**ASSESSING KNOWLEDGE LEVEL OF SECONDARY SCHOOL STUDENTS ON CAUSES, EFFECTS AND PREVENTION OF BREAST CANCER IN TAMALE METROPOLIS, GHANA**

**ABSTRACT**

**Background:** The death rate related to breast cancer in Africa is frighteningly high and the prevalence of breast cancer is continuously increasing. The majority of breast cancer cases that are diagnosed and treated quickly can be cured. However, in some cases, acquired resistances to breast cancer treatments might lead to treatment failures and disease progression.

**Aim**: The study aimed to assess the understanding level of secondary school students on the causes, effects and prevention of breast cancer.

**Methods:** The study adopted a descriptive research design. A purposive sampling approach was used to choose Tamale Girls and Ghana Senior High Schools from the Tamale Metropolis and a simple random technique was used to identify the study respondents. Data was analyzed using SPSS. Statistics like frequency and percentages were used to represent the findings.

**Results:** The study revealed that students had a moderate-to-high level of knowledge on the causes, effects and preventions of breast cancer which is mainly influenced by the form or class of learning. In general, very few students were involved in screening for breast cancer. Breast self-examination was the most widely used of the three procedures, followed by mammography and clinical breast examination. Breast cancer screening was linked to factors such as age, family size, religion, and social class. Most students did well on the health belief test when it came to low self-efficacy, perceived barriers, perceived advantages, and perceived vulnerability. The majority of respondents (48.9%) showed a high degree of awareness of breast cancer, while just 11.3% showed a low level of knowledge. The study found that although students' levels of knowledge on breast cancer ranged widely, their understanding of its causes, effects, and prevention was moderate to high. The knowledge level of the respondents on the causes, effects and prevention of breast cancer did not vary significantly with their age (p=.793), family size (p=0.509), level of class/form (p=0.216) or religion (p=0.112).

**Conclusion:** Numerous students exhibited a fundamental comprehension of breast cancer; however, considerable misconceptions and knowledge deficiencies remained, especially about risk factors, early detection techniques, and preventive strategies. The results highlight the necessity for extensive health education initiatives centred on breast cancer awareness in secondary educational institutions.

**Keywords:** *Breast cancer,**disease progression, cancer mortality****,*** *mammography*

**INTRODUCTION**

Proper health practices should be developed as early as possible and should lead to the lifetime maintenance of good health. Adolescent females are an important target group for the promotion of proper health habits, in particular with regard to breast health (Mohebi et al., 2023; Rasool et al., 2019). Breast cancer is the most common cancer among women. Even though early detection and diagnosis of this disease can reduce mortality considerably, several studies have shown that more than 92% of women are unaware of the risk factors for breast cancer and of breast cancer screening tests. The simultaneous promotion of screening and provision of education can increase community health and reduce medical costs, and students can play a leading role in informing and educating people in society (Abdalani et al., 2024; Almeshari et al., 2023). According to a study on the global state of cancer burden, there were an estimated 20 million new cases of cancer and *10 million deaths from cancer in 2023* 1. Out of those, lung cancer ranks top, contributing to 18.4% of all cancer fatalities, while breast cancer comes second, accounting for 11.6% of all cancer deaths. Breast cancer is not only the most common disease in women, affecting more than a million and a half of them every year, but it is also the major cause of cancer-related mortality in women 2. Over 60% of Ghanaian women report delaying or skipping breast cancer treatment, making it the most common cause of cancer mortality among women in Ghana 3. Breast cancer has gradually impacted a lot more women in recent years, making it a global public health concern 1.

Due to their delicate and sensitive social responsibilities and frequent youth, women from all socioeconomic classes are most impacted by breast cancer. The median age of incidence, which varies from 25 to 75 years old, is 45 years old 2. When a woman's breasts develop atypically, her health is seriously put at risk. Examples of these anomalies include broken nipples, excruciating pain, benign lumps, purulent discharges, breast tissue hypertrophy, engorgement, mastitis, and—most seriously—malignant tumors or cancer. By doing routine breast examinations using screening instruments, the abnormalities are quickly and discernible 3.

Despite the fact that traditionally breast cancer mortality rates in developed nations have been higher, recent research indicates that breast cancer fatalities among African women are much higher due to late presentation 4. Despite this, there are considerable regional differences in breast cancer survival rates, with high-income nations having an 80% survival rate, middle-income countries having 60%, and low-income countries having 40% 5. According to 6 the lower survival rates in less developed nations are caused by a lack of effective diagnosis, treatment facilities, and early detection programs, which cause a large number of those affected in these nations to report their cases at a late stage. Breast cancer survival depends on early discovery and reporting to the hospital for treatment 5,6. Majority of breast cancer cases that are diagnosed and treated quickly can be cured. However, in some cases, acquired resistances to breast cancer treatments might lead to treatment failures and disease progression 6. Even, difficulties can arise when the disease spreads to different body areas, such as the bone 5.

One significant worldwide health problem is the incidence of breast cancer 7. According to 8 a woman worldwide succumbs to breast cancer every 69 seconds. According to 9 more than 508 000 women are thought to have died from breast cancer in the globe in 2011. According to the Centers for Disease Control and Prevention (CDC), in 2015, 41,150 people are projected to have died from breast cancer in the United States in 2012. In 2008, there were 35,427 breast cancer fatalities in Sub-Saharan Africa 6.

In South Africa, statistics show that there are 8,000 new instances of breast cancer each year, with 3,000 fatalities 7. Another notable rise in the proportion of young Black women under 35 receiving a breast cancer diagnosis was discovered by 9. similar to Nigeria, where in a five-year period, breast cancer accounted for 22.41% of all newly diagnosed cancer cases and 35.41% of all female cancers 9. Estimates from 8 state that 1,021 of Ghana's anticipated 2,260 annual new cases of breast cancer mortality are attributable to breast cancer. Unfortunately, a lot of women who died of breast cancer in Ghana showed up at the hospital too late, when the illness had already advanced to the point that there was little to no prospect of recovery 10.

It has been decades since efforts to increase breast cancer awareness via education, screening, and treatment began 10. In order to raise awareness of breast cancer, October has been designated as “Pink Month” and International Breast Cancer Month. Increased awareness of the disease and methods for its early diagnosis and treatment are the goals of this event 10. Similar to other countries, Ghana has been actively raising awareness of breast cancer through cooperatives, individuals, and international and non-governmental organizations 11. The present study aimed to assess the understanding level of secondary school students on the causes, effects and prevention of breast cancer.

**MATERIALS AND METHODS**

This study was conducted in the Tamale Metropolis and used the quantitative research design method for the research.

Target Population: The target population consists of all female secondary school students in the Tamale Metropolis. This population is targeted because women are regarded as the prime receivers of the psychological effects of breast cancer and its related complications.

Sampling Technique and Size: A simple random sampling would be used to draw statistical conclusions about the communities and people in the study locations.

The entire schools in the Tamale Metropolis were divided into two clusters: Cluster one (1) consisted of Ghana Senior High School, Adventist Senior High School, Kalpohin Senior High School St. Charles Senior High School and Dabopka Senior High Technical School. Cluster two (2) consisted of Presby Senior High School, Vittin Senior High Technical School, Tamale Girls Senior High School and Anbariya Senior High School. This was used to choose the school for the research. This was done to accommodate female students as well as to represent the diverse demographic traits found in the Metropolis. The population of the research consists of female students. Two schools were randomly chosen to represent the many schools in the study area, and the study respondents were randomly chosen from those two schools to represent the characteristics of the larger population.

**List 1 : Distribution of respondents (female students)**

|  |  |
| --- | --- |
| **Schools**  | **Sample Size** |
| Ghana Senior High School | 150 |
| Tamale Girls Senior High School | 251 |
| **Total** | **365** |

Data Collection Instrument: The main data collection instrument was a self-developed questionnaire. The questionnaire was divided into three sections as follows;

* Section A: The questionnaire covered the demographic data of respondents.
* Section B: The causes, effects and prevention of breast cancer.
* Section C: The breast cancer screening practices among female students.

Data Collection Procedure: Written authorization to use the selected schools for the study was requested in a formal letter that was submitted to the Tamale Metro Educational directorate and the schools. A pre-tested structured questionnaire was used to gather the quantitative data.

Ethical issues: Ethics, according to 12, is primarily linked to morality and deals with questions of right and wrong within communities, societies, or groups. To the greatest extent possible, the researchers make every attempt to uphold moral standards. According to 13 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 got explanations regarding the study's purpose, confidentiality assurances, and withdrawal rights.

**RESULTS**

In selecting Tamale Girls and Ghana Senior High Schools, the study's major goal was to assess the understanding level of secondary school students on the causes, effects and prevention of breast cancer as well as health beliefs and screening practices. In this study, a descriptive research design was employed. A total of three hundred and fifty (350) copies of questionnaires were administered and 100% questionnaires were returned by study participants.

**Demographic Characteristics**

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

**Gender of the Respondents**

Table.1 represented the gender of the respondents. The study revealed that, majority of the respondents were females representing 81.6% of the total sample of the study. The findings revealed a total of 66 males representing 18.6% of participants in the study.

**Table.1: The gender of the respondents**

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

**Age of the Respondents**

Figure 1 illustrates the age of the study respondents. The findings revealed that, the majority (47.1%) of the students were between 15 - 17 years. This was followed by those between the age of 18 - 20 years (34.1%). Only 0.8% of the students were below 12 years. Also, the results revealed that 15.3% of the respondents were between 12 – 14 years whiles 2.7% of the students were above 20 years.

**Figure 1: Age of the study respondents**

**4.1.3: Class/Form of the Respondents**

Figure 2 represents the class/form of the study respondents. The study revealed that, majority (45.6%.) of the study respondents were from two students (SHS2). This was followed by SHS3 students (37.1%) and SHS1 students (17.3%) as illustrated in figure 2.

**Figure 2: Class/form of the respondents**

**4.2: Level of Knowledge of Students on Breast Cancer**

There were five questions about participants' knowledge of breast cancer; participants received a score of 3 for correctly answering a question, a score of 2 for not knowing, and a score of 1 for incorrectly answering a question. A participant could receive a minimum score of 5 and a maximum score of 15. A participant was considered to have good knowledge of breast cancer if they scored between 14 and 15 and correctly answered at least 4 out of the 5 questions while not knowing the answer to one of them. Moderate knowledge was defined as scores between 12 and 13. Less than 12 was considered to be a low knowledge score.

The findings revealed that the majority of the respondents demonstrated a high level of knowledge (48.9%) with regard to breast cancer, with only 11.3% of the respondents exhibiting a low level of knowledge (Table 2).

**Table 2:** **Level of knowledge on breast cancer**

|  |  |  |
| --- | --- | --- |
| **Level of knowledge on Breast Cancer** | **Frequency** | **Percentage (%)** |
| Low | 40 | 11.3 |
| Moderate | 139 | 39.8 |
| High | 171 | 48.9 |
| **Total** | **350** | **100** |

**4.2.1: Knowledge of the Causes, Effects and Prevention of Breast Cancer**

The purpose of research question one was to explore the level of knowledge of secondary school students on the causes, effects and prevention of breast cancer in the Tamale Metropolis**.** The respondents were asked to indicate to what extent you disagree or agree with each statement where SD = strongly disagree; D=disagree; N=neutral; A=agree and SA=strongly agree.

As indicated from the data gathered in **Table 3,** the study revealed that the students have good knowledge of the causes, effects and prevention of breast cancer. The study found that while 69.5% of respondents generally disagreed, 11.1% of respondents typically agreed that a person's likelihood of developing breast cancer increases with age. Moreover, 19.4% of respondents agreed and 74.3% disagreed that having a sister, mother, or cousin who has breast cancer increases one's own risk of developing the illness. However, it was interesting to note that the majority of the students (representing 72.5%) are in a general disagreement that, breast cancer can spread to other parts of the body while 22.7% of the students disagreed. Also, the study generally accepted that breast cancer can lead to death as indicated by 85.4% of the respondents (Table 3).

**Table.3:** **Knowledge of the causes, effects and prevention of breast cancer**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Statement**  | **SD** | **D** | **N** | **A** | **SA** |
| One’s risk of developing breast cancer increases with increasing age | 43.9 | 25.6 | 19.3 | 8.9 | 2.3 |
| If a family relative has/had breast cancer, it increases one’s risk of developing breast cancer | 33.1 | 41.2 | 14.4 | 10.4 | 0.9 |
| Menstruating before age 13 is a risk of developing breast cancer later in life | 24.6 | 33.5 | 15.8 | 9.9 | 16.2 |
| Breastfeeding for more than one year reduces a woman’s risk of developing breast cancer | 25 | 41.7 | 16.2 | 11.4 | 5.6 |
| Eating a lot of fatty foods may increase a woman’s risk of developing breast cancer | 38.2 | 29.8 | 11.3 | 17.3 | 3.3 |
| Excessive alcohol intake increases one’s risk of developing breast cancer | 18.7 | 16.2 | 26.3 | 16.5 | 22.3 |
| Breast cancer may manifest as an un usual painless lump | 0 | 10.4 | 11.4 | 47.3 | 30.4 |
| An unusual nipple discharge such as bloody nipple discharge may suggest breast cancer | 5.7 | 46.7 | 22.9 | 3.7 | 20.9 |
| Breast Cancer can spread to other parts of the body | 4.6 | 18.1 | 4.9 | 49.3 | 23.2 |
| Breast Cancer can lead to death | 3.4 | 4 | 7.2 | 44.4 | 41 |
| Breast Cancer be easily cured when it is detected early | 2.9 | 5.4 | 4.9 | 50.1 | 36.7 |
| Regular breast examination prevents complications of breast cancer | 4.9 | 4.3 | 5.7 | 46.7 | 38.4 |
| Breast cancer can be cured by surgery/removal of the breast | 3.4 | 5.2 | 5.7 | 57 | 28.7 |
| Breast cancer can be cured by use of herbs | 17.2 | 38.7 | 20.3 | 13.5 | 10.3 |

**4.2.2: Association between Demographic Characteristics and Level of Knowledge**

The knowledge level of the respondents on the causes, effects and prevention of breast cancer did not vary significantly with their age (p=.793), family size (p=0.509), level of class/form (p=0.216) or religion (p=0.112). The distribution of respondents’ knowledge on the causes, effects and prevention of breast cancer is represented in the table 4 below.

**Table 4: Association between demographic characteristics and level of knowledge**

|  |  |  |
| --- | --- | --- |
| **Characteristic** | **Level of Knowledge of Breast Cancer** |  |
|  | **Low (%)** | **Moderate (%)** | **High (%)** | **X2** | **P** |
| **Age** |  |  |  | 7.896 | 0.793 |
| ˂12  | 0.0 | 100 | 0.00 |  |  |
| 12.-14 | 3.2 | 35.5 | 61.3 |  |  |
| 15-17 | 2.2 | 39.1 | 58.7 |  |  |
| 18-20 | 0.0 | 44.9 | 55.1 |  |  |
| ˃20+ | 3.0 | 51.5 | 45.5 |  |  |
| **Level of Class** |  |  | 10.753 | 0.216 |
| SHS1 | 0.0 | 55.9 | 44.1 |  |  |
| SHS2 | 0.0 | 57.1 | 42.9 |  |  |
| SHS3 | 0.0 | 40.9 | 54.9 |  |  |
| **Religion** |  |  |  | 4.381 | 0.112 |
| Christian | 1.6 | 41.9 | 56.5 |  |  |
| Muslim | 0.0 | 68.8 | 31.3 |  |  |
| **Family size** |  |  | 5.290 | 0.507 |
| 1.-2 | 2.4 | 41.5 | 56.1 |  |  |
| 3.-4 | 4.6 | 54.6 | 40.9 |  |  |
| 5.-6 | 2.7 | 46.0 | 51.4 |  |  |
| 7 and above | 0.0 | 42.2 | 56.8 |  |  |

**4.3: Knowledge of Breast Cancer Screening Practices Among Secondary School Students**

Breast self-examination (BSE) was known to the majority of respondents, according to the study (95.4%). Furthermore, 68.9% of the participants possessed knowledge regarding clinical breast examination (CBE). Figure 3 shows that approximately 54.1% of study participants were aware of mammography screening.

**Figure 3: Knowledge of Breast Cancer Screening Practices**

**4.3.1: Prevalence of Breast Cancer Screening**

According to figures 4 and 5, the percentage of respondents who had ever had a mammography, BSE, or CBE was 1.1%, 21.6%, and 77.4%, respectively.

**Table 5:** **Prevalence of breast cancer screening**

|  |  |  |
| --- | --- | --- |
| **Prevalence**  | **Proportion** | **95% confidence interval** |
|  Breast Self-Examination | 0.7739 | 0.7206 | 0.8212 |
| Mammography | 0.2155 | 0.1691 | 0.2681 |
| Clinical Breast Examination  | 0.0106 | 0.0022 | 0.0307 |

**Figure 4: Prevalence of breast cancer screening**

**Frequency of Breast Screening**

The most popular screening technique among responders was breast self-examination. Of the 350 responders, about 45% underwent breast screening for more than a year, and 41.2% had done so in the previous six months to a year (figure 5).

**Figure 5: Frequency of breast screening**

**DISCUSSION**

Level of Knowledge of Students on Breast Cancer

This study is set to assess the understanding level of secondary school students on the causes, effects and prevention of breast cancer as well as health beliefs and screening practices in Tamale Metropolis.

According to the findings, the majority of respondents (48.9%) showed a high degree of awareness of breast cancer, while just 11.3% showed a low level of knowledge. The study found that although students' levels of knowledge on breast cancer ranged widely, their understanding of its causes, effects, and prevention was moderate to high.

The knowledge level of the respondents on the causes, effects and prevention of breast cancer did not vary significantly with their age (p=.793), family size (p=0.509), level of class/form (p=0.216) or religion (p=0.112).

Although this has been linked to specific genetic predispositions, the possibility of other multifactorial factors at play for this risk group cannot be ruled out 1. The fact that nearly 70% of women in Ghana who are diagnosed with breast cancer are in advanced stages of the disease 4,12, which is supported by 14, makes it imperative that these people receive special attention in the policy-making process and promotion programs.

According to 15,16, similar studies carried out locally in Ghana among women in the Makola shopping mall in Accra revealed positive results and indicated that breast cancer awareness was quite high. A significant number of the participants (87.6%) understood about the common signs and symptoms of presentation of the condition.

Knowledge of Breast Cancer Screening Practices Among Secondary School Students

Breast cancer screening is the cornerstone of early illness identification and treatment. The three methods of screening for breast cancer are clinical breast examination, which requires clinicians to examine women who visit their facilities for breast cancer, mammography, which uses a machine to detect early changes in the breast, and breast self-examination, which requires women to be skilled in order to perform it on themselves once a month. Majority of respondents (95.4%) to the research were aware of breast self-examination (BSE). Furthermore, approximately 68.9% of the participants were aware of clinical breast examinations (CBE). Of the study participants, approximately 54.1% were aware of mammography screening (figure 3).

According to results from a related study conducted in Kumasi, Ghana among nurses in KATH, 72.1% of them had BSE done 10, the high prevalence of BSE compared to other screening modalities is consistent with those findings. The prevalence of BSE among female health workers in Nigeria was somewhat greater than what was discovered in this investigation. According to 17, over 78% of Benin City, Nigeria's female health personnel engage in BSE. Another research of tertiary healthcare professionals in the Nigerian state of Anambra found that 81.9% of the respondents used BSE 2.

Additionally, this study revealed that 21.6% of respondents have ever undergone CBE. This ratio was insufficient and unsatisfactory. A low prevalence of CBE has also been observed by other investigations. The percentage of nurses who had undergone CBE in KATH, a tertiary healthcare center in Kumasi, Ghana, where there is a functioning breast clinic, was 21.1%. This discovery is consistent with findings from other African nations. According to a study conducted in Morocco 6, the incidence of CBE among nurses was 26.1%. It is unacceptable that these professionals have free access to this screening procedure yet choose not to use it. In this study, only a small portion of women used mammography. Only 1.1% of the 350 participants had ever undergone a breast cancer screening. The subjects were likely quite young (median age: 15 ± 4 years), therefore mammography screening may not have been essential for them.

According to 6, 10% of nurses in KATH had undergone a mammogram. According to a study done in Nnewi, Anambra state, Nigeria, the frequency among female health professionals was 1.9% 18. 3.1% of women in Nigeria had mammograms, according to a different study 19. Similar research among medical professionals in Morocco 20, an African nation with a somewhat higher socioeconomic standing, indicated that 22% of them had ever undergone a mammogram. But when compared to affluent nations, these reports from Africa are appallingly lower.

**CONCLUSION**

Findings from the study showed that students had a moderate-to-high level of knowledge on the causes, effects and preventions of breast cancer which is mainly influenced by the form or class of learning. In general, very few students were involved in screening for breast cancer. Breast self-examination was the most widely used of the three procedures, followed by mammography and clinical breast examination. Breast cancer screening was linked to factors such as age, family size, religion, and social class.

Based on their health beliefs, the majority of the students showed low perceived vulnerability, high perceived advantages, low self-efficacy, and high perceived barriers. This explains why the respondents' low rate of breast cancer screening updates was obtained. BSE practitioners were more likely to be extremely vulnerable, believe there are few barriers on their path, and rate the benefits of BSE practice highly. However, no relationship between the health belief constructions and CBE, mammography, was discovered.

Ethical Approval:

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

Consent

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

**Disclaimer (Artificial intelligence)**

Option 1:

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 the writing or editing of this manuscript.

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Author(s) hereby declare that generative AI technologies such as Large Language Models, etc. have been used during the writing or editing of manuscripts. This explanation will include the name, version, model, and source of the generative AI technology and as well as all input prompts provided to the generative AI technology

Details of the AI usage are given below:

1.

2.

3.

**Reference**

1. Malvia S, Bagadi SA, Dubey US, Saxena S. Epidemiology of breast cancer in Indian women. *Asia Pac J Clin Oncol*. 2017;13(4):289-295. doi:10.1111/ajco.12661

2. Katsura C, Ogunmwonyi I, Kankam HK, Saha S. Breast cancer: presentation, investigation and management. *Br J Hosp Med (Lond)*. 2022;83(2):1-7. doi:10.12968/hmed.2021.0459

3. McKinney SM, Sieniek M, Godbole V, et al. International evaluation of an AI system for breast cancer screening. *Nature*. 2020;577(7788):89-94. doi:10.1038/s41586-019-1799-6

4. Freeman D, Emsley R, Diamond R, et al. Comparison of a theoretically driven cognitive therapy (the Feeling Safe Programme) with befriending for the treatment of persistent persecutory delusions: a parallel, single-blind, randomised controlled trial. *The lancet Psychiatry*. 2021;8(8):696-707. doi:10.1016/S2215-0366(21)00158-9

5. Brinton LA, Figueroa JD, Ansong D, et al. Skin lighteners and hair relaxers as risk factors for breast cancer: Results from the Ghana breast health study. *Carcinogenesis*. 2018;39(4):571-579. doi:10.1093/carcin/bgy002

6. Obrist M, Osei-Bonsu E, Awuah B, et al. Factors related to incomplete treatment of breast cancer in Kumasi, Ghana. *Breast*. 2014;23(6):821-828. doi:10.1016/j.breast.2014.08.014

7. 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. *Int J Breast Cancer*. 2016;2016:3645308. doi:10.1155/2016/3645308

8. Boatemaa Benson R, Cobbold B, Opoku Boamah E, Akuoko CP, Boateng D. Challenges, Coping Strategies, and Social Support among Breast Cancer Patients in Ghana. *Adv Public Heal*. 2020;2020(1):4817932. doi:https://doi.org/10.1155/2020/4817932

9. Thomas PA, Liu H, Umberson D. Family Relationships and Well-Being. *Innov Aging*. 2017;1(3):1-11. doi:10.1093/geroni/igx025

10. Kugbey N, Oppong Asante K, Meyer-Weitz A. Depression, anxiety and quality of life among women living with breast cancer in Ghana: mediating roles of social support and religiosity. *Support care cancer Off J Multinatl Assoc Support Care Cancer*. 2020;28(6):2581-2588. doi:10.1007/s00520-019-05027-1

11. Aziato L, Clegg-Lamptey JNA. Breast cancer diagnosis and factors influencing treatment decisions in Ghana. *Health Care Women Int*. 2015;36(5):543-557. doi:10.1080/07399332.2014.911299

12. al. R et. 乳鼠心肌提取 HHS Public Access. *Physiol Behav*. 2018;176(5):139-148. doi:10.4049/jimmunol.1801473.The

13. Hagendorff T. The Ethics of AI Ethics: An Evaluation of Guidelines. *Minds Mach*. 2020;30(1):99-120. doi:10.1007/s11023-020-09517-8

14. Guilford K, McKinley E, Turner L. Breast Cancer Knowledge, Beliefs, and Screening Behaviors of College Women: Application of the Health Belief Model. *Am J Heal Educ*. 2017;48(4):256-263. doi:10.1080/19325037.2017.1316694

15. Coleman C. Early Detection and Screening for Breast Cancer. *Semin Oncol Nurs*. 2017;33(2):141-155. doi:10.1016/j.soncn.2017.02.009

16. Momenimovahed Z, Salehiniya H. Epidemiological characteristics of and risk factors for breast cancer in the world. *Breast cancer (Dove Med Press*. 2019;11:151-164. doi:10.2147/BCTT.S176070

17. Cragun D, Weidner A, Lewis C, et al. 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. doi:10.1002/cncr.30621

18. Tabár L, Dean PB, Chen THH, et al. The incidence of fatal breast cancer measures the increased effectiveness of therapy in women participating in mammography screening. *Cancer*. 2019;125(4):515-523. doi:10.1002/cncr.31840

19. Brown LC, Salgado R, Luen SJ, Savas P, Loi S. Tumor-Infiltrating Lymphocyctes in Triple-Negative Breast Cancer: Update for 2020. *Cancer J*. 2021;27(1). https://journals.lww.com/journalppo/fulltext/2021/01000/tumor\_infiltrating\_lymphocyctes\_in\_triple\_negative.5.aspx

20. Khalis M, Rhazi K El, Charaka H, et al. Female Breast Cancer Incidence And Mortality In Morocco: Comparison With Other Countries. *Asian Pacific J Cancer Prev*. 2016;17(12):5211-5216. doi:10.22034/APJCP.2016.17.12.5211

Mohebi, Z., Heidari Sarvestani, M., Moradi, Z., & Naghizadeh, M. M. (2023). Female high school students' knowledge and attitude toward breast cancer. BMC Women's Health, 23(1), 41.

Rasool, Saba, Maham Iqbal, Ammarah Siddiqui, Ramna Ahsan, Sahrish Mukhtar, and Shagufta Naqvi. 2019. “Knowledge, Attitude, Practice towards Breast Cancer and Breast Self-Examination Among Female Undergraduate Students in Karachi, Pakistan”. Journal of Advances in Medicine and Medical Research 29 (9):1-11. https://doi.org/10.9734/jammr/2019/v29i930126.

Abdalani, Badr, Omar Moufid, Meriem Amri, Saleh Obeidat, A. Assklou, M. GH. Benouna, A. Drighil, and R. Habbal. 2024. “Pericardial Effusion As an Early Indicator of Breast Cancer Recurrence: A Case Report”. International Journal of Medical and Pharmaceutical Case Reports 17 (2):74-80. https://doi.org/10.9734/ijmpcr/2024/v17i2379.

Almeshari, M., Alzamil, Y., Alyahyawi, A., Abanomy, A., Althmali, O., Al-Enezi, M. S., ... & Khandaker, M. U. (2023). Awareness level, knowledge and attitude towards breast cancer among staff and students of Hail University, Saudi Arabia. Plos one, 18(3), e0282916.