Assessing the Health Belief Model of Students with Regard to Breast Cancer: A Descriptive Study

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Background: Breast cancer continues to be a substantial worldwide health issue, impacting millions of individuals and families annually. Gaining insight into individuals' perception and reaction to the risk of breast cancer is crucial for advancing early detection and successful prevention

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methods. The Health Belief Model (HBM) is a commonly utilised theoretical framework for examining health behaviours associated with breast cancer. According to the Health Belief Model (HBM), individuals are more inclined to take measures to prevent or manage a health threat if they believe that they are at risk of developing the condition, perceive the condition to have severe consequences, believe that taking action would be advantageous in reducing the threat, and perceive minimal obstacles to taking action. The study seeks to evaluate the Health Belief Model of students in relation to breast cancer.

Methods: A descriptive research design was adopted. Self-administered semi-structured questionnaires were used to elicit information from 365 female participants. Purposive sampling approach was used to choose Tamale Girls and Ghana Senior High Schools from the Tamale Metropolis and simple random technique was used to identify the study respondents. Data was analysed using SPSS. Statistics like frequency and percentages were used to represent the findings.

Results: The study revealed that students possessed a moderate-to-high level of information regarding the causes, effects, and preventions of breast cancer. This knowledge was mostly influenced by the type or category of learning. Overall, a minimal number of students participated in the screening process for breast cancer. Among the three techniques, breast self-examination was the most commonly utilised, followed by mammography and clinical breast examination. Factors such as age, family size, religion, and social class were found to be associated with breast cancer screening.

Conclusion: Students generally exhibited a modest degree of perceived vulnerability to breast cancer. They also demonstrated a favourable disposition towards the advantages of breast cancer prevention and early detection measures.

1. INTRODUCTION

Breast cancer continues to be a major public health issue on a global scale, being the most prevalent form of cancer among women worldwide. Although there have been improvements in treatment and early identification, the number of cases of breast cancer is still increasing, emphasizing the importance of implementing effective preventive measures. The Health Belief Model (HBM) is an approach that aims to elucidate and forecast health behaviours by examining individuals' beliefs and perceptions of a disease and its prevention [1]. The Health Belief Model (HBM) suggests that a person's probability of participating in preventive health behaviours is influenced by their perception of being susceptible to the disease, the perception of the disease's severity and its consequences, the perception of the advantages of taking action to reduce the risk, and the perception of the obstacles to taking such action. Furthermore, the presence of cues to action and the level of self-efficacy are significant factors in determining an individual's likelihood of adopting suggested health behaviours [1,2-6]. While the HBM has been widely applied in various health contexts, including breast cancer prevention, there is limited research examining its applicability among college students. Understanding how college students perceive breast cancer and the factors that influence their health beliefs is crucial, as this population represents a group that is transitioning into adulthood and establishing lifelong health behaviors [7-11].

According to Hagendorff [12] breast cancer affects more women than any other kind of cancer in both developed and developing nations. The prevalence of breast cancer has increased, especially in developing countries like Africa. In 2012, breast cancer caused over 375,000 deaths and is thought to be a factor in about one million of the fourteen million cancer diagnoses reported yearly [13] Breast cancer incidence rates vary globally, with Africa reporting lower rates. It is also said that Africa has poorer survival rates. This demonstrates the urgent requirement for the adoption of sensible plans to lessen the toll that the illness has on society [14] Breast cancer is the most prevalent form of cancer among women in Ghana and a serious public health issue in terms of incidence and death [15] Data from the Korle Bu Teaching hospital cancer registry from 1972 to 1975 show that breast cancer accounted for 7.5% of all cancers, and this number increased to 12.8% of all malignant neoplasms admitted in Korle Bu Teaching hospital in 2016 [16]. As a result, the

incidence of breast cancer in Ghana is rising [17-23]. Breast cancer is the most prevalent cancer in women (25%) and accounts for 16% of all cancer cases in Accra. This provides more evidence for the disease's rising prevalence [16] Additionally, the Korle Bu Teaching Hospital in Accra diagnoses roughly 400 new cases each year. As opposed to an average age of over 65 in Europe and America, the average age of diagnosis for breast cancer in Ghana is 46.29 years, with a range of 26 to 80 years [14]

According to Naku Ghartey Jnr et al. [24], the average age of incidence in Ghana was even lower, at 38 years, suggesting that there may be a downward trend in the incidence of breast cancer. Clinical cases that have been reported from some sub-Saharan African nations, such as Ghana, show that the breast cancer that affects the native black African women population is frequently aggressive and has poor prognostic characteristics, such as young age at presentation, advanced stage at diagnosis, large tumor size, high grade histologic subtypes, and low rate of receptor positivity [25-30] Breast cancer incidence rose from 7.5% in 2000 to 14.8% in 2010, according to data from Korle Bu Teaching Hospital over the preceding 50 years [24]. According to the most recent study conducted in 2019 at the Korle Bu Teaching hospital, the incidence was 17%. These figures demonstrate that the incidence of breast cancer has been rising around the globe. To assist reduce the disease's worldwide impact, this asks for stepping up screening procedures and developing efficient treatment plans [31,32,33].

In 2017, World Health Organization (WHO) estimated that breast cancer accounted for 570, 000 deaths among women or 15% of all cancer fatalities. However, at the moment, the burden of cancer is growing in almost every region worldwide [34]. In developed countries, the rates of cancer appear to be rising among women. According to estimates made by Akram et al. [35], one in nine women worldwide will develop breast cancer in their lifetime. By contrast, the lifetime risk for women who have first-degree relatives who have been diagnosed with breast cancer is estimated to be around 31% and the lifetime risk for those who have relatives who have been diagnosed with ovarian cancer to be around 13%.

The death rate related to breast cancer in Africa is frighteningly high and the prevalence of breast cancer is continuously increasing. Patients arriving at the hospital after their symptoms have been noticed too late is a significant contributing reason to this high mortality. This study examines the role that information, attitudes, and behaviors about breast cancer have in promoting good health and behavior [36-40]. According to McKinney et al. [25], breast cancer has become a health problem that particularly affects women who are fertile. According to Burguin et al. [1], a woman's knowledge, attitude, and perception of breast cancer influence whether or not she will get screened for the disease. Similar to this, breast cancer carries a hefty burden since it is expensive to treat and has a high fatality rate.

Evaluation of knowledge on early detection procedures among women remains crucial given the dearth of information and statistics on women's understanding of breast cancer early detection methods, particularly among those with a family history [36]. This is due to the fact that in Nigeria, less than 43.2% of people reported to using the BSE process or practice in the year prior [14]. Many organizations and countries are encouraging breast screening techniques for early diagnosis as the prevalence of breast cancer rises. In long-term coordinated population-based screening programs, some of these strategies, albeit beneficial, may not be completely practical. In order to increase early detection, it is crucial that additional techniques that are also affordable are used in addition to those that promote BSE, CBE, and mammography [25,41-45].

Ghana, where breast cancer has been identified as the most prevalent malignancy and accounts for more than 16% of all cancers, is not exempt from the pandemic [1] In Ghana, there were about 2,000 incidences of breast cancer in 2012 (WHO, 2017). The claim that 70% of women with breast cancer diagnoses present late with advanced disease stages is even more astounding [46]. Despite continuous national efforts, these have been partially ascribed to inadequate knowledge of the disease's early symptoms, which has resulted in limited treatment effectiveness and increased mortality [1].

Higher education institutions are regarded to be very helpful in promoting and teaching health. In Ghana, however, fewer students receive the benefits of breast cancer tests. They failed to make a significant enough difference in Ghana to

enhance breast cancer screening practices and awareness. Traditional healers, herbalists, and spiritualists are given greater space by the media, which is the main source of information on breast cancer, to enlighten the public, providing women less options for alternative medical therapies [46]. This has the effect of spreading myths about breast cancer and lowering the number of women who have breast cancer screenings. As a result, less is being done to improve the issue of delayed diagnosis and treatment and improve Ghana's breast cancer survival rate. This thesis aims to assess the Health Belief Model among SHS students concerning breast cancer.

2. METHODS

Study design: This study used the descriptive research design method for the research. A cross-sectional survey study was also used because is concerned with the collection of data to explain or predict existing conditions or relationships, people's opinions, and popular practices at a particular time period.

Setting: The study was conducted in the Tamale Metropolis. With 360,579 residents, Tamale, also known as the Tamale Metropolitan Area, is the capital and fourth-largest city in Ghana (GSS, 2021).

Target Population: The target population will consist of all secondary school students in the Tamale Metropolis. These population is targeted because women are regarded as the prime receivers of psychological effects of breast cancer and it related complications. According to Cragun et al. [47] the term "population" is a statistical phrase that refers to a collection of individuals, groups, events, or things about which the researcher seeks to draw generalizations rather than a term that has to be applied to the human population of a particular geographic region.

Sampling Technique and Size: The researcher utilized purposive sampling, a type of non-probability sample for choosing the study schools. This indicates that the selection of the schools would not be random. The researchers chose two (2) schools among the Metropolis' nine (9) schools, thus Ghana Senior High School and Tamale Girls Senior High School. The population of the research consists of female students. Using a simple random approach, all female students in the study schools will have an equal chance of being selected. A simple random sampling would be used to draw statistical conclusions about the communities and people in the study locations. The sample size was 365.

Data Collection Instrument: The main data collection instrument would be a self-developed questionnaire. The questionnaire would be divided into 3 sections namely, demographic, self-efficacy towards breast cancer and the health beliefs of female students with regard to breast cancer. A structured questionnaire with both closed- and open-ended items were given to the participants to complete. The closed-ended questions required respondents to select from a prepared list of possible replies.

Data Collection Procedure: Written authorization to use the selected schools for the study will be requested in a formal letter that would be submitted to the Tamale Metro Educational directorate and the schools. The questionnaires will be given to respondents during free periods once authorization has been obtained. A pre-tested structured questionnaire will be used to gather the quantitative data. Further explanation would be given to respondents who may find some questions difficulty to understand. Age, class, educational attainment and work status of parents are just a few of the background factors that will be studied as variables. The questionnaire will ask questions about the causes, effects and prevention of breast cancer as well as screening practices among female students.

Ethical issues: Ethics, according to Char et al. [48], is primarily linked to morality and deals with questions of right and wrongs within communities, societies, or groups. Consequently, it is crucial that everyone conducting research understand the ethical issue DS Char, To the greatest extent possible, the researchers will make every attempt to uphold moral standards. According to Hagendorff [12] the fundamental ethical standards for research are that participants give voluntary consent, are fully informed about the research's purpose, methods, and benefits, and are given the option to withdraw at any time. Participants will get explanations regarding the study's purpose, confidentiality assurances, and withdrawal rights.

The questionnaire's first page would contain a declaration of consent, and the participant's informed consent would be assumed upon completion of the form. To maintain the data's confidentiality, no participant names or identifying information may be gathered. And perhaps most crucially, the researcher would treat each study subject with respect. Additionally, respondents will be given the assurance of anonymity and confidentiality when responding to the survey.

3. STUDY FINDINGS

3.1 Demographic Characteristics

The demographic characteristic illustrates the distribution of respondent's categories in relation to Gender, Age, Class/Form, Family Size and Religion.

3.2 Gender of the Respondents

Table 1 represent the gender of the respondents.

Table 1. The gender of the respondents

Gender	Frequency	Percent (%)
Female	284	81.6
Male	66	18.6
Total	**350**	**100**

3.3 Age of the Respondents

Fig. 1 illustrate the age of the study respondents.

3.4 Class/Form of the Respondents

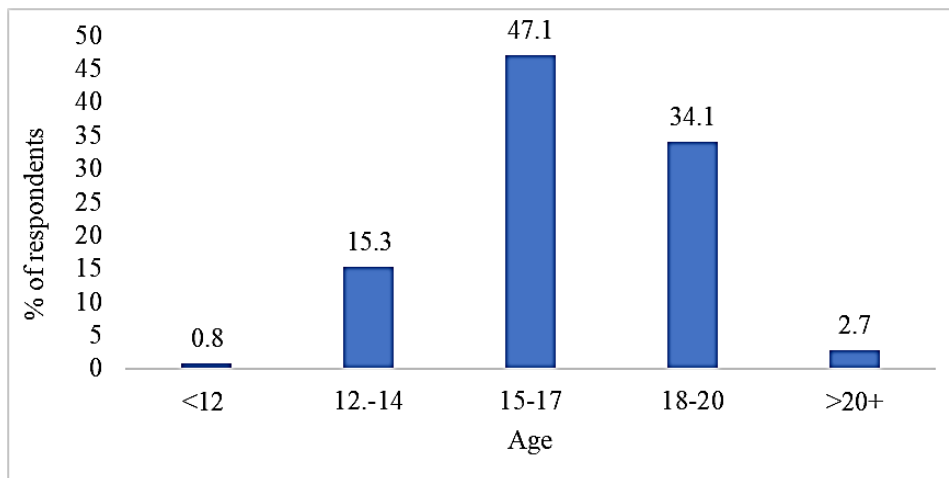Fig. 2 represent the class/form of the study respondents.
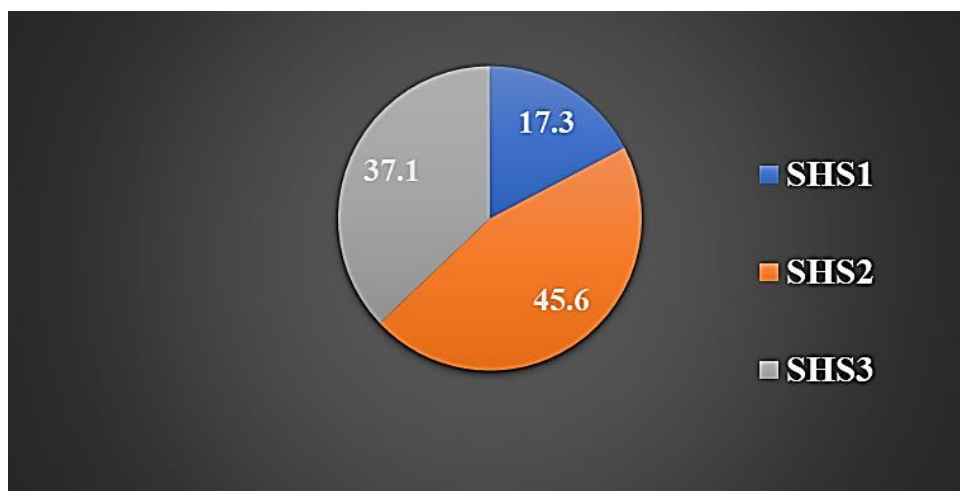

Fig. 1. Age of the study respondents

Fig. 2. Class/form of the study respondents

3.5 Health Beliefs of Students with Regard to Breast Cancer

The health beliefs of participants concerning breast cancer screening have previously been evaluated using four of the six health belief model elements created by Champion et al. (2008). These models were used to evaluate the students' attitudes toward BSE, CBE, and mammography in terms of their health.

Self-efficacy scale questions accounted for nine, perceived benefit questions six, perceived barrier questions eleven, and perceived susceptibility questions three. Answers to all questions were provided on a Likert scale, with "strongly disagree" receiving one point and "strongly agree" receiving five.

Greater scores imply Higher perceived benefits of breast cancer screening, higher perceived barriers to breast cancer screening, and higher perceived susceptibility to developing breast cancer are all indicators of higher self-efficacy to start breast cancer screening.

Participants who performed better than average on each construct received a "HIGH" mark for that construct, while those who performed worse received a "LOW" grade for that construct.

3.6 Self-efficacy towards Breast Cancer Screening

From 9 to 45 points can be earned for this construct. The study's participants' average

score was almost 37±5. The self-efficacy of 54% of the individuals was low. This indicates that a majority of the participants lacked confidence in their abilities to start the process of getting a clinical breast exam or mammogram.

Table 2. Health beliefs of students with regard to breast cancer

Health beliefs of students	Range	Mean (SD)
Self-efficacy	35	36.5 (5.1)
Perceive benefits	22	25.4 (4.1)
Perceive barriers	38	20.4 (7.8)
Perceive susceptibility	12	5.3 (2.7)

3.7 Perceived Benefits for Breast Cancer Screening

This build has a score range of 6 to 30. The study's subjects received an average score of almost 25±4. More than half (55%) of the participants believed their benefits were noteworthy. These results indicate that most participants think breast cancer screening is good.

3.8 Perceived Barriers towards Breast Screening

From 11 to 55 points can be earned for this construct. The study participants' average score was roughly 20±8, on average. High perceived barriers affected over 50% of the participants. This suggests that over 50% of participants thought that there were barriers keeping them from participating in breast cancer screening.
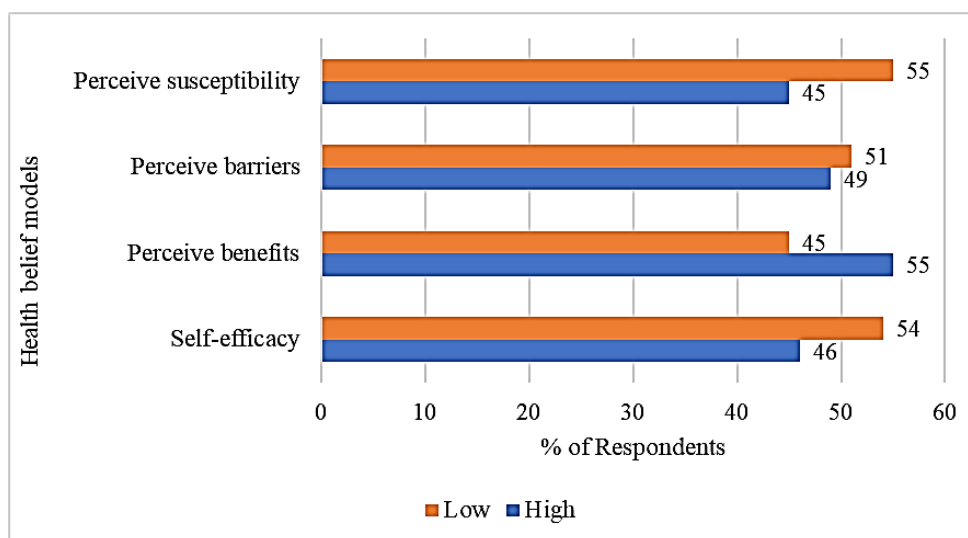

Fig. 3. Health beliefs of students with regard to breast cancer

3.9 Perceived Susceptibility to Breast Cancer

There is a range of 3 to 15 points for this construct. The study's typical rating was almost a 5 out of 3. A low perceived susceptibility was experienced by 45% of the individuals. According to this, the majority of participants did not think they were at danger of acquiring breast cancer.

3.10 Cronbach's Alpha Test for Health Belief Model

The internal consistency reliability of the four health belief model constructs utilized in this study was assessed using the Cronbach's alpha test. This test can proceed with a value of 0.7 (Table 3).

Table 3. Cronbach's alpha test for health belief model

Health beliefs of students	Scale reliability coefficient
Self-efficacy	0.8373
Perceive benefits	0.8508
Perceive barriers	0.9095
Perceive susceptibility	0.8675

3.11 Bivariate Analysis between Breast Self-Examination (BSE) and Health Belief Model

When bivariate analysis was done, there was a statistically significant correlation between breast self-examination and the constructs of the Health Belief model (perceived benefits and perceived barriers).

3.12 Bivariate Analysis between Clinical Breast Examination (CBE) and Health Belief Model

When bivariate analysis was performed, there was no correlation found between the clinical breast examination and the constructs of the Health Belief Model.

3.13 Bivariate Analysis between Mammography and Health Belief Model

The bivariate analysis did not yield significant associations between mammography and the Health Belief model constructs (Table 6).

Table 4. Bivariate Analysis between BSE and Health Belief Model

Variable	Breast self-examination			
Health belief	Yes (%)	No (%)	Chi square	p-value
Self-efficacy			0.01	0.909
Low self-efficacy	53.9	54.6		
High self-efficacy	46.1	45.3		
Perceived benefits			12.31	0
Low perceived benefits	39.3	64.1		
High perceived benefits	60.7	35.9		
Perceived barriers			17.68	0
Low perceived barrier	57.9	28.1		
High perceived barrier	42.1	71.9		
Perceived susceptibility			1.99	0.158
Low perceived susceptibility	52.5	62.5		
High perceived susceptibility	47.5	37.5		

Table 5. Bivariate Analysis between CBE and Health Belief Model

Variable	Breast self-examination			
Health belief	Yes (%)	No (%)	Chi square	p-value
Self-efficacy			0.09	0.767
Low self-efficacy	22.2	77.8		
High self-efficacy	20.8	79.2		
Perceived benefits			0.16	0.69
Low perceived benefits	20.5	79.5		
High perceived benefits	22.4	77.6		
Perceived barriers			0.63	0.427
Low perceived barrier	23.5	76.5		
High perceived barrier	19.6	80.4		
Perceived susceptibility			2.47	0.116
Low perceived susceptibility	18.1	81.9		
High perceived susceptibility	25.8	74.2		

Table 6. Bivariate Analysis between Mammography and Health Belief Model

Variable	Breast self-examination			
Health belief	Yes (%)	No (%)	Chi square	p-value
Self-efficacy			2.58	0.108
Low self-efficacy	1.9	98.1		
High self-efficacy	0.0	100		
Perceived benefits			0.58	0.446
Low perceived benefits	1.6	98.4		
High perceived benefits	0.6	99.4		
Perceived barriers			3.19	0.074
Low perceived barrier	0.0	100		
High perceived barrier	2.2	97.8		
Perceived susceptibility			0.56	0.453
Low perceived susceptibility	0.7	99.3		
High perceived susceptibility	1.6	98.4		

4. DISCUSSION

4.1 Health Belief Model of Students with Regard to Breast Cancer

The health beliefs of participants concerning breast cancer screening have previously been evaluated using four of the six health belief model elements created by Boatemaa Benson et al. [49]. These models were used to evaluate the students' attitudes toward BSE, CBE, and mammography in terms of their health.

Self-efficacy scale questions accounted for nine, perceived benefit questions six, perceived barrier questions eleven, and perceived susceptibility questions three. Answers to all questions were provided on a Likert scale, with "strongly disagree" receiving one point and "strongly agree" receiving five.

Higher rankings indicate Higher self-efficacy to begin breast cancer screening is correlated with higher perceived advantages of breast cancer screening, higher perceived barriers to breast cancer screening, and higher perceived vulnerability to developing breast cancer. Participants who performed better than average on each construct received a "HIGH" mark for that construct, while those who performed worse received a "LOW" grade for that construct.

From 9 to 45 points can be earned for this construct. The study's participants' average score was almost 37±5. The self-efficacy of 54% of the individuals was low. This indicates that a majority of the participants lacked confidence in their abilities to start the process of getting a clinical breast exam or mammogram.

This build has a score range of 6 to 30. The study's subjects received an average score of almost 25±4. Most participants (around 55%) had high perceived advantages. This indicates that the majority of participants think it is advantageous to screen for breast cancer.

From 11 to 55 points can be earned for this construct. The study participants' average score was roughly 20±8, on average. High perceived barriers affected over 50% of the participants. This suggests that over 50% of participants thought that there were barriers keeping them from participating in breast cancer screening.

There is a range of 3 to 15 points for this construct. The study's typical rating was almost a 5 out of 3. A low perceived susceptibility was experienced by 45% of the individuals. According to this, the majority of participants did not think they were at danger of acquiring breast cancer.

Self-efficacy was scored poorly by the majority of participants (54%) overall. This shows that a large portion of people lacked confidence in their ability to take the effort to get a breast cancer screening done. The fear of the test findings, inability to pay for the services, and preference for other problems in their lives over breast cancer screening were some of the factors that contributed to the participants' low self-efficacy. 56% of participants reported annual incomes of less than GHC1,000. Ghanaian prices for mammograms range from GH350 to GH500. Because of this, the normal Ghanaian woman must pay a significant price for this service. Although free clinical breast exams are offered, they are only available at a select few facilities, including the breast clinics at the Komfo Anokye Teaching Hospital in Kumasi and the Korle Bu

Teaching Hospital in Accra, which serve the southern and northern regions of Ghana respectively. Patients are generally required to pay the suggested consultation costs at hospitals and clinics. The price of the service is a significant factor in determining whether breast cancer screening is used in Ghana, according to research [50].

The vast majority of participants (55%) think that breast cancer screening is advantageous. This outcome is congruent with that of a study of a similar nature conducted in Austin, Texas, where the majority of participants reported high perceived benefits for clinical breast examination and mammography [25]. High perceived barriers to breast cancer screening were present for a sizable majority of the participants (51%) as well. The fact that they were unable to implement breast cancer screening demonstrates that there were barriers. This finding contrasts with that of a study conducted in Texas, where the majority of participants reported no perception of impediments [36]. Many of the participants in this study held the misconceptions that mammography screening exposes them to unnecessary radiation, is a time waster, and that the medical personnel performing the screening are impolite. The inability to remember to arrange for a breast cancer screening was cited by others as well. Furthermore, they felt that other issues were more pressing than getting their breasts screened for cancer and that the procedure would be too uncomfortable. For women to be encouraged to get their breasts screened, these obstacles must be removed.

The majority of participants in this study (55%) had low perceived breast cancer vulnerability, it was found. This may be the cause of how infrequently doctors perform breast cancer screenings. If a person thinks they won't get sick, they won't take precautions against it. To have a positive attitude toward the procedure, female healthcare providers may need to change their health attitudes regarding breast cancer screening. When it comes to health-related issues, they serve as role models for the general public, which is important because they may inspire women to get examined for breast cancer.

By contrasting the proportion of shared variation, or covariance, between the items that make up an instrument to the amount of overall variance, Cronbach's alpha is a method for evaluating reliability. According to the theory, if an instrument is trustworthy, there should be a significant amount of covariance between the items in relation to the variance. The four elements of the health belief model included in this study were assessed for internal consistency reliability using the Cronbach's alpha test. According to Table 4, a value of 0.7 is suitable for this test.

Bivariate Analysis involves looking at two variables to see how they relate to one another. Bivariate analysis results are widely published in quality-of-life studies. Bivariate Analysis between Breast Self-Examination (BSE); Clinical Breast Examination (CBE); Mammography and Health Belief Model. When bivariate analysis was done, the study found that there was a statistically significant relationship between breast self-examination and the variables of the Health Belief model (perceived advantages and perceived barriers). When bivariate analysis was performed, there was no correlation found between the clinical breast examination and the constructs of the Health Belief Model. There were no significant correlations found in the bivariate analysis between the Health Belief model constructs and mammography.

5. CONCLUSION

Students generally exhibited a modest degree of perceived vulnerability to breast cancer. This implies a fundamental grasp of the potential danger, but it also highlights the necessity for specific education to improve comprehension of personal risk variables. The students exhibited a diverse spectrum of opinions regarding the seriousness of breast cancer. While certain individuals acknowledged it as a significant health concern, others seemed to minimize its influence. This underscores the significance of a thorough education of the ramifications of breast cancer. Students demonstrated a favourable disposition towards the advantages of breast cancer prevention and early detection measures. This demonstrates a willingness to participate in proactive actions, which can be further promoted by specific interventions that emphasize the effectiveness of these measures. Typical obstacles encompassed apprehension of pain or discomfort during screening, limited availability of time, and financial limitations. Prioritizing efforts to mitigate these barriers is crucial in order to promote more convenient access to preventive care. Diverse stimuli, such as media campaigns,

educational programmes, and personal experiences, were recognized as influential variables for embracing preventative behaviours. Utilizing these cues can efficiently encourage students to engage in health-seeking behaviours.

In general, students displayed a modest degree of self-confidence in conducting breast self-examinations and seeking medical guidance. Nevertheless, treatments targeted at increasing self-assurance and proficiency in these domains could additionally improve preventive measures. Although the majority of students reported participating in breast cancer preventative measures, it is important to ensure consistent adherence to the recommended guidelines. Specific instruction and reminders tailored to individuals can effectively strengthen and reinforce these behaviours. These findings suggest that it would be beneficial to create focused educational efforts that directly tackle specific misunderstandings, increase knowledge, and encourage healthy behaviours about breast cancer prevention and early detection among students. Efforts should prioritize lowering perceived obstacles and strengthening self-confidence to encourage students to actively pursue breast health.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

CONSENT

As per international standards or university standards, Participants' written consent has been collected and preserved by the author (s).

ETHICAL APPROVAL

As per international standards or university standards written ethical approval has been collected and preserved by the author (s).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Burguin A, Diorio C, Durocher F. Breast cancer treatments: Updates and new challenges. Journal of Personalized Medicine. 2021;11(8). Available:https://doi.org/10.3390/jpm11080808

2. Aziato L, Clegg-Lamptey JNA. Breast cancer diagnosis and factors influencing treatment decisions in Ghana. Health Care for Women International. 2015;36(5):543–557. Available:https://doi.org/10.1080/07399332.2014.911299

3. Brinton L, Figueroa J, Adjei E, Ansong D, Biritwum R, Edusei L, Nyarko KM, Wiafe S, Yarney J, Addai BW, Awuah B, Clegg-Lamptey JN, Adjei A, Dedey F, Vanderpuye V, Okyne V, Oti NO, Tay E, Adu-Aryee, team O. behalf of the GBHS. Factors contributing to delays in diagnosis of breast cancers in Ghana, West Africa. Breast Cancer Research and Treatment. 2017;162(1): 105–114. Available:https://doi.org/10.1007/s10549-016-4088-1

4. Brown J, Soukas C, Lin JJ, Margolies L, Santiago-Rivas M, Jandorf L. Physician knowledge, attitudes, and practices regarding breast density. Journal of Women's Health. 2019;28(9): 1193–1199. Available:https://doi.org/10.1089/jwh.2018.7429

5. Coleman C. Early detection and screening for breast cancer. Seminars in Oncology Nursing. 2017;33(2):141–155. Available:https://doi.org/https://doi.org/10.1016/j.soncn.2017.02.009

6. Etikan I. Sampling and sampling methods. Biometrics and Biostatistics International Journal. 2017;5(6). Available:https://doi.org/10.15406/bbij.2017.05.00149

7. Abutabenjeh S, Jaradat R. Clarification of research design, research methods, and research methodology: A guide for public administration researchers and practitioners. Teaching Public Administration. 2018;36(3):237–258. Available:https://doi.org/10.1177/0144739418775787

8. Adam AM. Sample size determination in survey research. Journal of Scientific Research and Reports. 2020;90–97. Available:https://doi.org/10.9734/jsrr/2020/V26i530263

9. Allweis TM, Hermann N, Berenstein-Molho R, Guindy M. Personalized screening for breast cancer: Rationale, present practices, and future directions. Annals of Surgical Oncology. 2021;28(8):4306–4317.
Available:https://doi.org/10.1245/s10434-020-09426-1

10. Alshahrani M, Alhammam SYM, Al Munyif HAS, Alwadei AMA, Alwadei AMA, Alzamanan SS. M., & Aljohani, N. S. M. (2019). Knowledge, Attitudes, and Practices of Breast Cancer Screening methods among female patients in primary healthcare centers in Najran, Saudi Arabia. Journal of Cancer Education. 2021;34(6): 1167–1172.
Available:https://doi.org/10.1007/s13187-018-1423-8

11. Al-Zalabani AH, Alharbi KD, Fallatah NI, Alqabshawi RI, Al-Zalabani AA, Alghamdi SM. Breast cancer knowledge and screening practice and barriers among women in Madinah, Saudi Arabia. Journal of Cancer Education. 2018;33(1):201–207.
Available:https://doi.org/10.1007/s13187-016-1057-7

12. Hagendorff T. The ethics of ai ethics: An evaluation of guidelines. Minds and Machines. 2020;30(1):99–120.
Available:https://doi.org/10.1007/s11023-020-09517-8

13. Kumar P, Aggarwal R. An overview of triple-negative breast cancer. Archives of Gynecology and Obstetrics. 2016;293(2): 247–269.
Available:https://doi.org/10.1007/s00404-015-3859-y

14. Guilford K, McKinley E, Turner L. Breast cancer knowledge, beliefs, and screening behaviors of college women: Application of the health belief model. American Journal of Health Education. 2017;48(4): 256–263.
Available:https://doi.org/10.1080/19325037.2017.1316694

15. Bushnell GG, Deshmukh AP, den Hollander P, Luo M, Soundararajan R, Jia D, Levine H, Mani SA, Wicha MS. Breast cancer dormancy: Need for clinically relevant models to address current gaps in knowledge. Npj Breast Cancer. 2021; 7(1):66.
Available:https://doi.org/10.1038/s41523-021-00269-x

16. Nilashi M, Ibrahim O, Ahmadi H, Shahmoradi L. A knowledge-based system for breast cancer classification using fuzzy logic method. Telematics and Informatics. 2017;34(4):133–144.
Available:https://doi.org/https://doi.org/10.1016/j.tele.2017.01.007

17. Fondjo LA, Owusu-Afriyie O, Sakyi SA, Wiafe AA, Amankwaa B, Acheampong E, Ephraim RKD, Owiredu WKBA. Comparative assessment of knowledge, attitudes, and practice of breast self-examination among female secondary and tertiary school students in Ghana. International Journal of Breast Cancer. 2018;7502047.
Available:https://doi.org/10.1155/2018/7502047

18. Freeman K, Geppert J, Stinton C, Todkill D, Johnson S, Clarke A, Taylor-Phillips S. Use of artificial intelligence for image analysis in breast cancer screening programmes: Systematic review of test accuracy. BMJ. 2021;374.
Available:https://doi.org/10.1136/bmj.n1872

19. González-Alzaga B, Hernández AF, Kim Pack L, Iavicoli I, Tolonen H, Santonen T, Vinceti M, Filippini T, Moshammer H, Probst- Hensch N, Kolossa-Gehring M, Lacasaña M. The questionnaire design process in the European Human Biomonitoring Initiative (HBM4EU). Environment International. 2022;160: 107071.
Available:https://doi.org/https://doi.org/10.1016/j.envint.2021.107071

20. Houssami N, Kirkpatrick-Jones G, Noguchi N, Lee CI. Artificial intelligence (AI) for the early detection of breast cancer: A scoping review to assess AI's potential in breast screening practice. Expert Review of Medical Devices. 2019;16(5): 351–362.
Available:https://doi.org/10.1080/17434440.2019.1610387

21. Kugbey N, Meyer-Weitz A, Asante KO. Mental adjustment to cancer and quality of life among women living with breast cancer in Ghana. The International Journal of Psychiatry in Medicine. 2019;54(3):217–230.
Available:https://doi.org/10.1177/0091217418805087

22. Malvia S, Bagadi SA, Dubey US, Saxena S. Epidemiology of breast cancer in Indian

women. Asia-Pacific Journal of Clinical Oncology. 2017;13(4):289–295. Available:https://doi.org/https://doi.org/10.1 111/ajco.12661

23. Momenimovahed Z, Salehiniya H. Epidemiological characteristics of and risk factors for breast cancer in the world. Breast Cancer: Targets and Therapy. 2019;11:151–164. Available:https://doi.org/10.2147/BCTT.S1 76070

24. Naku Ghartey Jnr F, Anyanful A, Eliason S, Mohammed Adamu S, Debrah S. Pattern of breast cancer distribution in Ghana: A survey to enhance early detection, diagnosis, and treatment. International Journal of Breast Cancer. 2016;3645308. Available:https://doi.org/10.1155/2016/364 5308

25. McKinney SM, Sieniek M, Godbole V, Godwin J, Antropova N, Ashrafian H, Back T, Chesus M, Corrado GS, Darzi A, Etemadi M, Garcia-Vicente F, Gilbert FJ, Halling-Brown M, Hassabis D, Jansen S, Karthikesalingam A, Kelly CJ, King D, Shetty S. International evaluation of an AI system for breast cancer screening. Nature. 2020;577(7788):89–94. Available:https://doi.org/10.1038/s41586-019-1799-6

26. Obrist M, Osei-Bonsu E, Awuah B, Watanabe-Galloway S, Merajver SD, Schmid K, Soliman AS. Factors related to incomplete treatment of breast cancer in Kumasi, Ghana. The Breast. 2014;23(6): 821–828. Available:https://doi.org/https://doi.org/10.1 016/j.breast.2014.08.014

27. Patterson PD, Weaver MD, Fabio A, Teasley EM, Renn ML, Curtis BR, Matthews ME, Kroemer AJ, Xun X, Bizhanova Z, Weiss PM, Sequeira DJ, Coppler PJ, Lang ES, Higgins JS. Reliability and validity of survey instruments to measure work-related fatigue in the emergency medical services setting: A systematic review. Prehospital Emergency Care. 2018;22(sup1):17–27. Available:https://doi.org/10.1080/10903127 .2017.1376134

28. Pierz AJ, Randall TC, Castle PE, Adedimeji A, Ingabire C, Kubwimana G, Uwinkindi F, Hagenimana M, Businge L, Musabyimana F, Munyaneza A, Murenzi G. A scoping review: Facilitators and barriers of cervical cancer screening and early diagnosis of breast cancer in Sub-Saharan African health settings. Gynecologic Oncology Reports. 2020;33: 100605. Available:https://doi.org/https://doi.org/10.1 016/j.gore.2020.100605

29. Santee JA, Marszalek JM, Hardinger KL. A critique of validity analysis from instruments assessing the affective domain. Currents in Pharmacy Teaching and Learning. 2019a;11(2): 218–229. Available:https://doi.org/https://doi.org/10.1 016/j.cptl.2018.11.010

30. Santee JA, Marszalek JM, Hardinger KL. A critique of validity analysis from instruments assessing the affective domain. Currents in Pharmacy Teaching and Learning. 2019b;11(2): 218–229. Available:https://doi.org/https://doi.org/10.1 016/j.cptl.2018.11.010

31. Esserman LJ, Anton-Culver H, Borowsky A, Brain S, Cink T, Crawford B, Eklund M, Esserman L, Fenton J, Heditsian D, Hiatt RA, Hogarth M, Kaplan C, Koenig B, LaCroix A, Larsen KM, Lee V, Matthews J, Madlensky L, Investigators, the WS.A. The WISDOM Study: breaking the deadlock in the breast cancer screening debate. Npj Breast Cancer. 2017;3(1):34. Available:https://doi.org/10.1038/s41523-017-0035-5

32. Nachtigal E, LoConte NK, Kerch S, Zhang X, Parkes A. Variation in breast cancer screening recommendations by primary care providers surveyed in wisconsin. Journal of General Internal Medicine. 2020;35(9):2553–2559. Available:https://doi.org/10.1007/s11606-020-05922-y

33. Nde FP, Assob JCN, Kwenti TE, Njunda AL, Tainenbe TRG. Knowledge, attitude and practice of breast self-examination among female undergraduate students in the University of Buea. BMC Research Notes. 2015;8(1):43. Available:https://doi.org/10.1186/s13104-015-1004-4

34. Katsura C, Ogunmwonyi I, Kankam HKN, Saha S. Breast cancer: Presentation, investigation and management. British Journal of Hospital Medicine. 2022;83(2): 1–7. Available:https://doi.org/10.12968/hmed.20 21.0459

35. Akram M, Iqbal M, Daniyal M, Khan AU. Awareness and current knowledge of

breast cancer. Biological Research. 2017;50(1):33.
Available:https://doi.org/10.1186/s40659-017-0140-9

36. Britt KL, Cuzick J, Phillips K-A. Key steps for effective breast cancer prevention. Nature Reviews Cancer. 2020;20(8):417–436.
Available:https://doi.org/10.1038/s41568-020-0266-x

37. Sharma G. Impact Factor: 5.2 IJAR. 2017a;3(7):749–752.
Available:www.allresearchjournal.com

38. Sharma G. Impact Factor: 5.2 IJAR. 2017b;3(7):749–752.
Available:www.allresearchjournal.com

39. Sharma R, Pannikottu J, Xu Y, Tung M, Nothelle S, Oakes AH, Segal JB. Factors influencing overuse of breast cancer screening: A systematic review. Journal of Women's Health. 2018;27(9):1142–1151.
Available:https://doi.org/10.1089/jwh.2017.6689

40. Shermis RB, Wilson KD, Doyle MT, Martin TS, Merryman D, Kudrolli H, Brenner RJ. Supplemental breast cancer screening with molecular breast imaging for women with dense breast tissue. American Journal of Roentgenology. 2016;207(2): 450–457.
Available:https://doi.org/10.2214/AJR.15.15924

41. Song L, Hsu W, Xu J, van der Schaar M. Using contextual learning to improve diagnostic accuracy: Application in breast cancer screening. IEEE Journal of Biomedical and Health Informatics. 2016; 20(3):902–914.
Available:https://doi.org/10.1109/JBHI.2015.2414934

42. Tabár L, Yen AM-F, Wu WY-Y, Chen SL-S, Chiu SY-H, Fann JC-Y, Ku MM-S, Smith RA, Duffy SW, Chen TH-H. Insights from the breast cancer screening trials: How screening affects the natural history of breast cancer and implications for evaluating service screening programs. The Breast Journal. 2015;21(1): 13–20.
Available:https://doi.org/https://doi.org/10.1111/tbj.12354

43. Tao Z, Shi A, Lu C, Song T, Zhang Z, Zhao J. Breast cancer: Epidemiology and etiology. Cell Biochemistry and Biophysics. 2015;72(2):333–338.
Available:https://doi.org/10.1007/s12013-014-0459-6

44. Vahabi M, Lofters A, Kim E, Wong JP-H, Ellison L, Graves E, Glazier RH. Breast cancer screening utilization among women from Muslim majority countries in Ontario, Canada. Preventive Medicine. 2017;105: 176–183.
Available:https://doi.org/https://doi.org/10.1016/j.ypmed.2017.09.008

45. Vernieri C, Milano M, Brambilla M, Mennitto A, Maggi C, Cona MS, Prisciandaro M, Fabbroni C, Celio L, Mariani G, Bianchi GV, Capri G, de Braud F. Resistance mechanisms to anti-HER2 therapies in HER2-positive breast cancer: Current knowledge, new research directions and therapeutic perspectives. Critical Reviews in Oncology/Hematology. 2019;139:53–66.
Available:https://doi.org/https://doi.org/10.1016/j.critrevonc.2019.05.001

46. Fahad Ullah M. Breast cancer: Current perspectives on the disease status. In A. Ahmad (Ed.), Breast Cancer Metastasis and Drug Resistance: Challenges and Progress (pp. 51–64). Springer International Publishing; 2019.
Available:https://doi.org/10.1007/978-3-030-20301-6_4

47. Cragun D, Weidner A, Lewis C, Bonner D, Kim J, Vadaparampil ST, Pal T. Racial disparities in BRCA testing and cancer risk management across a population-based sample of young breast cancer survivors. Cancer. 2017;123(13):2497–2505.
Available:https://doi.org/https://doi.org/10.1002/cncr.30621

48. Char DS, Abràmoff MD, Feudtner C. Identifying ethical considerations for machine learning healthcare applications. The American Journal of Bioethics. 2020;20(11):7–17.
Available:https://doi.org/10.1080/15265161.2020.1819469

49. Boatemaa Benson R, Cobbold B, Opoku Boamah E, Akuoko CP, Boateng D. Challenges, coping strategies, and social support among breast cancer patients in Ghana. Advances in Public Health. 2020;4817932.
Available:https://doi.org/10.1155/2020/4817932

50. Thomas AS, Kidwell KM, Oppong JK, Adjei EK, Osei-Bonsu E, Boahene A, Jiagge E,

Gyan K, Merajver SD. Breast cancer in Ghana: Demonstrating the need for population-based cancer registries in low- and middle-income countries. Journal of Global Oncology. 2017; 3(6):765–772.
Available:https://doi.org/10.1200/JGO.2016.006098

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