority of them 748 (70.9%) did not know any risk factors of BC (Table 3).
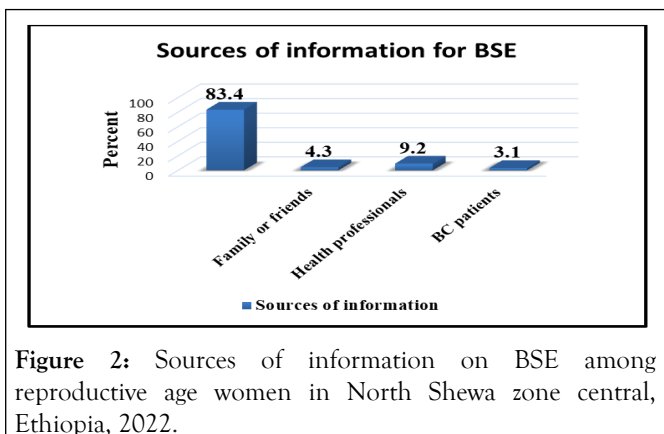

Figure 2: Sources of information on BSE among reproductive age women in North Shewa zone central, Ethiopia, 2022.
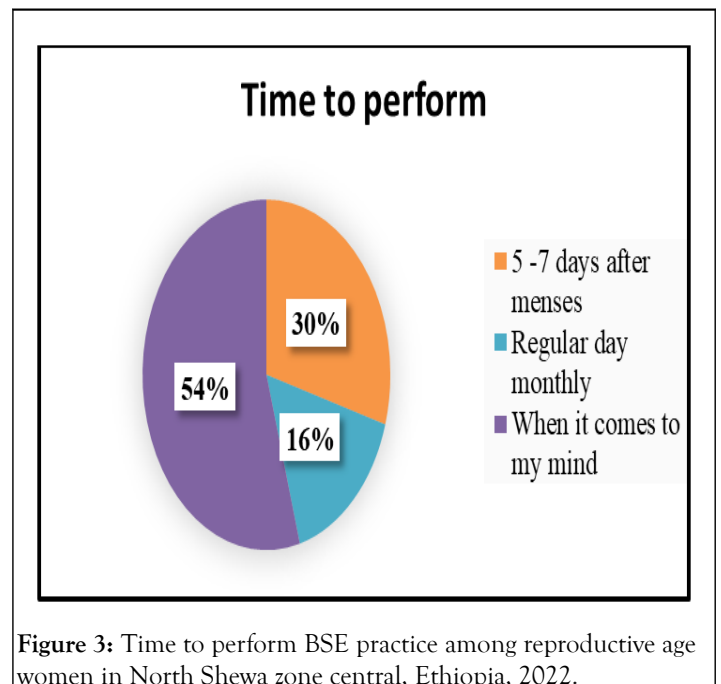

Figure 3: Time to perform BSE practice among reproductive age women in North Shewa zone central, Ethiopia, 2022.

Table 3: Knowledge on breast self examination practice among study participants, 2022.

Variables (n=1055)	Categories	Frequency	Percent (%)
Ever heard about BSE practice	Yes	501	47.5
	No	554	52.5
BSE is done by an individual to check for breast lumps	Yes	427	40.5
	No	628	59.5
Early detection of BC improves the chance of survival	Yes	221	20.9
	No	834	79.1
Knowing the presence of BC screening methods	Yes	247	23.4
	No	808	76.6

When should a girl begin BSE	At age less than 20	161	15
	At age 20	151	14
	At age above 20	764	71
What the position of the body while performing BSE	Standing in front of mirror	280	26.5
	Sitting in front of mirror	83	7.9
	I don't know	691	65.5
Frequency BSE should be performed	Once a week	120	11.4
	Once a month	410	38.8
	Once in 3 months	182	17.3
	Once in 6 months	98	9.3
	When it comes to mind	245	23.2
Knowing technique to perform BSE	Yes	192	18.2
	No	863	81.8
What to look for when doing BSE	Nipple discharge	515	48.8
	Lump	419	39.7
	Nipple retraction	121	11.5
Knowing the advantages of regular BSE practice	Yes	339	32.1
	No	716	67.9
Knowing the factors that may risk for BC	Yes	307	29.1
	No	748	70.9
Over all knowledge of respondents	Knowledgeable	594	56.3
	Not knowledgeable	461	43.7

Perception toward BSE and BC

The perception of participants was measured by using HBM constructs; which majority of them have high perceived susceptibility to BC 51.8% and 66.6% of them have high perceived severity of BC (Figure 4).
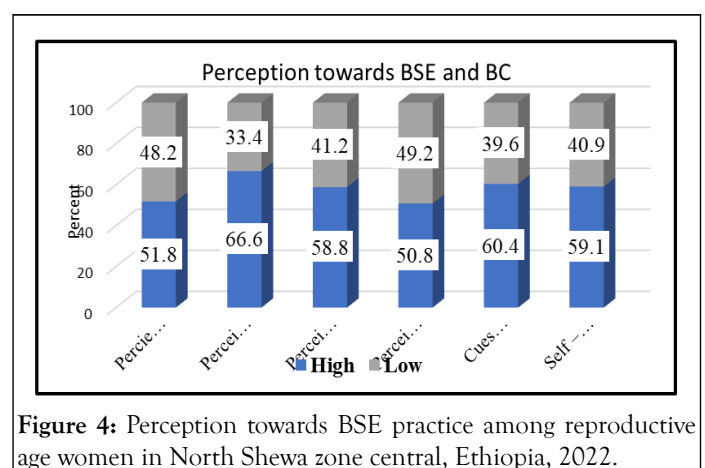

Figure 4: Perception towards BSE practice among reproductive age women in North Shewa zone central, Ethiopia, 2022.

Relationship between HBM constructs and practice of BSE

The relationship between HBM constructs and the practice of BSE was tested using pearson correlation coefficient (r). The statistical analysis was conducted using Pearson r to establish a significant relationship between the HBM constructs and the practice of BSE among women. A strong negative correlation exists between the perceived barrier and the practice of BSE (r=-0.6, p=0.001), while a strong positive correlation was found between the perceived benefit of BSE and its practice (r=0.6, p=0.001). This indicates that a unit decrease in the perceived barrier towards BSE may produce a corresponding increase in the practice of BSE (Table 4).

Table 4: Relationship between the basic construct of HBM and BSE practice.

HBM constructs	BSE practice	
	Pearson correlation coefficient	P-value
Susceptibility	0.6	0.001
Severity	0.2	0.018
Benefit	0.5	0.001
Barrier	0.6	0.001
Cue to action	0.6	0.01
BSE self efficacy	0.6	0.001

BSE practice of the respondents

In this study, the overall prevalence of BSE practice was 18.2% with 95% CI (15.7, 20.5). Among these, only 20 (10.4%) had practiced monthly (regularly). Those women who performed BSE had detected abnormalities in their breasts such as Nipple discharge 125 (65.1%), and Nipple retraction 44 (22.9%). The majority, 115 (59.9%) of the respondents who detected positive findings in their breasts did not consult Health professionals (Table 5).

Table 5: Breast self examination practice among study participants, 2022.

Variables	Categories	Frequency	Percent (%)
Ever performed BSE	Yes	192	17.8
	No	884	82.2
Age when you started performing BSE (n=192)	At age less than 20	74	38.5
	At age 20	92	47.9
	At age above 20	26	13.6
Frequency of performing BSE (n=192)	Once a month	20	10.4
	Once in 3 months	33	17.2
	When it comes to mind	139	72.4
Time of performing BSE (n=192)	Few days before menses	65	33.8
	5-7 days after menses	75	39.1
	1-7 days of menses	52	27.1
The body position used while performing BSE (n=192)	Standing in front of mirror	149	77.6

	Sitting in front of mirror	43	22.4
What to look for when doing BSE (n=192)	Nipple discharge	125	65.1
	Lump	44	22.9
	Nipple retraction	23	12
What did you do upon a positive finding (n=192)	Consult health professional	77	40.1
	Consult traditional healers	115	59.9

Reason for practicing BSE

More than half of the respondents 102 (53.1%) practiced the BSE due to recommendations by a health professionals and 87 (45.3%) of the respondents practiced BSE for early detection and treatment (Figure 5).
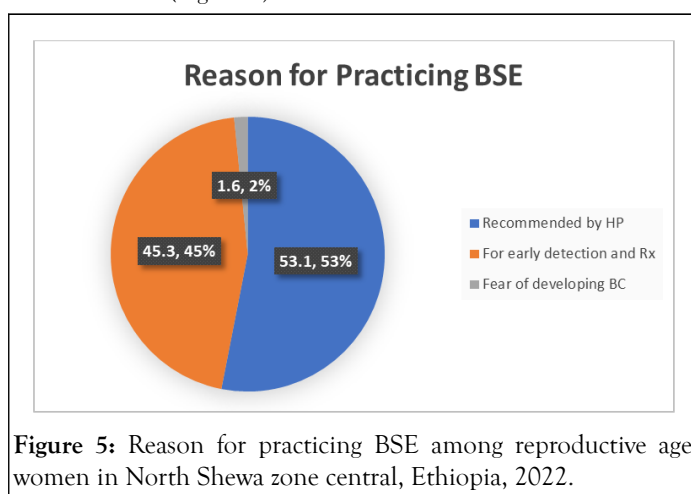

Figure 5: Reason for practicing BSE among reproductive age women in North Shewa zone central, Ethiopia, 2022.

Reason for not practicing BSE

The commonest reasons for not performing were that I don't know how to do it (30.2%), have no symptoms (29.5%), and do not believe that it is beneficial (24.9%) (Figure 6).
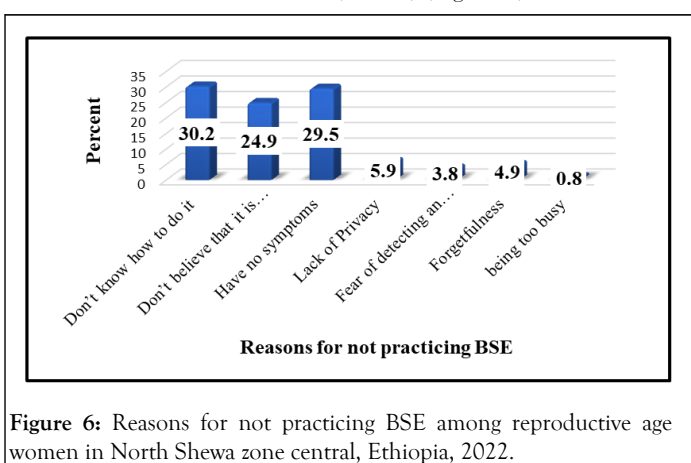

Figure 6: Reasons for not practicing BSE among reproductive age women in North Shewa zone central, Ethiopia, 2022.

Factors associated with BSE practice

Bivariate and multivariable logistic regression analyses were done to assess the determinants of BSE practice. Variables in bivariate analysis with p value<0.25 were entered into a multivariable logistic regression model for analysis. Based on binary logistic regression variables, included in the model were, age, family history of BC, knowledge of BSE and constructs of HBM perceived susceptibility, perceived severity, perceived barriers, perceived benefit, perceived threat of BC and self efficacy were candidate variables for the multivariable logistic regression model for analysis.

The multivariable logistic regression analysis result showed that age of 15-24, knowledge of BSE practice, a family history of BC, perceived susceptibility, perceived benefit and self efficacy were statistically significant with BSE practice (at p value<0.05). The odds of BSE practice among younger aged women (15-24), were four times (AOR=3.9, 95% CI (2.2-6.8)) higher compared to those women who were older than 35 years. Women who had a family history of BC were seven times (AOR=6.9, 95% CI (4.7-10.3)) more likely to practice BSE than women who had no family history of BC. Participants knowing BSE practice were three times more likely to practice BSE (AOR=3, 95% CI (1.9-4.3)) compared with those not knowledgeable. Regarding the perception, women who had high perceived susceptibility to develop BC were 1.7 times (AOR=1.7, 95% CI (1.1-2.5)) more likely to practice BSE than women who had low perceived susceptibility. Women who had high perceived benefits of BSE were 1.5 more likely to practice BSE as compared to women who had low perceived benefits of BSE (AOR=1.5; 95% CI (1.1-2.3)). Women who had high perceived self efficacy to do BSE were 1.5 times more likely to practice BSE as compared to women who had low perceived self-efficacy to do BSE, (AOR=1.5; 95% CI (1.2-2.5)) (Table 6).

Table 6: Bivariate and multivariate logistic regression analysis results of BSE practice among study participants, 2022.

Variable	BSE practice		COR (95% CI)	AOR (95% CI)	p-value
	Yes (%)	No (%)			
Age (in years)					
15-24	67 (34.9%)	608 (68.8%)	7.0 (4.4-11.4)	3.9 (2.2-6.8)	0.001**
25-34	83 (43.2%)	222 (25.1%)	2.1 (1.3-3.3)	1.4 (0.8-2.3)	0.275
35-49	42 (21.9%)	84 (6.1%)	1	1	
Family history of BC					
Yes	101 (52.6%)	99 (11.2%)	8.8 (6.2-12.5)	6.9 (4.710.3)	0.001**
No	91 (47.6%)	785 (88.8%)	1	1	
Knowledge					
Knowledgeable	85 (44.3%)	522 (56.4%)	0.6 (1.3-2.5)	3 (1.9.-4.3)	0.001**
Not knowledgeable	107 (55.7%)	362 (43.6%)	1	1	
Perceived Susceptibility					
High	136 (70.8%)	421 (47.6%)	2.7 (1.9-3.7)	1.7 (1.1-2.5)	0.038**
Low	56 (29.2%)	463 (52.4%)	1	1	
Perceived barrier					
High	49 (25.5%)	498 (56.3%)	1	1	0.256
Low	143 (74.5%)	386 (43.7%)	0.7 (1.9-3.7)	0.8 (0.5-1.2)	
Perceived severity					
High	174 (90.6%)	543 (61.4%)	6.1 (3.7-10)	1.3 (0.8-1.9)	0.313
Low	18 (9.4%)	341 (38.6%)	1	1	
Cues to action					
High	161 (83.9%)	489 (55.3%)	4.2 (2.8-6.3)	1.3 (0.8-1.9)	0.265
Low	31 (16.1%)	395 (44.7%)	1	1	
Self efficacy					
High	152 (79.2%)	484 (54.8%)	3.1 (2.2-4.6)	1.5 (1.2-2.5)	0.004**
Low	40 (20.8%)	400 (45.2%)	1	1	
Perceived benefit					
High	167 (86.9%)	466 (52.7%)	5.9 (3.9-9.3)	1.5 (1.1-2.3)	0.027**
Low	25 (13.1%)	418 (47.3%)	1	1	
Perceived threat of BC					

High	145 (75.5%)	478 (54.1%)	2.6 (1.8-3.7)	1.6 (0.92.7)	0.054
Low	47 (24.5%)	406 (45.9%)	1	1	

Note: NB: **Statistically significance, at p value<0.05, 1: Reference, AOR=Adjusted Odds Ratio, COR=Crude Odds Ratio

Model fitness result

The hosmer and lemeshow test indicated a good fit (P=0.8) and accounted for 72.3% to 82.3% of the variation in the practice of BSE is explained by the combination of the six independent variables in the model, namely, age of women, knowledge of BSE practice, a family history of BC, perceived susceptibility, perceived benefit and self efficacy. At all levels, the model passed the test of overall significance. Therefore, the variables in the equation can, in the light of the empirical findings be considered to be good predictors of BSE practice among women of reproductive age in North Shewa (Table 7).

Table 7: Model fitness result of BSE practice.

Model summary			
Step	-2 Log likelihood	Cox and snell R square	Nagelkerke R square
1	778.807	0.723	0.823
Hosmer and lemeshow test			
Step	*Chi-square*	Df	Sig.
1	38.852	8	0.8

Qualitative research section

Description of participants: A total of 46 women were involved in five FGDs, which were considered participants with and without cancer. Participants' ages ranged from fifteen to forty-nine. Accordingly, most of the participants were between the age of 25-34 years, educational background varies among them and ranges from primary (n=18) to secondary (n=22) to tertiary level (n=6). Each participant showed good interest in the topic and gave enthusiastic answers to the questions.

Findings

Generally, confirmed from the discussion as there is a lack of BSE practice. The majority of the participants reported that they did not know how to do BSE correctly. Some women performed BSE sometimes when they felt something or had pain in the breast. They responded, "I don't have a history of breast disease. "I don't have a history of breast disease" "I do not feel pain in my breast. I think that I do not need to do a breast examination". (women16, Group 1-4) ". Because I do not know how to do it, and I have no extra time to do it". (women16, Group 1-4) "I rarely perform it because I have no problem with breast and usually visit health facilities and HCWs to get a child. Nevertheless, I have never asked about BC, and also, they do not suggest me to perform BSE" (women 10, Group 1-4).

Codes were compared for similarity and differences, merged and categorize. Finally, themes emerged and the emerged themes with the categories that came together for the data analysis. The findings are presented in four thematic groups (Table 8).

Table 8: Codes, categories and themes emerged from FGD on BSE practice among study participants, 2022.

Codes	Categories	Themes
Definition of BC	Knowledge about BC	BC and BSE-related knowledge
Source of information		
Sign and symptoms		
Risk for BC		
Its screening methods		
Hearing about BSE practice	Knowledge and experience of BSE practice	
Who should perform BSE		

The best time to perform BSE		
The right technique		
The right position to perform BSE		
Believe performing BSE is important		
Consult traditional healers	Alternative use of treatment	Perceived benefits of treatment
Holy water (Tsebel)		
Consult health professionals		
Unable to seek treatment if the disease is not severed		
I don't know how to do it	Low knowledge of BSE practice	Barriers to BSE practice
I don't know the right technique		
I don't know the right position		
I don't know the best time to be performed		
I don't have any symptoms	The misconception about BC and BSE	
I don't feel it is necessary		
BSE is embarrassing to me		
Adequate information on BSE practice	Good knowledge of BSE practice	Enablers of BSE practice
I know how to do it		
I worry about my body image		
I believe it important		
I know screening methods		
breast enlargement in the childhood period	Perceived susceptibility	
I am at risk for BC		
Having a family history of BC		

Theme 1: BC and BSE-related knowledge

Category 1 knowledge about BC: Generally confirmed from all FGD as low awareness about BC. The participants raised that even if they had heard about BC from media (television and radio) and BC patients but they did not know exactly what it was., especially its sign and symptoms, risk factors, screening methods and management.

The majority of the women agreed that BC was a painful lump. Some of their responses were: "It is the lump in the breast that can disseminate to other parts of the body. If the lump has no pain, there is no need to worry. There is no problem. It is not BC" (women 40, group 1-5). "....it is a painful ulcer or lump, but

I do not know well" (women16, group 1-5). "I do not know the symptoms...It is a lump and painful" (women13, group 1-3).

Some participants associated the early symptoms of BC with breast feeding: "I believed that to be usual. It's always been that way for women, but when the baby stinks, it goes away. So, I assumed that it would too" (women 8, group 1-4). Another participant stated the following to show the lack of understanding regarding the symptoms of BC: "I initially felt a lump in my breast, quite hard like a stone and large, but it was not uncomfortable therefore I disregarded it. At the moment, I never gave it any thought. Even when it got quite heavy, there was no actual pain present; only hardness and weight. Later, I visited the hospital" (Women 4, Group 1-5).

One participant's comment that reveals ignorance about BC symptoms is as follows: "This form of sickness is particularly hazardous since it does not cause pain. I believed the lump was gone for a while when I could not even feel it. It was eating me up in the meanwhile. There was no discomfort for a long time. Then it started again all of a sudden, and this time I knew I needed to see a doctor" (women 1, group 4). Regarding risk factors and causes, many different aspects appeared. They assumed that menopausal or unmarried women can suffer more BC. Some of the women believed they had no chance to experience BC. Some of their opinions were: "It is common in women after menopause and in spinsters. I don't think I could …. I am not old age and already married" (women 6, group 1-3). "…if a woman gives birth and goes out from her house within ten days, fifteen days, one month or forty days starting from the birthday, cold can be the cause of breast disease. On some other women the disease arises without any known reason, it swells and becomes painful, people say the problem is engorgement, some say again it is because of another thing, in reality, we do not know the cause." (women 5, group 2).

"I thought it was menopause because my friend told me that you can experience many things when that time comes. I really that I have reached that age" (women 5, group 1-5). Other groups also reported, "…god (rabbi) sends disease to a human being; I think no one can know what god brings to a human being. What god brings to human beings arises from the body of the person itself. Usually, a woman can get breast disease when she marries and gives birth to a baby. Milk fills the breast, when it remains inside the breast for a long time, it becomes curdle, then changed to pus. If she doesn't get treatment either from a traditional healer or health facility, the problem becomes worst and changed to severe breast disease." (women 5, group 1-3).

In addition, one group also stated, "…what is said in our tradition, if child eat delicious food and suck the breast, it can be diseased as the result of 'Michi' and the belching of a child on it." (women 5 group 3-5). Cancer patients were asked about their knowledge of 'cancer' and 'BC before they were diagnosed with the illness. Most of the women were unfamiliar with the subject of cancer. They expressed a lack of knowledge of cancer as a disease and its symptoms. Although the patient heard about cancer before their diagnosis, she never knew that she could suffer from BC as well. She was shocked when told of the diagnosis and had difficulty telling his family and others about her illness.

Expressions such as "never knew anything about cancer before." "We never knew." "We didn't know what is cancer" were common. Lack of knowledge of cancer could have contributed to the absence of personal experience of cancer: none of the patients in the present study knew someone personally who had cancer. Many women in the present study recognised a lump in the breast or under the arm as a sign of 'illness, but they did not know that this could signify BC. "I had a little lump in my breast …for a while. I used cream to rub it, thought it will go away. (I) thought nothing of it. Then after 3 or 4 days, i had a lot of pain and i was awake all night" "i was perfectly all right, except i had a lump that was not causing any problem." (women 3, group 4).

"In our setting, there has not been any awareness creating activities or education by doctors on breast matter (presence of the disease, its consequences, its symptoms and its option of treatment)." We have heard some information on television and radio. Some of us are hearing even the presence of its screening methods and methods for early detection of breast cancer today from this discussion." (women 16, group 1-5).

Category 2: Knowledge and experience of BSE practice

The level of understanding of BSE was inadequate among participants. Although the women had already heard of and accepted BSE as a way to detect BC, but did not know the method accurately, especially the best time to perform, the right technique and the position to perform. Their uncertainty was seen in the following responses: "Just we heard about BSE as one method of BC screening. But it is not sure how to do it and doesn't know the right time to perform it" (women 26, group 1-4). "I heard about BSE. But not know the way to do" (women 14, group 1-5). "I heard about BSE and accepted as it important for early detection of BC but I did not know the right time to perform as well as its technique" (women 24, group 1-4). "We have never had any opportunity to examine ourselves because we do not know how to do it and we don't know when to examine our breast" (women 13, group 1-4).

"I heard that breast cancer might be found through lumps in advance. When i touched my breasts, i felt the mass in them. The mass is still there but there have not been any changes up to now. I think that techniques of BSE can be of help for self examination".

FGD confirmed a lack of BSE practice; the majority of women do not need to touch their breasts if they do not doubt there their problems and also the majority of them did not believe performing BSE is important for early detection of any breast diseases. Most of the women stated that BSE is unknown among us. "…we won't need to touch and examine our breast if we don't doubt the problem. If it develops a problem, symptoms enforce us to touch and examine the breast."

"It is must see some internally felt discomfort or externally observed sign and symptoms of the disease" (women 12, group 3-4). "I heard about BSE But it is not sure how to do it so, don't believe as it important for early detection of breast disease" (women 15, group 1-4). "We don't know the right technique to perform BSE and the right position to perform it. Therefore, we don't believe performing BSE is important for us If we have a problem, we check the improvement of that problem from time to time if no improvement we consult HCWs or a traditional healer" (women 16, group 1-4).

Theme 2: Perceived benefits of treatment

Category 1 alternative use of treatment: In five FGD majority of the participants said that women preferred traditional medicine than a modern one. "…women prefer traditional healer to get fast relief and recovery from their problem and for the time being it gives some relief but it does not cure" (women 24, group 1-5). "…women who trusted in God and spray the

"prayed water" Yetetseleyebet wuha by prophets healed the women who developed such a disease." ".... In fact, this is true in our church Orthodox, those women who believed in god with their full heart go to 'tsebel' holy water and then healed after drinking and spraying it by church holy person" (women 24, group 1-4). "...women know their breasts or their bodies, especially during a change. Breast pain is not simple, its pain is more severe than other diseases; therefore, it is easy to know about breast problems on ourselves. However, women have seen this problem traditionally and some of them mostly seek traditional treatment because they will not permit to expose their breasts to health professionals if the disease is not severe. This makes the disease too fatal among our community..." (women 10, group 1-4).

"God (rabbi) sends diseases to a human being; we think no one can know what god brings to a human being. So, women who develop such diseases go to 'Tsebel'-meaning holy water." (women 11 group 1-4) In addition, FGD from Jidda stated also stated, "...as our tradition what is being said, if child eat delicious food and suck breast can be infected as the result of "michi". This time we feel breast itching and tubing pain. For this we apply some leave that we know traditionally as medicine for "michi which is called demakese" (women 4, group 2).

Theme 3: Barriers to BSE practice

Category 1 Low knowledge of BSE practice: Generally, confirmed from the discussion as there is a lack of BSE practice. The women who had never performed BSE answered that they did not know how to do it correctly, they didn't know what to find and they didn't understand if the mass they detected was normal or not. Their responses were as follows: "Just we heard about BSE as one method of BC screening. But it is not sure how to do it and doesn't know the right time to perform it" (women 26, group 1-4). "I heard about BSE. But not know the way to do" (women 14, group 1-2). "I heard about BSE and accepted as it important for early detection of BC but I did not know the right time to perform as well as its technique" (women 24, group 1-3). "BSE is squeezing of the breast thoroughly with hand in sitting position at the time of bathing, but not the axilla because of BC" (women 4, group 1-2). "Because i do not know how to do it, and i have no extra time to do it".

Category 2: Misconception about BC and BSE practice

Generally, confirmed from the discussion as there is a misconception about BC and BSE practice. The women who had never performed BSE answered that, have no history of a breast lump and have no symptoms, they did not believe it important and fear made them afraid to talk about the practice of BSE. Their responses were as follows: "I have no history of breast disease. I do not feel pain in my breast. I think that I do not need to do a breast examination". (women 12, group 1-3). "I rarely perform it because I have no problem with breast and usually visit health facilities and HCWs to get a child. Nevertheless, I have never asked about BC, and also, they do not suggest me to perform BSE" (women 5, group 1-4). "I heard

about BSE But it is not sure how to do it so, don't believe as it important for early detection of breast disease."

"BSE practice, I feel it is not necessary to me (laugh). As you saw i am an adult, I am married and have given birth to children and fed breast to all of my children so, through all this time I do not feel any changes or problems with discharge, and no pain and if this was needed, it should be done by a healthcare professional" (women 9, Group 1-3). "I did BSE but I couldn´t find anything, I mean I couldn´t figure it out. Then, I asked myself why I am breaking me down and I gave up practicing these self-examinations" (women 19, group 1-4).

"We don't want to talk about BC because when you talk about a disease, the spirit of that disease can inflict or make it happen to you. It is a disease that makes them remove your breast? it is scaring" (women 5, group 1-4). "Frequent breast examination will make one detect a growth. The breast is a private area that should be kept as such" (women 5, group 2-4).

Theme 4: enablers of BSE practice

Category 1 good knowledge of BSE practice: Generally, confirmed from the discussion out of 46 participants in this discussion, 22 women had practiced BSE at least once during the past 6 months. Those women who had performed BSE answered that "we worry for our body image", "we know how to do it", "we know screening methods" and "we believe it important for early diagnosis and treatment". "I heard about BSE and I know the way to do it" (women 14, group 1-5).

"I heard about BSE and accepted as it important for early detection of BC and I know the right time to perform as well as its technique" (women 8, group 1-5). "BSE is squeezing of the breast thoroughly with hand in standing In front of the mirror" (women 14, group 1-5). "I heard from health professionals as early detection of BC improves the chance of survival, do to that I do it every month" (women 14, group 1-5). "We are high school students and young enough at this time we carry for our physical appearance and to be healthier than older aged women us you know (laugh) we have many plans in the future for that matter we perform BSE" (women 11, group 1-2). "We like to have a husband, child and to be a good mother to the children. We don't like having cancer ...so we check our breast every time" (women 7, group 3-4).

"I don't like getting cancer, I don't like getting chemotherapy treatment, losing hair" (women 3, group 1-4). "If we get BC, we will be immersed in suffering ... we'll face the outcome of breast defect ... we'll suffer physical defect. If a member of the body is lost, we won't know what is happening to us. If a physical crisis happens to us, the people around us look at us with pity ... we won't feel defective, non existence and helpless if we soon notice BC, we do not actually cause physical or psychological crises among family members. I wish i had the knowledge to do so.

Regarding believing it is important for early diagnosis and treatment, most participants in this discussion know well that BSE can help find the breast problem because their relatives and friends found the BC by self examination. "My friend discovered her BC by touching her own body. Unfortunately, her tumour been growing. If it had been found earlier, everything could be

different. I think that every woman should do BSE" (women 13, group 1-4).

"BSE is useful to understand the normal look and feel of your breast so, by doing it you can identify any problems in your breast early" (women 12, group 1-5). "I want to say I did BSE just for health, not intending to argue with the size of my breasts. The incentive of health is still strong (laughs). By the way, I have recommended the skills to my friends. For example, I told my boy boyfriends I could teach his sister; as we are all women, we have to protect ourselves..." (women 2, group 4). "The kuyu general hospital caregiver found the lump in my mother's breast when she examined my mother. She did my mother a great favour.... This is a good chance for me to learn these skills. I think that i can do it more often with my fingers so that it might keep my mind at ease" (women 2, group 1).

Category 2: Perceived susceptibility

The majority of participants perceived that the cause of BC is hereditary, supernatural power and a few associated it with breast enlargement in the childhood period. Those women who had performed BSE answered that they have a family history of BC, perceived they are susceptible to the disease and perceived the severity of the disease. In this discussion, the majority of the women expressed that they perceived the risk of BC. However, the participants varied in assessing their risk of BC. The majority of them believed that their risks were connected with having a family history of BC. Their responses are as follows: "My mother was diagnosed with a BC last five years starting from that time. I was nervous about having BC due to that i checked my breast every month" (women 5, group 1-4). "I was nervous about having BC because my mother had BC, and had a mastectomy for one of her breasts last year. Also, I have sometimes felt the pain that is why I want to examine my breast every month."

"Sometimes those women who were not breastfeeding their child at early stage.... their breast becomes very large and develop breast mass and later develops BC" (women 3, group 1-4).

This community based cross sectional mixed study attempted to explore BSE practice and associated factors among women of reproductive age in the North Shewa zone. The community is a crucial resource for encouraging improvements in early BC preventive methods. Women must know how their breasts normally look and feel. Early detection which remains the unquestionable means of BC prevention can be achieved through BSE. The value of BSE practice in the early diagnosis of BC has been emphasized by several authors.

In the current study, the overall prevalence of BSE practice was 18.2% within 95% CI (15.7, 20.5), which is comparable with the study conducted in Ethiopia, Jimma town and other counties like Cameron and South Khorasan among women of reproductive age which indicated 15%, in Jimma town and 16.8% in South Khorasan and 15% in Cameron respectively. But this study was found to be lower when compared to the other studies conducted in Ethiopia that indicated 51.4% in adama and 48.5% in Gondar town respectively. The possible justification might be the educational level difference and

information availability. In the current study, only 20% of participants were college and above, while 46.4% of study participants in Adama, and 29.8% in gondar were college and above educational status. As most studies showed, as the level of education is high, there will be a tendency to BSE practice. This may be women with higher education may have more exposure to health information and more knowledge about BC which in turn may influence their intention to BSE practice.

It was also lower than studies conducted in Iranian, Ghana and Nigeria. This might be due to differences in community base awareness, accessibility to information or mass media, and screening program of BSE in the study area. The current finding implies that clinical usage of BSE is very poor, because of this the majority of the women did not benefit from BSE to detect abnormality before reaching an advancing stage of BC.

Regarding the factors, this study found that younger-aged women (15-24), having a family history of BC, knowledge of BSE, having perceived susceptibility, perceived benefit and self efficacy are independent predictors of BSE practice. In this study, younger aged women were four times more likely to practice BSE than those who are older than 35 years of age. This was similar to a study conducted in Southwest, Ethiopia Jimma town, Ruanda and Egypt. However, it was contradicted within the study conducted in Southern, Ethiopia, the Bale zone and Indonesia. The discrepancy might be due to differences in the study area and study population structure like the study of Indonesia, the majority of the study population were above 40 years old and in the Bale zone majority were above 25-34 while in the current study about 62.7% of them their age distribution is 15-24 those who are a younger age.

So possible explanation for this difference may be because younger women are more involved in social events and media including watching television, Facebook, and YouTube. In addition, younger women are in formal education today more than older women. Therefore, younger women are exposed to more health related information than older women. This was supported by qualitative findings as the age of women has an impact on the performance of BSE. As confirmed in the discussion, young women are giving more attention to their body image and have good health seeking behaviour than older aged women which implies that being in a young age has more willing to do BSE.

The likely hood of performing BSE practice increased by seven times for respondents who have fear of BC from family history from those who have no family history of BC. It was consistent with studies conducted in Ethiopia Jimma and Adama and other countries like Saudi Arabia, Egypt and South Khorasan. It may be because the women may perceive that they are at risk of having the disease in their life once they have a family history of the disease. It was supported by qualitative findings as confirmed from the discussions the majority of the participants believe as BC is hereditary. So, women who have a family history of BC are more willing to do BSE, while several participants reported that BC was not a threat to them because it was not in their family histories when asked about BSE.

In this study, women of reproductive age with good knowledge on BSE practice and BC risk perception were three times more likely to practice than their counterparts. It is consistent with the studies conducted in Ethiopia, Modjo town, Iran, and Ruanda among women of reproductive age. This gives the clue that when individuals have adequate knowledge about some disease problem and its consequence probability of to practice the preventive behaviour is high. Because of that knowledgeable respondents' motivation to practice BSE. The qualitative data also supported this finding. As confirmed from the discussions, most of the women who do not practise BSE acknowledged poor knowledge and understanding of the technique. So, a possible explanation is the limited knowledge about BSE is the main reason they do not practice it.

In this study, those women who perceived their susceptibility to developing BC were around two times more likely to practice BSE than their counterparts. This finding was similar to other studies conducted in Ethiopia, Adawa town, and other countries like Lebanon and Saudi Arabia. The possible justification, that women who are perceived as they are susceptible to developing BC may believe that BSE could have the potential for early detection of a breast lump and to improve the outcome. The other explanation can be the perceived susceptibility to developing BC may increase the perceived threat of respondents; hence they could practice BSE more. This is also, supported by qualitative findings identified from the discussions as women who perceived they are susceptible to developing the disease have a higher degree of performing BSE and also, the majority of them believed that their risks are connected with having a family history of BC, breast enlargement in childhood period and supernatural power.

In this study, women who perceived as BSE important to detect BC timely were around two times more likely to practice BSE as compared with their counterparts. This finding was in agreement with the study conducted in Ethiopia, Hosanna town and UAE, in Ajman The possible justification, that women with a better understanding of the benefits of BSE, such as doing it regularly (monthly) are helping them to detect any changes (like lumps) before the health professionals are more willing to perform BSE. In agreement with the above concept, the qualitative part of the study also showed that those women who believed BSE is important for early diagnosis and treatment are more tendency to perform it. Because their relatives and friends get the opportunity of early detection of BC (any breast problems) through self-examination.

In this study, the odds of performing BSE among women who perceived self-confidence to perform BSE were nearly two times higher when compared to their counterparts. This finding was consistent with the study conducted in the North Ethiopia, Adawa, and other countries like Indonesia and Yemen. It showed that one's ability to act successfully has an impact on their behaviour. As a result, educating women will enhance the practice. Also, supported by qualitative findings as understood from the discussion the self efficacy of the women for breast screening is very low, especially among those failing to do BSE practice because they do not know how to perform it and are unable to find the lump and also, didn't understand if the mass they detected is normal or not.

Strengths and limitations of the study

The fact that this study used both quantitative and qualitative research methods to gather its data was one of its major strengths. Additionally, the study is conducted among a general population that may be representative of Ethiopia's rural community or other urban communities. Moreover, the use of the updated champions of HBM is more crucial to understanding health-seeking behavior or the reasons why people aren't using health services. Despite the aforementioned strengths, the study was cross sectional, so a cause and effect relationship could not be established to identify a precise predictor. Additionally, the study excluded older women, for whom BC concerns may be greater, and only included those in reproductive age.

CONCLUSION

This study showed that the prevalence of BSE practice among women of reproductive age living in the North Shewa zone is very low. In this study a woman's age, a family history of BC, and knowledge of BSE practice and from HBM constructs perceived susceptibility, benefit and self efficacy are identified as independent predictors of BSE practice. And the current qualitative study also identified and described the barriers to BSE practice which are inadequate knowledge regarding BSE practice and BC and also, misconceptions of BC and BSE practice. So, BSE shall be encouraged by improving knowledge of BSE practice and perception of BSE practice and BC through providing special health education for women at all levels. To overcome this problem, effort is needed from health system management like, North Shewa zonal health office, and the regional health bureau, health care providers, cancer associations at the regional health bureau, and further research that looks into a comprehensive community based study at a national level on BC screening practices to plan an awareness creation program and a longitudinal study for a better outcome in all dimensions of breast screening practices.

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ETHICAL APPROVAL

The studies involving human participants were reviewed and approved by salale university ethical review committee. Written informed consent to participate in this study was provided by the participants and their legal guardian/next of kin for the study subject less than 18 years old.

AUTHOR CONTRIBUTIONS

DH carried out the conception and designing the study, performed statistical analysis and wrote the manuscript. DG and TAG performed statistical analysis. LAG, KG and BT critically evaluated and made progressive suggestions throughout the study. All of the authors read and approved the final draft of the manuscript.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding authors.

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