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Determinants and practices of breast self-examination among students in three tertiary institutions in Northern Ghana

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Evidence in Context

- The study showed positive attitudes toward breast self-examination
- There is high level of awareness and knowledge of breast cancer
- Despite general optimism, there is perception of breast cancer as a death sentence
- Despite general optimism, there is perception of breast cancer as a death sentence
- Lack of access to mammography, cultural sensitivities, and fear of pain were notable barriers, highlighting areas for improvement in screening participation.

To view Article

Abstract

Background: Breast cancer is a significant global public health problem, where early detection is essential for improving survival rates and effective treatment. The study sought to assess the determinants of Breast Self-Examination (BSE) among tertiary students in Northern Ghana.

Methods: The study employed a multi-institutional cross-sectional design to evaluate factors influencing BSE and related practices among female tertiary students. A test of association was conducted between demographic variables and attitude towards BSE at 95% confidence level with P≤0.05. The data were tested for normal distribution using transformed Attitude, knowledge and barriers scores; hence non parametric analysis was adopted since it was not normally distributed. Spearman correlation was also conducted to determine the strength of attitude, knowledge, and barriers at p≤0.05.

Results: The study found that majority of the students (89%) had a positive attitude towards BSE, with 94.4% considering it important for early cancer detection. Additionally, 91.3% had been educated on breast cancer and BSE, and most believed that early detection improves survival. However, barriers to screening were identified, including limited access to mammography (49.2%), discomfort with BSE (31.4%), and embarrassment or reluctance regarding mammograms (32.4%). Despite strong awareness and knowledge, the study highlights the need to address cultural and access barriers to improve breast cancer screening practices.

Conclusion: This study highlights a combination of socio-cultural, logistical, and personal barriers that hinder breast cancer screening practices. Addressing these barriers requires multifaceted interventions, including improved access to services, culturally sensitive education, and empowerment of healthcare providers and students to advocate for breast health. These findings align with previous studies and underscore the need for comprehensive strategies to enhance breast cancer awareness and screening in Ghana and beyond.

Keywords: *Determinants; breast cancer, self-breast examination, attitude, knowledge barriers*

Introduction

Breast cancer is a significant global health issue, with early detection being critical for better survival rates and treatment outcomes. Breast self-examination (BSE) remains a key method for early detection among young women, despite its reduced reliability as a diagnostic tool. The World Health Organization (WHO) continues to recommend BSE as a method to raise awareness of breast cancer, supporting secondary prevention efforts [1-3]. In Ghana, despite efforts by non-governmental organizations (NGOs) and international organizations like the Breast Health Global Initiative and Susan G. Komen for the Cure to raise awareness, late presentation of breast cancer cases remains a problem. As a result, many women present with advanced cases where treatment options are limited [2,4]. Nurses play a critical role in promoting early detection, making it essential for them to have the knowledge and attitudes needed to educate others [5-7].

However, a study indicates that less than 50% of university students regularly practice BSE, highlighting a gap between knowledge and practice [8]. Nursing students, who are on the frontline of educating others, show a mixed level of expertise and awareness about BSE. Some misconceptions persist, such as associating breast cancer predominantly with older women and not recognizing its risks for younger women [9]. In fact, around 64% of non-medical students are unaware of breast cancer's prevalence among women [10,11]. Educational background plays a significant role in shaping attitudes toward BSE, with medical students generally demonstrating a more favorable approach compared to their non-medical peers. Nonetheless, a large proportion of students, both medical and non-medical, either do not practice BSE or perform it infrequently [12-14]. About 58.08% of students, including both medical and non-medical students, had never performed BSE [15]. This low level of practice is exacerbated by cultural perceptions, where some students believe that BSE is unnecessary, a waste of time, or against their cultural beliefs [16].

Research shows a clear correlation between higher levels of knowledge and a positive attitude towards BSE [17, 18]. Medical students, for instance, are more likely to recognize the importance of early detection and demonstrate better attitudes towards BSE, yet their actual practice of it is still low, with only 50% performing BSE at least once a month [19-21]. Furthermore, healthcare workers generally express confidence in their ability to conduct BSE and make informed decisions about early detection methods, but barriers like fear of pain, privacy concerns, and lack of access to mammography services still exist [22-25]. Cultural and psychological barriers also play a significant role in preventing women from engaging in BSE and other early detection practices. Embarrassment, lack of time, fear of discovering something abnormal, and general neglect are some of the main reasons women avoid BSE [26, 27]. These barriers are compounded by structural issues like access to healthcare, insurance coverage, and the availability of mammography services [28-30].

In sub-Saharan Africa, BSE practices are notably low despite widespread awareness campaigns. In Ghana, Nigeria, Sudan, and other countries in the region, the prevalence of BSE practice remains a challenge, largely due to gaps in health education and awareness [31, 32]. While medical students tend to have better knowledge of breast cancer and BSE, the lack of regular practice is still a significant issue [33].

Promoting breast cancer awareness and regular self-examinations is crucial for early detection and prevention, especially among younger women [34,35]. Educating university students—especially those in medical programs about the importance of BSE can significantly impact breast cancer outcomes. Addressing the psychological, cultural, and structural barriers that prevent regular BSE practice is essential in promoting early detection and reducing the incidence of breast cancer in Ghana and beyond [36,37]. Women who perceive themselves as being at higher risk of breast cancer are more likely to perform SBE regularly [38,39]. Belief that SBE can aid in early detection, and positively influence adherence to the practice. Conversely, perceived barriers, such as fear of finding a lump or lack of knowledge on how to perform SBE, reduce compliance [40].

Methods

Study setting

The study was conducted in three tertiary institutions located in Northern Ghana:

University for Development Studies (UDS), Tamale Technical University, and Yendi College of Health. These institutions were purposively selected to provide a diverse sample of tertiary students, representing universities, technical institutions, and specialized health training colleges. Notably, all these institutions offer health-related programs, making them ideal settings for studying future health professionals. This selection ensured a broad representation of students being trained for careers in various health disciplines, reflecting the diverse academic and professional pathways of Northern Ghana's upcoming healthcare workforce.

Study Design, Participants and Sampling Procedure

The study employed a cross-sectional descriptive study design to assess the determinants and barriers of practice of BSE among female tertiary students. This design was appropriate for collecting data at a single point in time, allowing an evaluation of BSE knowledge, attitudes, and barriers to mammographic screening practices within the target population. Quantitative method approach was used to gather data and statistically analyze the data.

The study population consisted of female students aged 18 years and above from three selected institutions, including one university, one technical university, and two health colleges, to ensure a diverse sample.

Sample Size Determination

The sample size was calculated using Cochran's (41) formula for cross-sectional studies, assuming a 95% confidence interval, a 50% proportion (p = 0.5) to account for maximum variability, and a 5% margin of error (d = 0.05). The initial calculated sample size was 384. After adjusting for a finite population (estimated total of 5,000 female students across all institutions) and a 10% non-response rate, the final sample size was determined to be approximately 397 respondents.

$$n = \frac{Z^2 pq}{d^2}$$

Where:

N = sample size

Z = Z-value (standard normal deviate corresponding to the desired confidence level, typically 1.96 for 95% confidence)

P = estimated prevalence or proportion (we assume 50% or 0.5 for maximum variability)

D = margin of error (5% or 0.05)

The estimated initial sample size is approximately 384 participants.

Adjusting for population size (finite population correction)

Since the population of female students in the five selected institutions may not be infinite, we apply the finite population correction (FPC) formula. Assuming the total population of female students across the five institutions is N, the corrected sample size is given by:

N = initial sample size (384)

N = estimated total population of female students in the five institutions. To adjust the sample size, we estimated the total number of female students in the five institutions. Using the finite population correction ≈356.73. So, the adjusted sample size is approximately **357** participants.

Non-response rate was adjusted to ensure adequate sample size. Assuming a non-response rate of **10%**, the final sample size can be calculated as =396.67

Thus, the final sample size would be approximately **397** participants.

Data collection procedure

Data were collected from three health training institutions in Northern Ghana, including the

University for Development Studies and other technical and health colleges. Stratified random sampling ensured proportional representation from each institution Data collection occurred over a 3-to-4-week period, with trained research assistants administering the questionnaires using the electronically powered KoboCollect toolbox application

Data collection tool

The tool was adopted from Kwok et al. (42) and modified based on reviewed literature. The tool constituted four sections: Section A: demographic characteristics with six questions The tool consists of 13 items divided into three subscales: (1) Attitudes toward general health check-ups (4 items), which assess the willingness to undergo health check-ups even without disease symptoms; (2) Knowledge and perceptions about breast cancer (4 items), which examine cultural beliefs, including fatalistic views about breast cancer; and (3) Barriers to mammographic screening practices (5 items), which address psychosocial and practical challenges that hinder women's participation in breast cancer screening. These subscales are referred to as Attitude, Knowledge, and Barriers. Responses were rated on a 5-point Likert scale from "strongly agree" (1) to "strongly disagree" (5). For items where "disagree" or "strongly disagree" was selected, it indicated a more proactive attitude toward health check-ups, better knowledge about breast cancer, fewer fatalistic beliefs, and fewer perceived obstacles to mammographic screening. Cronbach's Alpha was estimated as 79%.

Data management and analysis

The electronically collected data was downloaded into excel cleaned and imported into IBM SPPSS statistics software version 25 for analysis. Descriptive statistics was used to analyze demographic data. The seventeen Likert scale questions on attitude, knowledge and barriers were analyzed to determine the means and standard deviations. A test of associate was conducted between demographic variable and attitude towards BSE at 95% level with $p \leq 0.05$. The data was also tested for normal distribution using transformed Attitude, knowledge and barriers and hence non parametric analysis was adopted since it was not normally distributed. Spearman rank correlation was also conducted to determine the strength of attitude, knowledge, and barriers at $p \leq 0.05$.

Results

Sociodemographic characteristics

Table 1: Sociodemographic characteristics of respondents

Demographic Variable	Frequency	Percentages
Age		
< 25	207	52.1
25-34	152	38.3
35+	38	9.6
Marital Status		
Married	130	32.7
Single	267	67.3
Stream of Study		
Access	10	2.5
Generic	261	65.7
Mature	93	23.4
Top-up	33	8.3
Residency		
Off-Campus	160	40.3
On-Campus	237	59.7
Level of Study		
100	39	9.8
200	82	20.7
300	147	37.0
400	129	32.5
Total	397	100

The respondents of this study were predominantly females representing 397 (100%) of the total population. The majority of the surveyed individuals reported being single representing 267 (67.3%) of the population and 130 (32.7%) were married. A significant portion of the individuals surveyed are generic students representing 261 (65.7%) of the population, Mature students represented 93 (23.4%), 33(8.3%) represented top-up students and 10 (2.5%) represented assess students. With regards to their level of study, most of the participant was level 300 students representing 147 (37.0%) of the population, followed by level 400 student accounting for 129 (32.5%) of the population, 82 (20.7%) level 200 student and 39 (9.8%) were level 100 students. Most participant 237 (59.7%) stayed on-campus and 160 (40.3%) stayed off campus. Most participants were under age 25 representing 207 (52.1%) of the population.

General attitudes towards breast self-examination

Almost all the participants 354(89.2%) had a good attitude toward breast self-examination while only a few 43(10.8%) stated that they had poor attitude towards breast self-examination. (Figure 1)

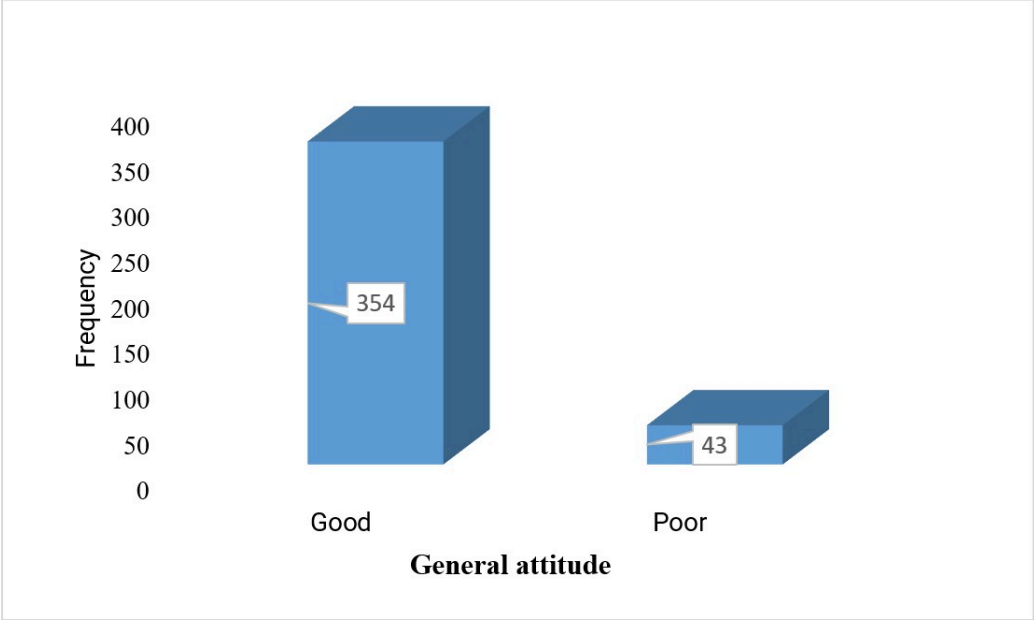

Figure 1: General attitudes towards breast self-examination

Attitudes towards BSE and general health check-ups

The table 2 examines respondents' attitudes toward breast examination and general health check-ups, with responses categorized into levels of agreement (Agree, Neutral, Disagree, Strongly Disagree). The mean and standard deviation (SD) provide insight into overall trends and variability.

A significant portion of respondents (35.5%) agreed with the statement, "If I feel well, I do not need to have a health check-up," while 62.0% disagreed or strongly disagreed. This suggests that while most participants recognize the importance of regular check-ups even when feeling well, a notable minority holds a reactive approach to healthcare. The mean score of 3.58 indicates a slight leaning toward disagreement overall, but the standard deviation (1.260) shows considerable variability, reflecting differing attitudes.

Nearly all respondents (95.0%) agreed that breast examination is an important part of their health routine, with only 1.5% disagreeing or strongly disagreeing. The mean score of 2.08, with a low standard deviation (0.375), indicates a strong consensus on the importance of breast examination as part of health maintenance. Similarly, a majority (82.6%) reported feeling comfortable performing breast self-examination (BSE), with only 7.8% expressing discomfort. The mean score of 2.27 suggests overall agreement with this statement, though the slightly higher variability (SD = 0.660) indicates that some respondents may still experience discomfort.

In contrast, 49.1% of respondents agreed with the statement, "I see a doctor or have my health check-up only when I have a health problem," suggesting a largely problem-focused approach to healthcare. However, 46.1% disagreed or strongly disagreed, indicating a near split in attitudes. The mean score of 3.17 suggests moderate agreement overall, with variability (SD = 1.242) reflecting differing practices.

Table 2: Attitudes towards BSE and general health check-ups

Statements	Agree		Neutral		Disagree		Strongly Disagree		Mean	S.D.
	N	Percentage	N	Percentage	N	Percentage	N	Percentage		
If I feel well, I do not need to have a health check-up.	141	35.5	10	2.5	121	30.5	125	31.5	3.58	1.260
I believe breast examination is an important part of my health routine.	377	95.0	14	3.5	2	0.5	4	1.0	2.08	0.375
I feel comfortable performing breast self-examination.	328	82.6	36	9.1	23	5.8	8	2.0	2.27	0.660
I see a doctor or have my health check-up only when I have a health problem.	195	49.1	18	4.5	102	25.7	81	20.4	3.17	1.242

Knowledge and perception of breast cancer

The table 3 presents respondents' knowledge and perceptions regarding breast cancer, with responses categorized into levels of agreement (Agree, Neutral, Disagree, Strongly Disagree). The mean and SD provide an overview of the central tendency and variability in the responses. A significant portion of respondents (23.4%) agreed with the statement that breast cancer is like a death sentence, implying fatalistic beliefs. However, a larger proportion (66.5%) disagreed or strongly disagreed, reflecting a more optimistic perception. The mean score of 3.71 indicates a leaning toward disagreement, although the standard deviation of 1.110 suggests variability in perceptions. Similarly, 16.9% of respondents agreed that breast cancer cannot be cured and only prolongs suffering, but a substantial majority (72.1%) disagreed. The mean score of 3.83 shows strong disagreement with this misconception, with a lower variability (SD = 1.020).

When asked if there is little a woman can do to reduce the chance of dying from breast cancer even if it is detected early, 19.6% agreed, while 68.6% disagreed. The mean score of 3.76 reflects overall disagreement with this pessimistic view, though some respondents hold this belief (SD = 1.058). On the notion of fate determining whether a woman gets breast cancer, 22.7% agreed, 21.4% were neutral, and a majority (55.9%) disagreed. The mean score of 3.54 indicates overall disagreement, but the standard deviation (1.055) suggests this belief is still moderately prevalent among some respondents.

Encouragingly, knowledge and awareness of breast cancer were high among participants. An overwhelming 89.2% agreed that they were aware of the risk for breast cancer, with a mean score of 2.16 and very low variability (SD = 0.529). Similarly, 88.2% of respondents agreed that they know the signs and symptoms of breast cancer, with a mean of 2.16 and a low standard deviation (0.473), indicating a strong consensus. Additionally, 91.9% believed that breast cancer can be treated effectively if detected early. The mean score of 2.09, with minimal variability (SD = 0.354), shows a highly optimistic perception regarding early detection and treatment.

Barriers to BSE and mammography

The table 4 presents six key statements exploring barriers related to performing BSE and accessing mammography screening. Responses were analyzed based on levels of agreement (Agree, Neutral, Disagree, and Strongly Disagree), and the mean and SD were calculated to show the overall trend and variability in responses. A significant portion of respondents (29.0%) felt embarrassment as a barrier to performing BSE, but the majority (64.2%) did not find it to be an issue. The mean score of 3.60 indicates a general leaning toward disagreement with this statement, although the standard deviation of 1.151 shows some variability in responses. Lack of access to mammography screening emerged as a prominent barrier, with nearly half of the respondents (48.6%) agreeing to this, while 29.0% disagreed. The mean score of 2.89 shows a moderate level of agreement overall, with relatively lower variability (SD = 1.019).

Regarding perceived risk of breast cancer, only 17.4% of respondents believed they did not need screening due to low risk, while the majority (77.1%) disagreed with this notion. The mean score of 4.00 reflects strong disagreement with this belief, indicating a general awareness of the importance of screening irrespective of perceived risk, with a low standard deviation of 1.077. Fear of pain during mammography was cited by 21.7% of participants as a barrier, but 64.4% disagreed with this concern.

The mean score of 3.63 shows responses trending toward disagreement, with moderate variability (SD = 1.032). Embarrassment over undressing for a mammogram was reported as a barrier by 29.5% of respondents, while 62.2% disagreed. The mean score of 3.56 indicates a tendency toward disagreement with some variability (SD = 1.139). Similarly, general embarrassment about having a mammogram was a concern for 29.2% of respondents, but the majority (63.8%) did not see this as a significant issue. The mean score of 3.61 reflects a trend toward disagreement, although variability is notable (SD = 1.168).

Table 3: Knowledge and perceptions on breast cancer

Statements	Agree		Neutral		Disagree		Strongly Disagree		mean	S.D.
	N	Percentage	N	Percentage	N	Percentage	N	Percentage		
Breast cancer is like a death sentence; if you get it, you surely die from it.	93	23.4	40	10.1	154	38.8	110	27.7	3.71	1.110
Breast cancer cannot be cured; you can only prolong your suffering	67	16.9	43	10.8	175	44.1	111	28.0	3.83	1.020
Even if breast cancer is detected early, there is only very little a woman can do to reduce the chance of dying from it.	78	19.6	46	11.6	165	41.6	107	27.0	3.76	1.058
If a woman is fated to get breast cancer, she will get breast cancer; there is nothing she can do to change fate	90	22.7	85	21.4	141	35.5	81	20.4	3.54	1.055
I am aware of the risk for breast cancer	354	89.2	24	6.0	13	3.3	5	1.3	2.16	0.529
I know the signs and symptoms of breast cancer	350	88.2	32	8.1	12	3.0	2	0.5	2.16	0.473
I believe breast cancer can be treated effectively if detected early	356	91.9	27	6.8	2	0.5	2	0.5	2.09	0.354

In summary, lack of access to mammography screening emerged as the most significant barrier, cited by nearly half of the respondents, while embarrassment and fear of pain were secondary concerns. The majority of respondents rejected the belief that they were not at risk of breast cancer, reflecting good awareness of the importance of screening. Cultural sensitivities, such as embarrassment about removing clothes or general discomfort with mammography, were noted by some participants, highlighting the need for culturally sensitive approaches. Improving access and addressing these barriers could enhance participation in breast health practices.

Table 4: Barriers faced in accessing/performing mammography and breast self-examination

Statements	Agree		Neutral		Disagree		Strongly Disagree		mean	S.D.
	Freq.	Per.%	Freq.	Per.%	Freq.	Per.%	Freq.	Per.%		
I do not perform breast self-examination because I am embarrassed.	115	29.0	27	6.8	155	39.0	100	25.2	3.60	1.151
I do not have access to mammography screening	193	48.6	89	22.4	79	19.9	36	9.1	2.89	1.019
I do not think I am at risk of for breast cancer, so I do not see the need for screening	69	17.4	22	5.5	145	36.5	161	40.6	4.00	1.077
I am worried that having a mammography will hurt my breast.	86	21.7	54	13.6	178	44.8	78	19.6	3.63	1.032
I do not want to go for a mammogram because I would have to take off my cloth	117	29.5	33	8.3	156	39.3	91	22.9	3.56	1.139
Having a mammogram is embarrassing	116	29.2	28	7.1	146	36.8	107	27.0	3.61	1.168

Association between sociodemographic characteristics and attitude towards BSE

Table 5 presents chi-square test results that revealed associations between demographic characteristics and attitudes toward breast examination. Age was found to have a statistically significant association with attitudes (χ^2 = 17.412, p = 0.001), indicating that attitudes toward breast examination differ across age groups. The majority of participants were under 25 years old (52.1%), followed by those aged 25-34 (38.3%) and 35-44 (9.6%). Similarly, the level of study showed a highly significant association with attitudes (χ^2 = 115.755, p = 0.000), suggesting that attitudes vary based on academic level. Most participants were in level 300 (37.0%), followed by level 400 (32.5%), level 200 (20.7%), and level 100 (9.8%). However, no significant associations were found between attitudes and other demographic variables, including marital status (χ^2 = 0.513, p = 0.474), stream of studies (χ^2 = 5.440, p = 0.142), and residency (χ^2 = 0.012, p = 0.913). While most respondents were single (67.3%) and residing on-campus (59.7%), these factors, along with the stream of study, did not significantly influence attitudes toward breast examination. Overall, age and academic level were the only demographic factors with a significant impact on attitudes.

Table 5: Association between Sociodemographic characteristics and attitude towards BSE

Variables	Frequency	Percentage	Chi-square (P<0.05)
Age			17.412 (0.001)**
<25	207	52.1	
25-34	152	38.3	
35-44	38	9.6	
Marital-Status			
Married	130	32.7	0.513 (0.474)*
Single	267	67.3	
Stream of studies			
Access	10	2.5	
Generic	261	65.7	
Mature	93	23.4	5.440(0.142)*
Top-up	33	8.3	
Residency			
Off-campus	160	40.3	0.012(0.913)*
On-Campus	237	59.7	
Level Of Study			
100	39	9.8	
200	82	20.7	115.755(0.000)**
300	147	37.0	
400	129	32.5	
Total	397	100	

*Insignificant, **significant

Correlation between attitude, knowledge, and barriers to breast cancer self-examination

The Spearman rank correlation analysis revealed significant relationships among attitude, knowledge, and barriers to breast cancer self-examination (Table 6). A weak but statistically significant positive correlation was observed between attitude and knowledge (ρ = 0.149, p = 0.003). This indicates that individuals with more positive attitudes toward breast cancer self-examination tend to have slightly higher levels of knowledge about the procedure. A moderate positive correlation was found between attitude and barriers (ρ = 0.323, p < 0.001).

This suggests that individuals with more favorable attitudes perceive fewer barriers to performing breast cancer self-examinations. A weak to moderate positive correlation was observed between knowledge and barriers (ρ = 0.281, p < 0.001). This implies that greater knowledge about breast self-examination is moderately associated with fewer perceived obstacles to performing the procedure. All reported correlations were statistically significant at the p < 0.01 level (2-tailed), indicating that the relationships are unlikely to have occurred by chance.

Discussion

The findings of this study, which examined the determinants and practices of BSE among students in three tertiary education facilities in northern Ghana, highlight the behavior of these respondents towards BSE and the barriers to practicing BSE. The validity of the tool was assessed which was similar to the findings of Kwok & Chun [43]. While most respondents (62.0%) reject the idea of avoiding health check-ups when feeling well, a significant minority (35.5%) only seek healthcare when symptomatic. This aligns with findings from studies like Akuoko et al. [4], which emphasize that a reactive approach to healthcare is common in resource-limited settings and often delays early detection of conditions like breast cancer. The overwhelming agreement (95.0%) on the importance of breast examination reflects a positive attitude toward breast health, consistent with findings by Ohaeri & Aderigbigbe [1], who reported similar results among Nigerian women. Additionally, the high level of comfort (82.6%) in performing BSE aligns with the study by Sadoh et al. [3], which found that educational interventions can significantly improve confidence and practice of BSE.

The finding that nearly half of respondents (49.1%) seek health check-ups only when experiencing health problems highlights a barrier to preventive healthcare. This attitude has been noted in other studies, such as Black and Richmond [31], which identified problem-driven healthcare-seeking behavior as a significant contributor to late-stage breast cancer diagnosis in sub-Saharan Africa. The demonstration of a positive attitude toward Breast Self-Examination (BSE), with over 80% showing a favorable perspective on the practice is consistent with a similar study in Ghana where a positive attitude towards BSE was found to be over 90% among Ghanaian female tertiary students. The similarity in these studies can be attributed to the similarities in settings of both studies. However, this finding is inconsistent with a study conducted in Bahrain, which revealed that fewer than 50% of university students had a positive attitude toward BSE [9]. The difference in these two studies can be attributed to the differences in the settings of these studies. In studies by Norfjord et al. [26] and Abul-Salam et al. [27], found that it, embarrassing to conduct BSE. This finding does not align with the findings in this current study as the majority of respondents do not see embarrassment as an obstacle to BSE.

Table 6: Correlation between attitude, knowledge, and barriers to breast cancer self-examination

Spearman correlation	Attitude	Knowledge	Barriers
Attitude			
Correlation Coefficient	1.000	.149**	.323**
Sig.		0.003	.000
Knowledge			
Correlation Coefficient	0.149**	1.000	.281**
Sig.	0.003	.	0.000
Correlation Coefficient	0.323**	0.281**	1.000
Barriers			
Sig.	0.000	0.000	
Total	397	397	397

**. Correlation is significant at the 0.01 level (2-tailed).

With knowledge about BSE, the findings revealed that knowledge about breast cancer and BSE was good with the majority of respondents disagreeing the perception that breast cancer is a death sentence and not curable. The findings highlighted respondents' good understanding of the signs and symptoms of breast cancer and its associated risk similar to the findings align with Dadzi and Adam [17]. Even though Dadzi and Adam [17] was conducted among reproductive-age women in the general population, the consistency in the findings can be a result of the Ghanaian setting similarity in both studies. These findings are however inconsistent with [9] where knowledge was found to be poor among female tertiary students. While both studies were conducted among tertiary students, the differences may be attributed to the settings of both studies. The results of this study highlight key barriers to breast cancer screening practices such as BSE and mammography among participants, aligning with findings from prior research in Ghana and other

Regions. Embarrassment was identified as a recurring barrier, with 29.0% of participants agreeing that they avoided BSE because they felt embarrassed, while 29.5% and 29.2% reported embarrassment with undressing or undergoing mammography, respectively. These findings echo studies such as Osei-Afriyie et al. [2], which demonstrated that cultural perceptions and stigma surrounding breast cancer screening can deter participation, especially in conservative communities. Similarly, Akuoko et al. [4] emphasize that socio-cultural norms in Ghana often influence women's willingness to engage in breast health practices, including mammography. Addressing these barriers may require culturally sensitive education initiatives that normalize discussions around breast health and reduce feelings of shame or discomfort.

The study revealed that nearly half (48.6%) of participants identified lack of access to mammography as a significant barrier. This is consistent with the findings of Afaya et al. [11], who reported that geographic and financial barriers are among the key reasons for low uptake of mammography in Ghana. Similarly, Black and Richmond [31] argue that limited access to mammographic services in sub-Saharan Africa poses a critical challenge to early detection, further exacerbated by inadequate infrastructure and resources. Efforts to decentralize mammographic services and improve access, particularly in rural and underserved areas, are necessary to bridge this gap. Sangwan et al. [5] suggest that strengthening primary healthcare systems through capacity building and health education for healthcare providers can significantly enhance access and participation in breast cancer screening programs. Interestingly, 17.4% of respondents believed they were not at risk of breast cancer and therefore did not see the need for screening, a finding consistent with studies like Dadzi and Adam [17], who reported a similar lack of perceived susceptibility among Ghanaian women. This aligns with the Health Belief Model, which posits that individuals who do not perceive themselves as being at risk are less likely to engage in preventive health behaviors. Educational interventions that emphasize the risk factors for breast cancer and the importance of early detection have proven effective in addressing this misconception, as demonstrated by Sadoh et al. [3] in their peer-education intervention among Nigerian adolescents.

Pain and discomfort associated with mammography were also noted as barriers, 21.7% of participants reported that fear of pain deterred them from undergoing the procedure. Mansour et al. [7] reported similar findings among female healthcare workers in Gaza, where fear of pain during mammography was a common deterrent. This highlights the need for public health campaigns to address misconceptions about the discomfort associated with mammography and provide reassurance about the safety and benefits of the procedure. Finally, the study underscores the importance of targeting future health professionals in awareness campaigns, as their attitudes and practices can influence wider community adoption of breast cancer screening. Ohaeri and Aderigbigbe [1] emphasize that health workers play a pivotal role in promoting breast health practices, particularly in underserved communities. Similarly, Aluko et al. [9] demonstrated that nursing students' willingness to teach BSE to relatives significantly improved knowledge and practices in their communities. As future healthcare providers, students in this study can serve as key agents of change by addressing barriers, educating peers, and advocating for greater access to screening services. While the majority of respondents disagreed with fatalistic or pessimistic beliefs about breast cancer, a notable minority still held these views. For example, 23.4% believed breast cancer to be a death sentence, and 16.9% thought it could not be cured. These misconceptions align with findings from studies such as Ohaeri and Aderigbigbe [1], who identified similar myths as barriers to breast cancer screening in Nigeria.

The high levels of awareness about breast cancer risk factors (89.2%), signs and symptoms (88.2%), and the effectiveness of early treatment (91.9%) are encouraging. These findings are consistent with research by Osei-Afriyie et al. [2], which showed significant knowledge of breast cancer among future health professionals in Ghana. The belief in fate as a determinant of breast cancer (22.7%) reflects cultural attitudes that have been documented in other studies. For example, Dadzi and Adam [17] reported that such fatalistic beliefs are common in sub-Saharan Africa and can deter individuals from seeking early detection and treatment.

Conclusion

In conclusion, this study highlights the generally positive attitude and good knowledge of BSE among students in three tertiary institutions in Northern Ghana. While over 80% of respondents

Demonstrated a positive attitude toward BSE, consistent with similar studies in Ghana, access to mammographic services was identified as a major barrier to BSE. Respondents' age and level of study were significantly associated with BSE practices, suggesting the need for targeted educational interventions aimed at younger students and those at lower academic levels. Addressing barriers such as access to mammography and dispelling misconceptions about BSE will be critical to improving early detection practices. These findings emphasize the importance of continued awareness and education programs to further promote BSE and breast cancer detection in this population. Ghana Health Service (GHS) in collaboration with the Tamale Teaching Hospital should make efforts to improve access to mammography in Northern Ghana through increased availability of screening centers, mobile mammography units, or subsidized services to address the identified barrier to breast cancer detection. Ministry of Education should develop and implement age- and academic-level-specific educational programs to promote BSE practices, with a focus on younger students and those at lower academic levels. GHS should design campaigns and workshops to address common misconceptions about BSE and breast cancer, emphasizing its importance in early detection and improving survival outcomes. MoE in collaboration with GHS should continue and expand breast health awareness initiatives within tertiary institutions, utilizing peer educators, multimedia tools, and partnerships with health organizations to encourage regular BSE practices and improve knowledge of breast cancer prevention.

Abbreviations

BSE: Breast Self-Examination

GHS: Ghana Health Service

SD: Standard deviation

Supporting information: None

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