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Self-screening practice of breast cancer and associated factors among female students in Ethiopian universities using the theory of planned behavior: a cross sectional study

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Abstract

Background Breast cancer is the most common cancer among females. Assessing self-screening practices for breast cancer patients is vital for developing targeted interventions. The current study aimed to assess self-screening practices for breast cancer and associated factors via the theory of planned behavior constructs among female students in Ethiopian universities.

Methods A cross-sectional study design was conducted using the theory of planned behavior constructs. The data were collected from January 30, 2022, to February 30, 2022, in Ethiopia. A structured, self-administered questionnaire was used. The validity and reliability tests were checked to use the questionnaire in the main study through a pilot test. The data were collected through online Google Forms by distributing them to university students via Telegram groups, Imo, emails, and Facebook. The collected data were exported to SPSS version 26 for analysis. Bivariate analysis was used to identify the candidate variables for multiple logistic regression (P value < 0.02). Those variables with a P value less than 0.05 were considered significant predictors of breast cancer screening practices.

Results A total of 418 female students participated in the study. The respondents were aged between 18 and 37 years. In the current study, 318 (76.1%; 95% CI: 72.0, 80.4) university students had good screening practices for breast cancer. Nonhealth-related departments (AOR = 1.95; 95% CI: 1.11, 3.44), having training in breast cancer self-examination (AOR = 1.87; 95% CI: 1.04, 3.35), having a good attitude (AOR = 1.96; 95% CI: 1.11, 3.47), having good behavioral control (AOR = 4.1; 95% CI: 2.18, 7.71), and having good behavioral intentions (AOR = 1.88; 95% CI: 1.09, 3.24) were associated with self-screening practices for breast cancer patients.

Conclusion Designing a theory of planned behavior-based educational interventions improve self-screening practices for breast cancer among university female students. These insights could guide the development of future breast cancer awareness and prevention programs in university settings, with the goal of increasing early detection

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rates and lowering the risk of breast cancer. The study also serves as foundational information for designing future research using more advanced study design methods.

Keywords Breast cancer, Screening practice, Theory of planned behavior, Female university students

Introduction

Breast cancer remains the leading cause of cancer among women globally, with approximately 2.3 million new cases reported globally [1]. It results in psychological suffering, including anxiety, depression, and disfigurement [2, 3]. In developed countries, 5–7% of all patients with breast cancer are younger than 40 years of age [4]. Although disease incidence is higher in high-income countries, mortality rates are disproportionately high in sub-Saharan Africa (SSA) [5, 6]. Approximately 627,000 breast cancer-related deaths were recorded in 2018, with the majority from sub-Saharan African countries [7]. Against this backdrop, over 19.3 and 21.7 million women are estimated to suffer from breast cancer by 2025 and 2030, respectively, with the majority from SSA [8].

In 2020, the cancer incidence per 100,000 women in Southern (46.2), Western (37.3), Eastern (29.9), and Central Africa (27.9) was estimated to be 15.6, 17.8, 15.4, and 15.8, respectively [9]. The 2016 American Association for Cancer Education (AACE) report revealed that 2.5% of midwifery students had breast cancer [10]. Five hundred fifty-nine (18.6%) breast cancer cases were retrieved over 7 years between 2013 and 2019 in Ethiopia. Of these, 548 (98%) were women [11]. Breast cancer will most likely be a neglected healthcare issue in SSA, as governments in these countries focus on other healthcare priorities, particularly communicable diseases [12].

Breast screening examination (BSE) is a screening technique for early breast cancer detection of breast abnormalities that can be performed by women at home [13, 14]. This is a simple, inexpensive, easy, and effective technique that allows women to examine their breast tissue for any physical or visual changes. The statistics indicated that the participation rate in screening practices was 27.5% for BSE [12].

Many studies have shown that breast cancer screening intentions are still low [15, 16]. Among Emirati students, 68.5% of participants were aware of BSE, but few participants actually performed BSE [17]. Furthermore, 33% of Turkish students perform BSE regularly [18]. In Ethiopia, efforts to address breast cancer screening among women of reproductive age have been facilitated through various initiatives and the recommendation of a multitiered approach to breast cancer screening, including clinical breast examination (CBE) and breast self-examination (BSE), for early detection among women in the reproductive age range [19].

Additionally, Ethiopia's National Cancer Control Programme emphasizes the importance of breast cancer

screening, particularly for women of reproductive age, as part of its comprehensive approach to cancer control [20]. However, a study by Tewabe and Mekuria at Bahir Dar University in Ethiopia reported an 80.3% level of awareness among students, but their practice was poor [21].

Early detection of breast cancer plays a key role in better outcomes, and breast cancer is preventable and treatable if it is detected and treated early [22–25]. Early detection of breast cancer via the theory of planned behavior (TPB), an extension of the earlier theory of reasoned action (TRA), has been used to reduce associated morbidity and mortality by initiating and continuing the performance of a variety of health behaviors under volitional control [26–28]. It is one of the most widely employed social-cognitive theories for understanding the relationship between intentions and behavior [29]. The TPB has been found to be the most parsimonious model for predicting intentions and various behavioral outcomes [30].

The TPB is a social cognitive theory that explains how attitudes toward behavior, subjective norms, and perceived behavioral control affect behavior intention [28, 31–37]. The theory postulates that the best and most immediate predictor of a behavior is behavioral intention [38]. There is no local study that has assessed breast cancer screening practices and predictors via the TPB. Therefore, this study aimed to assess self-screening practices for breast cancer and associated factors using the TPB construct among female students in Ethiopian universities.

Methods

Study design, setting and period

A cross-sectional study was conducted among public university female students in Ethiopia. As of 2022, the country has 42 public universities with an estimated student population of over 450,000, of which approximately 250,000 are female. The data were collected from January 30, 2022, to February 30, 2022.

Study population and eligibility criteria

All female university students who had used social media (such as Telegram, Facebook, and Imo), who were voluntary, granted ethical consent, and available online during the study period were included. Students who were not Ethiopian citizens were excluded from the study. The survey was voluntary, as evidenced by the inclusion of the

participant consent form attached to the online instruments at the beginning of the questionnaire.

Sampling technique and sample size

All study participants who could access the online Google form during the study period were accessed via the snowball sampling method. We did not use a statistical formula to calculate the estimated sample size. Instead, we aimed to include all eligible participants who could access the online Google form during the one-month study period. The study period was set to one month, during which the questionnaire was efficiently distributed online. As a result, the final sample size of 418 participants was determined by the number of individuals who voluntarily completed the questionnaire within the one-month study period.

Data collection tool and procedure

A structured, self-administered questionnaire was used. The data collection tool used for the present study consists of three parts. Part 1 consists of questions on sociodemographic characteristics and related information. Part 2 included questions to assess breast cancer screening practices and was adapted from previous studies [17, 39–43]. The items were as follows: have you ever heard of breast self-examination? ; have you applied at least one breast cancer screening method in the previous month? Has you ever applied for breast self-examination in the previous month? Has you ever regular breast self-examinations? ; were you screened for breast cancer via

mammography? Do you have breast self-examination skills? Do you have advice or training about breast self-examination? ; and have you ever undergone a clinical breast cancer examination? Part 3 included items to cover the constructs of the TPB obtained from different studies based on Ajzen TPB 1991 and from similar studies (Table 1) (Table 1) [3, 44–51].

The questionnaire was distributed to the university's social media users via a Telegram group, Imo, email, and Facebook through the student's representative. Students were asked to continue the survey once they read the introduction of the questionnaire, including the purpose of the study, consent to participate, and confidentiality issues, as well as being able to discontinue the survey even if they started to fill it out. The schematic presentation of the study participants is as follows, including the year of study (Fig. 1).

Pilot study and procedure

A pilot study was conducted with 25 students to ascertain the validity and reliability of the instruments [52]. Factor analysis was performed to assess the validity and Cronbach's alpha reliability of each scale in the pilot study and to assess cultural adaptability in Ethiopia (>0.74). The correlation matrix and the determinant value were observed and fitted to factor analysis via PCA. The TPB manual also recommended piloting the questionnaire by more than five respondents to check if there were any ambiguous, difficult to answer, repetitive, too long, too superficial, annoying features of wording or

Table 1 Items under the constructs of TPB used to assess the self-screening practice of breast cancer among university students in Ethiopia, 2022 ($n=418$)

Constructs	Items	Options	
Attitude	For me regular breast care is:	1. Harmful	2. Beneficial
	For me regular check-up of breast in the health facility is:	1. Good	2. Bad
	For me applying breast cancer screening practice via mammography is:	1. Worthless	2. Useful
	For me doing regular breast care for certain days is:	1. Pleasant	2. Unpleasant
	For me clinical breast cancer examination is:	1. Good	2. Bad
Subjective norms	Most people who are important to me think that I should do breast care.	1. Yes	2. No
	People who are important to me would like me to check my breast regularly.	1. Yes	2. No
	People who are important to me think that I should do regular check up in the health facility.	1. Yes	2. No
	People who are important to me would like me to have breast cancer screening practice via mammography.	1. Yes	2. No
	People who are important to me would like me to have clinical breast cancer examination.	1. Yes	2. No
Perceived behavioural control	I am confident I could do breast care.	1. Yes	2. No
	For me doing regular breast care is:	1. Easy	2. Difficult
	For me doing regular check-up of my breast in the health facility is:	1. Easy	2. Difficult
	I am confident I could breast cancer screening practice via mammography.	1. Yes	2. No
	Whether or not I have clinical breast examination is entirely up to me.	1. Yes	2. No
Perceived behavioural intention	I intend to do regular breast care.	1. Yes	2. No
	I intend do breast cancer screening practice via mammography.	1. Yes	2. No
	I intend to have clinical breast examination.	1. Yes	2. No
	I Intend to have training about breast cancer self-examination.	1. Yes	2. No
	I intend to take breast self-examination practice as told by health professionals.	1. Yes	2. No

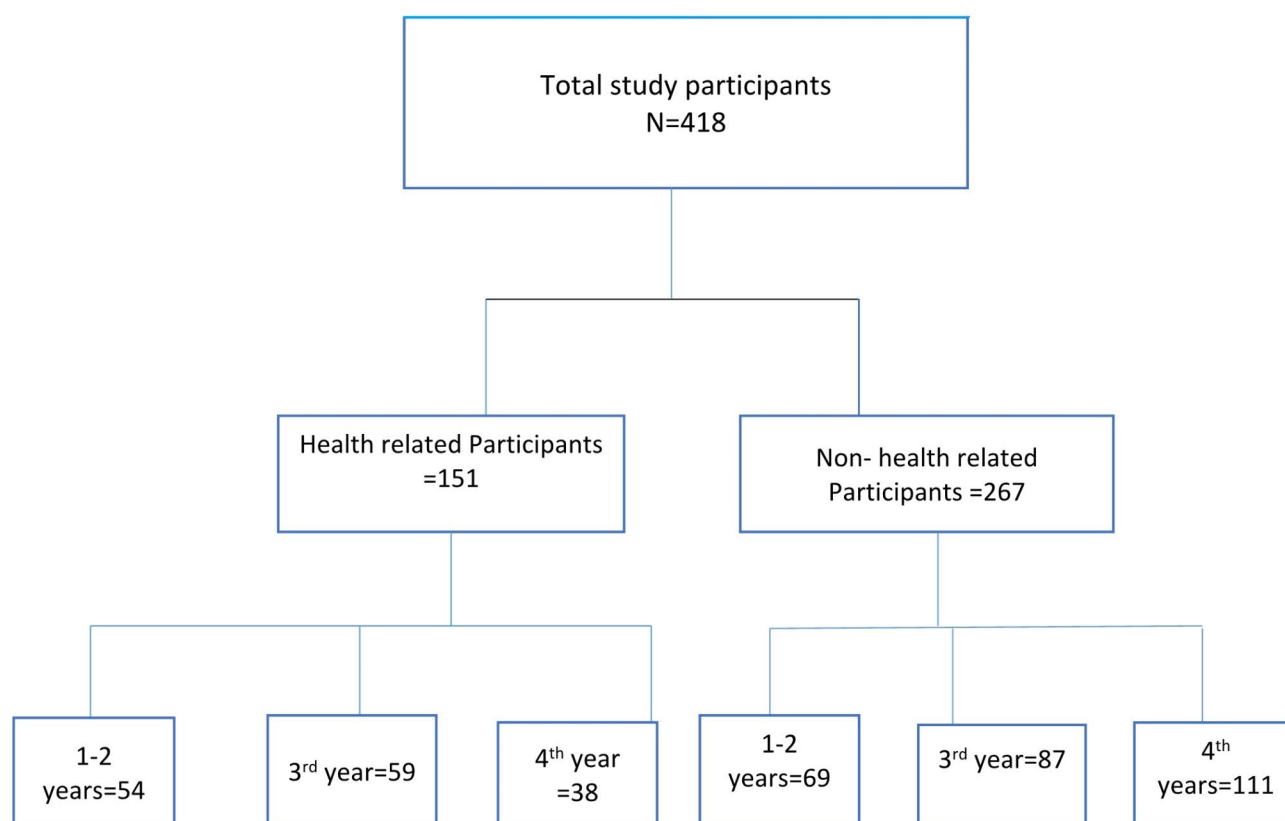


Fig. 1 Schematic presentation of study participants

formatting, or inconsistent responses that might indicate that changes in response endpoints are problematic for respondents [53]. The collected data were subjected to preliminary analysis. The validity and reliability tests were checked to use the questionnaire for the main study. Factor analysis (principal component analysis) was used for validity, and Cronbach's alpha was used for the reliability test [54].

Measurement of variables

Sociodemographic survey The sociodemographic variables included in this study were age in years, department (health-related/others), family residence (urban/rural), years of study (1–2 years/3rd year/4th+years), romantic relationship (yes/no), living alone (yes/no), sexual harassment (yes/no), smoking (yes/no), khat consumption (yes/no), alcohol drink (yes/no), chronic disease (yes/no), ever having a family history of breast cancer (yes/no), ever having training on breast cancer self-examination (yes/no), and source of information on breast cancer self-examination practices. The questions were used in previous studies in Ethiopia [55–59].

Sexual harassment The respondents were asked if they had ever encountered any form of sexual harassment in their lifetime. Those who encountered at least one form of

sexual harassment were considered to have experienced sexual harassment.

Romantic relationship Respondents were asked if they had romantic relationships or marital status, with yes or no answers.

Chronic disease Respondents were asked if they had any long-term health conditions that may impact their health behaviors.

problems were assessed by a single self-reported item with a yes or no response. The respondents were asked if they faced difficulty falling asleep at least once over the week preceding the survey (did you encounter falling asleep at least once over the previous week?) [60]. The respondents who answered 'yes' were considered to have sleeping problems.

Breast cancer screening practices Eight items were used to evaluate the extent of breast examination practices. Responses were asked to answer yes, no, and I do not know. For each question, 1 point was given for yes, and 0 points were given for the answers no and I do not know. ranged from 0 to 8, with a mean of 4.95 (SD=0.42). The minimum and maximum possible scores were 0 and 8, respectively. Study participants with a score greater

than the mean score (4.95) were considered to have good breast cancer screening practices, and those with scores less than the mean score were considered to have poor breast cancer screening practices.

TBP constructs For each construct (attitude, subjective norm, perceived behavioral control, and behavioral intention), 5 items with the lowest value of 0 and the highest value of 1 were used. The sum score of each construct ranged from 0 to 5. For all the constructs, the direction of the endpoint was adjusted to similar endpoints, and the value of the point was reversed to obtain the highest value at the positive endpoints during the analysis stage. Each value under the TPB constructs was dichotomized on the basis of the mean score. For all the constructs, the study participants were dichotomized as good or poor on the

basis of the summed scores of the items. A score above the mean (all the data measuring the four constructs were normally distributed) was considered a good attitude toward breast cancer screening practices, good subjective norms toward breast cancer screening practices, good behavioral control toward breast cancer screening practices, and good intentions toward breast cancer screening practices. This cutoff point is based on the manual for the TPB [53].

Statistical analysis

The data were collected through online Google Forms and exported to SPSS version 26 for analysis. The means, frequencies, and percentages were computed. Logistic regression was used to identify factors associated with breast cancer screening practices. Bivariate analysis was used to identify the candidate variables for multiple logistic regression (P value < 0.02). Those variables with a P value less than 0.05 were declared predictors of breast cancer screening practice.

Data quality control

The questionnaires were checked for consistency, completeness, clarity, and accuracy. A pilot test was performed among 25 female students who were subsequently excluded from the study. Minor modifications were made on the basis of the findings of the pretest. The validity and reliability of the tools were determined via factor analysis (principal component analysis) and Cronbach's alpha coefficient, respectively, in the pilot study to ensure the cultural adaptability and internal consistency of the tools. The factor analysis confirmed one factor load for assessing breast cancer screening practices and for all the constructs under the TPB. The Cronbach's alpha coefficient for all the variables was above 0.74, indicating acceptable internal consistency [61, 62].

Results

Sociodemographic and clinical characteristics of the participants

A total of 418 female students participated in this study. The respondents were aged between 18 and 37 years. Two hundred sixty-seven (63.9%) participants were from non-health-related departments. Two hundred sixty-six (63.6%) participants lived in urban areas. More than one-third of the students (35.6%) were in their fourth year of study. The majority (70.6%) of the female students had no romantic relationship. Nearly half of the study participants (45.5%) drank alcohol. More than one-third of the students had sleeping problems (38.8%) (Table 2).

Table 2 Socio-demographic characteristics of study participants among female university students in Ethiopia, 2021 ($n = 418$)

Variable	Categories	Frequency (n)	Percent (%)
Age	18–22	239	57.2
	23–37	179	42.8
Department	Health related	151	36.1
	Not health related	267	63.9
Residence of family	Rural	152	36.4
	Urban	266	63.6
Years of study	1–2 years	123	29.4
	3rd year	146	34.9
	4th + years	149	35.6
Love engagement	No	295	70.6
	Yes	123	29.4
Ever encountered sexual harassment	No	309	73.9
	Yes	109	26.1
Smoking	No	375	89.7
	Yes	43	10.3
Chat chewing	No	349	83.5
	Yes	69	16.5
Alcohol drink	No	228	54.5
	Yes	190	45.5
Sleeping problem	No	256	61.2
	Yes	162	38.8
Chronic disease	No	367	87.8
	Yes	51	12.2
Current use of oral pills/injectable contraceptive	No	41	9.8
	Yes	377	90.2
Family history of breast cancer	No	28	6.7
	Yes	390	93.3
Do you have training/advice about self-examination of breast cancer from health professionals?	No	129	30.9
	Yes	289	69.1
Ever felt pain around your breast	No	135	32.3
	Yes	283	67.7

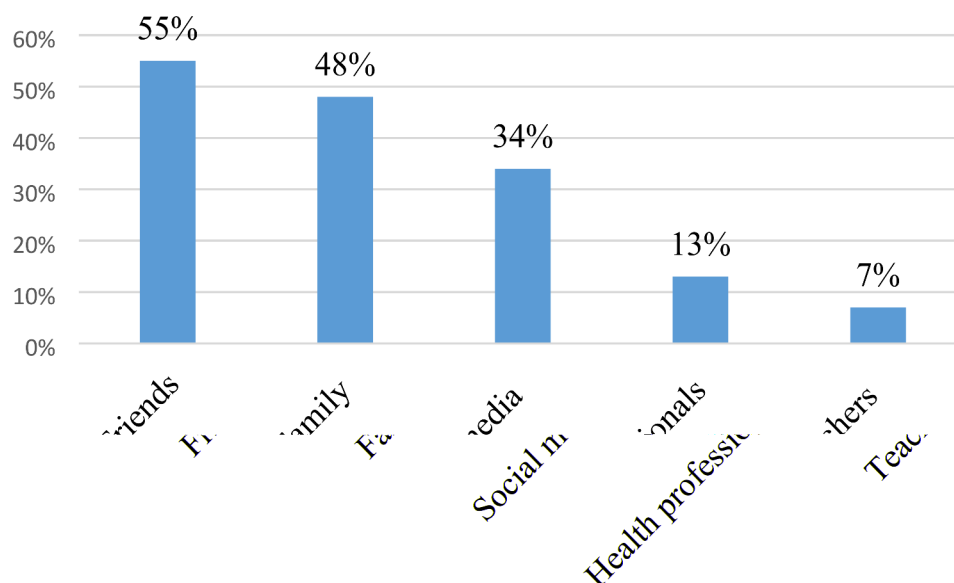


Fig. 2 Participants' sources of information about breast cancer screening practice ($n=418$)

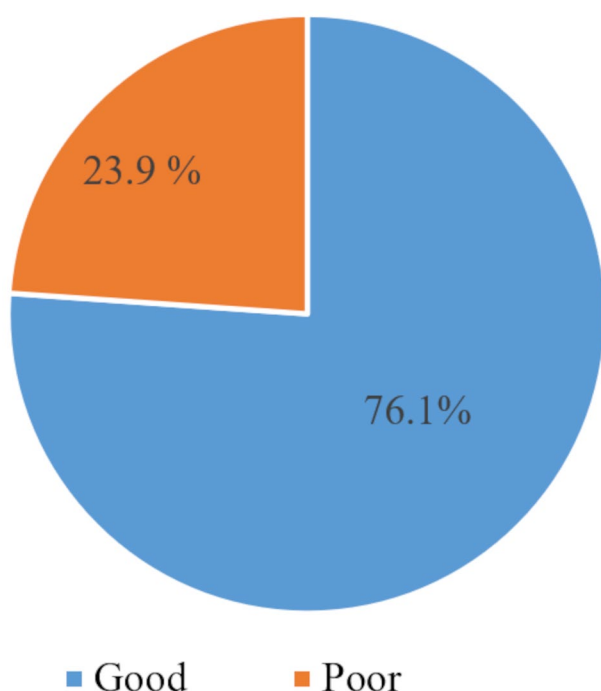


Fig. 3 Self-screening practice of breast cancer among female university students in Ethiopia ($n=418$)

Participants' sources of information about breast cancer screening practices

The majority of the participants (55%) received information about screening for breast cancer from friends, followed by information from family (48%) and social media (34%) (Fig. 2).

Self-screening practices for breast cancer

In the present study, 318 (76.1%; 95% CI: 72.0, 80.4) university students had good screening practices for breast cancer (Fig. 3).

Percentage score of the constructs under the TPB

More than half of the students (37.6%) had a good attitude toward self-screening practices for breast cancer. The majority of the study participants (65.3%) had good subjective norms toward self-screening practices related to breast cancer. Fewer than one-third of the study participants (37.6%) had good behavioral control toward self-screening practices for breast cancer (Fig. 4).

Factors associated with self-screening practices for patients with breast cancer

Age, residence, department, years of study, having training on breast cancer self-examination, ever feeling pain around one's breast, attitudes, subjective norms, behavioral control, and behavioral intentions were candidate variables for multiple logistic regression ($p<0.2$). In the final model, nonhealth-related departments (AOR=1.95; 95% CI: 1.11, 3.44), having training on breast cancer self-examination (AOR=1.87; 95% CI: 1.04, 3.35), having a good attitude (AOR=1.96; 95% CI: 1.11, 3.47), good behavioral control (AOR=4.1; 95% CI: 2.18, 7.71), and good behavioral intention (AOR=1.88; 95% CI: 1.09, 3.24) were associated with self-screening practices related to breast cancer (Table 3).

Discussion

The current study aimed to assess self-screening practices for breast cancer and associated factors among university students in Ethiopia. Our study revealed that 76.1% (95%

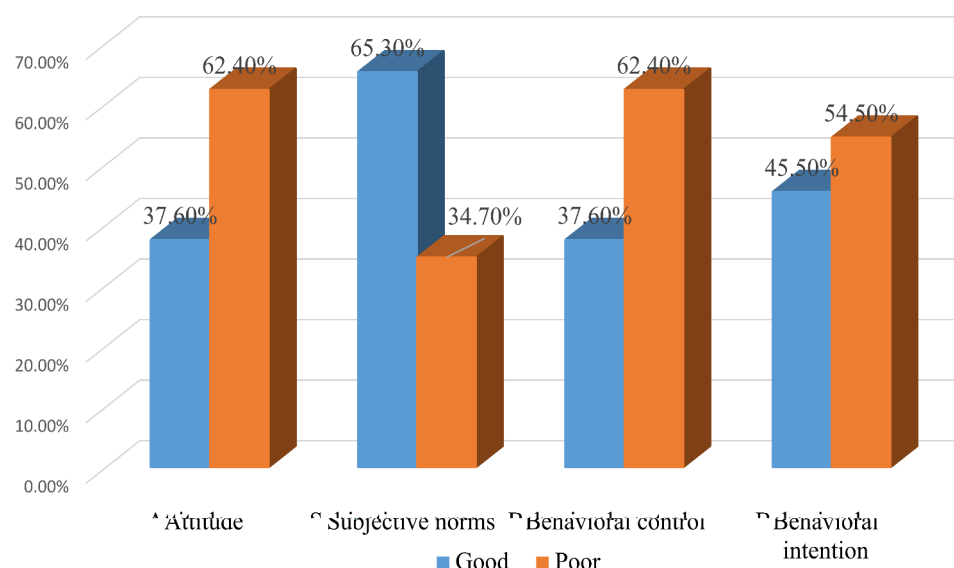


Fig. 4 Percentage of score of the constructs under TPB among female university students ($n=418$)

Table 3 Associated factors of self-screening practice of breast cancer among university students in Ethiopia, 2022 ($n=418$)

Variables	Categories	Self-care		COR (95% UI)	AOR (95% UI)
		Good (%)	Poor (%)		
Age	18–22	176(73.6)	63(26.4)	1	1
	23–37	142(79.3)	37(20.7)	1.37(0.86,2.18)	1.13(0.61,2.10)
Residence	Urban	191(71.8)	75(28.2)	1	1
	Rural	127(83.6)	25(16.4)	1.99(1.20,3.31)	1.49(0.85,2.61)
Department	Health-related	100(66.2)	51(33.8)	1	1
	Not health-related	219(81.6)	49(18.4)	2.27(1.44,3.59)	1.95(1.11,3.44) *
Years of study	1st -2nd	85(69.1)	38(30.9)	1	
	3rd	113(77.4)	33(22.6)	1.21(0.69,2.12)	1.32(0.71,2.46)
	4th and above	120 (80.5)	29(19.5)	1.85(1.06,3.23)	1.66(0.83,3.31)
Having training on breast cancer self-examination	No	106(82.2)	23(17.8)	1	1
	Yes	212(73.4)	77(26.6)	1.67(0.99,2.82)	1.87(1.04,3.35)*
Ever felt pain around your breast	Good	227(80.2)	56(19.8)	1.96(1.23,3.12)	1.53(0.90,2.59)
	Poor	91(67.4)	44(32.6)	1	1
Attitude	Positive	130(82.8)	27(17.2)	1.87(1.14,3.07)	1.96(1.11,3.47) *
	Negative	188(72.0)	73(28.0)	1	1
Subjective norms	Good	215(78.8)	58(21.2)	1.51(0.95,2.40)	1.47(0.86,2.51)
	Poor	103(71.0)	42(29.0)		1
Behavioral control	Good	142(90.4)	15(9.6)	4.57(2.53,8.26)	4.10(2.18,7.71)**
	Poor	176(67.4)	85(32.6)	1	1
behavioral intention	Good	152(80.0)	38(20.0)	1.50(1.00,2.37)	1.88(1.09,3.24)*
	Poor	166(72.8)	62(27.2)	1	1

Hosmer and Lemeshow goodness of fit $p=0.771$, * $p<0.05$ and ** $p<0.01$

CI; 72.0, 80.4) of female students had good self-screening practices for breast cancer. This finding is consistent with performed in Uganda [63] and Turkea [64]. However, these results are greater than those of a study performed in Pakistan and Ghana [65, 66]) and lower than those of a study performed in Palastine, Gaza [67]. The discrepancy might be due to sampling variation, different sources of information, sociocultural differences, and the study setting.

In the present study, the department of students, training on breast cancer self-examination, attitudes, behavioral control, and behavioral intentions were associated (p value <0.05) with the self-reported practice of breast cancer among university students in Ethiopia.

In this study, students who were not in health departments had approximately two times better self-screening practices for breast cancer than did those who were in health-related departments. This result was supported

by studies conducted in Indonesia [68] and Ghana [66]. This might be due to increased health-seeking behavior among -related students [69]. In addition, the demanding nature of health-related programs might lead to increased stress and time constraints, which could result in lower prioritization of self-screening practices [70].

The study participants who had training in breast cancer self-examination were 1.87 times more likely to have self-screening practices for breast cancer than those who did not have training in self-screening practices for breast cancer. This is not surprising, as awareness might be created by training about the importance of self-care practices and the risks of breast cancer. The chance of receiving training helps students assess their breasts and identify symptoms for early medical observation [71–73]. Several studies have also indicated the importance of educational interventions to increase knowledge, practice self-screening, and prevent breast cancer among university students [74–76].

Our results showed that the theory of planned behavior models could help enhance self-screening practices for breast cancer patients. It assesses participants' attitudes, subjunctive norms, behavioral control, and behavioral intentions toward self-breast screening. The three constructs of the TPB, namely, attitudes, behavioral control, and behavioral intentions, were associated with self-screening practices related to breast cancer.

The study participants who had a good attitude toward self-screening practices for breast cancer were approximately 1.96 times more likely to have self-screening practices for breast cancer than those who had a poor attitude toward self-screening practices for breast cancer. This is supported by previous studies conducted elsewhere [66, 77, 78]. A systematic review and meta-analysis among female health professionals revealed that a positive attitude was significantly associated with self-examination practices in the breast [79].

Study participants with good behavioral control had approximately four times better self-screening practices for breast cancer than did study participants who had poor behavioral control. This finding is supported by previous studies [66, 80]. This could be because individuals who have good behavioral control are more confident or motivated to screen themselves for breast cancer than those who have poor behavioral control [81].

The study revealed that study participants with good behavioral intentions had 1.9 times better self-screening practices for breast cancer than did those with poor behavioral intentions. This finding was supported by studies performed in southern Ethiopia [82] and Ghana [66]. This could be due to intervention strategies that can increase students' sense of self-screening for breast cancer [76, 83].

The findings of our study have important implications for promoting breast cancer screening behaviors among university students in Ethiopia. the TPB framework as a guide for designing interventions can enhance their effectiveness by addressing attitudes, subjective norms, and perceived behavioral control related to breast cancer screening. By implementing these strategies, healthcare providers and educators can work toward improving the early detection of breast cancer and reducing its burden among young women in educational institutions.

While the current study provides valuable new insights, it also has certain limitations. The cross-sectional design restricts our ability to establish causality between variables, and the reliance on self-reported measures for assessing breast cancer screening practices may introduce recall and social desirability biases. We employed a snowball sampling technique, which allowed us to distribute the online questionnaire among the study participants and achieve an adequate sample size without the need for random sampling. Not including students who were not using social media would limit the generalisability of the data. The study included students from the health department, which may have influenced the results. The authors did not perform a sample size calculation because the questionnaire was distributed online. The authors relied on participants' responses to terms such as "sleeping problems" and "chronic disease," which may not be entirely accurate.

Conclusion

In the present study, three-fourths of the university students had good self-screening practices for breast cancer. Not in health-related department, having training on breast cancer self-examination, having a good attitude, having good behavioral control, and having good behavioral intentions were associated with self-screening practices for breast cancer. The TPB constructs were good predictors of increased self-screening practices for breast cancer among female students. Therefore, designing TPB-based health behavior change interventions is highly recommended for self-screening practices for breast cancer patients. These findings can inform the development of university-based breast cancer awareness and prevention programs aimed at improving early detection and reducing breast cancer risk. The study also serves as foundational information for designing future research using more advanced study design methods.

Abbreviations

AOR	Adjusted odds ratio
AACE	American Association for Cancer Education
BSE	Breast screening examination
SSA	Sub-Saharan Africa
TPB	Theory of planned behavior
TRA	Theory of reasoned action

Acknowledgements

The authors are grateful for the University of Gondar, the study participants, and the facilitators.

Author contributions

WS, AMS, MM, DGA, LWL, FTK and WA wrote the main manuscript text and LY, GSC, TDB and DGA prepared Figs. 1–4. All authors reviewed the manuscript.

Funding

No funding agent.

Data availability

The dataset is accessible at the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate

The study was approved by the ethical review committee members of the School of Pharmacy, University of Gondar, with reference number SOP/45/2014. A statement confirming that all the experimental protocols were approved by a named institutional and/or licensing committee was signed by Mr. Abyot Endale, Mr. Zemene Demelash, Mr. Asmamaw Emagn, Mr. Nurahimed Seid, and Mr. Gizework Aleminew. Written informed consent was obtained from each study participant. All methods were carried out in accordance with the Declaration of Helsinki.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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Received: 20 March 2023 / Accepted: 13 November 2024

Published online: 20 November 2024

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