



Knowledge and preventive practices regarding breast cancer among nursing students in Northern Mexico: A cross-sectional correlational study

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ABSTRACT

Background: Breast cancer is one of the most prevalent non-communicable diseases and a leading cause of morbidity and mortality among women worldwide. It is characterized by the uncontrolled proliferation of malignant breast cells, leading to tumor growth and potential metastasis to distant organs. Early detection and preventive behaviors, such as breast self-examination (BSE), are critical in reducing disease burden.

Objective: This study aimed to examine the relationship between breast cancer knowledge and preventive practices among nursing students in northern Mexico.

Methods: A cross-sectional, correlational study was conducted from January to February 2024, involving 118 Bachelor of Nursing students aged 18 years or older. Participants were selected through simple random sampling. Data were collected using a structured, self-administered questionnaire assessing sociodemographic characteristics, attitudes toward BSE, and knowledge of breast cancer. The instrument demonstrated acceptable internal consistency (Cronbach's $\alpha = 0.632$). Data were analyzed using SPSS version 23, with descriptive statistics summarizing participant characteristics and Spearman's rank-order correlation assessing the association between knowledge and preventive measures. Statistical significance was set at $p < 0.05$.

Results: The majority of participants were female (82%), with a mean age of 21.9 years. Most respondents demonstrated awareness of breast cancer and early detection methods; however, regular BSE practice was reported by only 33%. A moderate, statistically significant correlation was observed between knowledge and preventive measures ($r_s = 0.57$, $p = 0.001$).

Conclusion: Findings highlight the need for targeted educational interventions in nursing curricula to strengthen knowledge and reinforce preventive practices, ultimately enhancing early detection and improving patient outcomes.

Keywords: breast neoplasm; knowledge; nursing students

Nursing and Healthcare Practices

- *Nursing educators and institutions should implement targeted educational programs to improve knowledge and awareness of breast cancer, emphasizing the importance of early detection methods such as breast self-examination.*
- *Incorporating breast cancer prevention strategies into the nursing curriculum can empower students to adopt and advocate for preventive behaviors in both personal and clinical settings.*
- *Utilizing mobile devices and digital tools can enhance the accessibility and effectiveness of health education interventions among nursing students, fostering greater engagement in preventive measures.*

INTRODUCTION

Breast cancer (BC) is one of the most prevalent non-communicable diseases worldwide and remains a leading cause of disability and mortality among women. It is characterized by the abnormal and irreversible proliferation of malignant cells in breast tissue, resulting in tumor formation that can infiltrate surrounding tissues and metastasize to distant organs (Pan American Health Organization [PAHO], n.d.). Malignancies most commonly originate in the lobules, which produce milk, or in the ducts, which transport milk to the nipple. As the disease advances, tumor cells can spread to regional lymph nodes and, in later stages, to distant sites via metastasis (Samuel et al., 2018).

Multiple risk factors contribute to BC development, including genetic predisposition, particularly having first- or second-degree relatives diagnosed with BC—especially when diagnosis occurs before age 50—or a family history of male breast cancer (Aldaz & Córdova, 2023). Modifiable risk factors such as obesity (BMI ≥ 30), tobacco and alcohol consumption (>3 units/day), and prolonged hormone replacement therapy (>5 years) are also significantly associated with increased risk (Colditz et al., 2020). Globally, BC accounts

for approximately 25% of all cancer diagnoses in women, with an estimated 1.67 million new cases annually. Projections suggest that, without effective interventions, BC could cause up to 8.8 million deaths over the next two decades (WHO, 2023; IARC, 2024). Evidence indicates that targeted prevention strategies—including lifestyle modifications and biennial mammography screening for at-risk women aged 40–69 years—could reduce incidence by up to 30% (European Commission Initiative on Breast Cancer [ECIBC], 2022).

Health promotion and primary prevention are critical to lowering BC morbidity and mortality. Nursing professionals play an essential role in this effort, particularly through education on breast self-examination (BSE) techniques, counseling on modifiable risk factors, and promoting early detection practices (WHO, 2022). Studies have shown that up to 30% of BC cases are preventable through these combined strategies (Colditz et al., 2020). Nursing students, as future healthcare providers, must possess both adequate knowledge and effective preventive behaviors to influence community health positively. Assessing their current knowledge and practices can identify gaps that may hinder their capacity to promote BC prevention. Therefore, this study aims to analyze the correlation between knowledge of BC and the adoption of preventive measures among nursing students in northern Mexico, providing evidence to inform targeted educational interventions within nursing curricula.

METHODS

Design

This research employed a descriptive, correlational, and cross-sectional design as outlined by Burns and Grove (2012). The descriptive component allowed for the systematic documentation of participants' sociodemographic characteristics, knowledge levels, and preventive practices related to breast cancer. The correlational aspect aimed to examine the strength and direction of the relationship between knowledge and preventive behaviors without manipulating variables. The cross-sectional approach involved collecting all data at a single point in time, enabling the assessment of existing conditions and associations within the study population efficiently and cost-effectively.

This design was considered appropriate for the study's objectives, as it facilitated both the quantification of key variables and the identification of statistically significant associations within a defined timeframe.

Sample and Setting

The study was conducted at an educational university institution in Saltillo, Coahuila, Mexico, over a two-month period from January to February 2024. The target population comprised nursing students of both genders who were actively enrolled in the Bachelor of Nursing program. A simple random probabilistic sampling method was employed to ensure that each eligible student had an equal chance of selection, thereby reducing selection bias and enhancing the representativeness of the sample. The sample size was calculated using the statistical software nQuery Advisor version 4.0, with parameters set at a 95% confidence interval and a 5% margin of error. This calculation yielded a required sample of 118 participants, considered sufficient to achieve statistical reliability for the intended correlational analysis. Inclusion criteria specified that participants had to be aged 18 years or older, currently enrolled in the Bachelor of Nursing program, possess a mobile device equipped with a camera and internet access, and provide informed consent by signing the consent form in full. Exclusion criteria included faculty members, administrative staff, and students who either declined to participate or failed to provide complete informed consent. These criteria were established to ensure that the sample was homogeneous in terms of academic status and capable of fully participating in the data collection process.

Variable

The variables examined in this study included knowledge about breast cancer as the independent variable and preventive measures as the dependent variable. The independent variable was operationalized as the participants' understanding of breast cancer etiology, risk factors, signs and symptoms, and early detection strategies. The dependent variable, preventive measures, referred to the participants' engagement in behaviors and attitudes aimed at reducing breast cancer risk, with a particular emphasis on the practice of breast self-examination (BSE). This encompassed the frequency, accuracy, and timing of BSE, as well as the participants'

willingness to seek clinical evaluation upon detecting abnormal findings. Together, these variables were selected to assess not only the level of theoretical knowledge but also its translation into tangible preventive actions, thereby providing insight into the relationship between awareness and health-promoting behaviors among nursing students.

Data Collection

The data collection instrument consisted of two main sections. The first section was a sociodemographic data sheet that gathered information on semester of study, age, educational level, marital status, and family medical history of breast cancer. The second section was the Questionnaire on Attitudes Toward Breast Self-Examination and Knowledge About Breast Cancer, adapted from Blossiers Mazzini (2014). This questionnaire comprised 14 items divided into two domains: (1) knowledge about breast cancer, including its risk factors, signs and symptoms, and early detection methods, and (2) attitudes and practices related to breast self-examination (BSE). The instrument demonstrated a Cronbach's alpha coefficient of 0.632, reflecting acceptable internal consistency for exploratory research.

Data collection was carried out using a structured, self-administered questionnaire distributed to eligible nursing students who met the inclusion criteria. All participants were adult students enrolled in a Bachelor of Nursing program in northern Mexico, with access to a mobile device equipped with internet connectivity and camera functionality. Prior to participation, informed consent was obtained electronically, ensuring voluntary participation and adherence to ethical standards. Responses were collected electronically to facilitate ease of access, minimize logistical barriers, and ensure consistency in administration. This approach also supported data integrity by reducing manual entry errors and allowed for anonymity and confidentiality, thereby encouraging honest and accurate responses. The instrument was designed not only to measure knowledge levels but also to capture the extent to which knowledge translates into preventive behaviors, particularly regular and correct BSE practices.

Data Analysis

Social Sciences (SPSS), version 23. Descriptive statistics, including frequencies,

Table 1. Sociodemographic characteristics of nursing school students.

Category	n	%
Age		
18-20	28	24
21-23	50	42
>23	40	34
Gender Identity		
Female	97	82
Male	20	17
Other gender identity	1	1
Relationship status		
Single	84	71
Married	19	16
Divorce	6	5
Common-law partnership	9	8
Semester		
4	37	31
6	34	29
8	47	40
Section		
A	62	52
B	41	35
C	15	13
Menarche (Age at first menstrual period)		
0	16	14
12	59	50
13	30	25
14	6	5
15	7	6
Gravidity (Number of pregnancies)		
1	15	13
2	9	7
3	15	13
None	79	67
Parity (number of deliveries)		
1	14	12
2	12	10
3	11	9
None	81	69
Breast cancer history		
Yes	20	16
No	98	84
Family History Documentation		
Maternal	13	11
Paternal	3	2
Nuclear (mother, father, young brothers)	2	2
None	100	85

Table 2. Level of knowledge about breast cancer among nursing school students

Question	If you know		If you don't know	
	n	%	n	%
How would you define breast cancer?	93	78	25	21
Are you aware of any methods for early detection of breast cancer?	104	87	14	12
In your opinion, which would it be?	76	64	42	35
At what age do you think women should start getting clinical breast exams by a specialist?	40	34	78	66
How often do you perform breast self-exams as a preventive measure?"	44	37	74	62
When do you believe is the right time to start doing breast self-exams?"	69	58	49	41
Why do you think breast self-exams are important?	44	37	74	62
Which of the following signs do you believe are associated with breast cancer?"	101	85	17	14
Do you believe menopause after age 55 increases the risk of developing breast cancer?	40	34	78	66
Which groups do you think are at higher risk for breast cancer?"	47	40	71	60
Do you believe people with first-degree relatives (e.g., grandmother, mother, sisters) who had breast cancer are at higher risk?"	87	73	31	26

Table 3. Correlation of variables

Variable	Level of cancer knowledge	Preventive measures
Level of cancer knowledge	1	0.001
Preventive measures	0.001	2

percentages, means, and standard deviations, were applied to summarize the participants' sociodemographic characteristics, as well as their responses related to knowledge of breast cancer and engagement in preventive practices. For inferential analysis, Spearman's rank-order correlation was employed to examine the relationship between the independent variable (knowledge about breast cancer) and the dependent variable (preventive measures), as the data did not meet the assumptions of parametric tests. The correlation analysis was conducted to determine both the strength and direction of the association between these variables. A statistical significance level of $p < 0.05$ was adopted. The analysis revealed a moderate positive correlation between knowledge and preventive measures ($r_s = 0.57$, $p = 0.001$), indicating that higher levels of breast cancer knowledge were associated with more frequent and effective engagement in preventive practices, such as breast self-examination. The results were presented using both tabular formats to display quantitative findings and narrative descriptions to highlight key patterns and relationships, thereby ensuring clarity and facilitating interpretation for readers. This dual presentation approach also enhances the accessibility of the findings

for both academic and clinical audiences.

Ethical Consideration

This study was conducted in full compliance with the Regulations of the General Health Law on Research for Health (Secretaría de Salud, 1987), ensuring the protection of participants' dignity, rights, and overall well-being throughout the research process. In alignment with Articles 13 and 14, the study adhered to fundamental ethical principles, including confidentiality, non-maleficence, autonomy, and respect for personal data privacy. The research was classified as a low-risk investigation under Article 17, Section I, as it did not involve any physical, psychological, or social harm to participants. In accordance with Article 20, informed consent was obtained from all participants prior to data collection, ensuring that participation was entirely voluntary and based on a clear understanding of the study's purpose and procedures. No monetary or material incentives were provided to participants, as stipulated in Article 17, Section IV, to avoid any undue influence on participation. In line with Article 16, all personal data and information gathered were handled with strict confidentiality, employing measures to safeguard participants' privacy and prevent

unauthorized access. Furthermore, as required by Article 17, Section VI, participants were guaranteed access to clear explanations about the research and offered appropriate support should any concerns arise. These measures collectively ensured that the study was conducted with the highest ethical standards, promoting trust and integrity in the research process.

RESULTS

The final sample comprised 118 nursing students who met the inclusion criteria. Among them, 42% (n = 50) were aged between 21 and 23 years. The majority were female (82%, n = 97) and single (71%, n = 84). In terms of academic status, 31% (n = 37) were enrolled in the fourth semester. Regarding reproductive history, half of the female participants (50%, n = 59) reported menarche at age 12, and 13% (n = 15) had experienced one pregnancy. A family history of breast cancer was reported by 16% (n = 19), predominantly on the maternal side (11%, n = 13), while the remaining 84% (n = 99) reported no hereditary history of the disease (Table 1).

Knowledge about breast cancer

Analysis of participants' knowledge regarding breast cancer revealed that 78% reported knowing what breast cancer is, and 87% were aware of early detection methods, with mammography and breast self-examination being the most frequently mentioned. However, only 34% considered it advisable to undergo a clinical breast examination by a specialist, and just 37% reported performing breast self-examination regularly as a preventive measure. Regarding the optimal timing for self-examination, 58% of respondents answered correctly. A majority (85%) recognized signs and symptoms associated with breast cancer, such as skin changes or abnormal nipple discharge. In contrast, only 34% identified late menopause (after age 55) as a risk factor. Additionally, 73% acknowledged that having a first-degree family history increases the likelihood of developing the disease (Table 2).

Preventive Measures

A total of 90% of respondents reported knowing what breast self-examination (BSE) is, and 93% recognized its importance. However, only 35% were aware of the appropriate age to initiate this practice, and 46% knew the recommended

frequency for performing it. In terms of practice, 53% indicated having performed BSE within the past six months, yet only 33% reported doing so regularly. Among all participants, 71% demonstrated knowledge of the correct procedure, and 74% understood the proper technique for performing BSE. Despite this, 67% of those who did not engage in regular BSE cited lack of knowledge or absence of habit as the main reasons. When presented with the hypothetical scenario of discovering a lump, only 16% stated they would seek medical evaluation, indicating a substantial gap in appropriate responses to potential warning signs. Furthermore, 70% of participants were unaware of the optimal timing for conducting BSE.

To address the primary research objective, a non-parametric Spearman's rank-order correlation was applied, revealing a statistically significant moderate positive association between knowledge and preventive measures related to breast cancer ($r_s = 0.57$, $p = 0.001$) (Table 3).

DISCUSSION

The present study examined the sociodemographic characteristics, knowledge levels, and preventive practices related to breast cancer among nursing students in northern Mexico. The majority of participants were women aged 21–23 years, predominantly in the eighth semester of study, single, with menarche at age 12, and without a personal or family history of breast cancer. These demographic findings differ from those reported in a study conducted at the School of Health Sciences in Tegucigalpa, Honduras, which identified a younger mean age and a smaller sample size (Álvarez et al., 2024). Similarly, Ortiz Montalvo et al. (2024) found that most participants were in their first semester, highlighting variations in academic progression across contexts. These differences may reflect the diversity of nursing student populations in Latin America, influenced by regional demographics, educational structures, and recruitment patterns.

In terms of knowledge, most participants demonstrated a strong understanding of breast cancer and its prevention, aligning with findings from Chile (Yrigoin, 2022), where comparable academic training programs and widespread access to preventive health information may account for similarities. However, this contrasts

with results from Ecuador (Lazo Sosa, 2023), where lower knowledge levels were reported. Such discrepancies could stem from differences in curricular emphasis on oncology content, availability of health promotion initiatives, and sociocultural perceptions of breast cancer.

Preventive practices among participants were generally positive, consistent with the findings of Álvarez et al. (2024), suggesting that nursing students in this context are well-prepared to model and promote preventive behaviors. Nevertheless, these results differ from those of Becerril (2020) in Puebla, Mexico, where a high proportion of students lacked awareness and did not engage in breast self-examination. This divergence may be linked to differences in program curricula, exposure to clinical practice, or the presence of institutional health promotion campaigns.

A key finding of this study is the moderate positive correlation between knowledge and preventive measures, indicating that higher knowledge levels are associated with greater engagement in preventive behaviors. This relationship is consistent with evidence from Peru, Chile, and Iran (Yrigoin, 2022; Limbani, 2023; Asadi et al., 2018), reinforcing the concept that breast cancer education has a universal and cross-cultural impact on the adoption of preventive practices. The consistency of this association across diverse contexts underscores the importance of integrating comprehensive breast cancer education into nursing curricula, as well as reinforcing skill-based training in breast self-examination.

Overall, these findings suggest that targeted educational interventions can further strengthen the link between knowledge and practice, ensuring that nursing students are not only informed but also confident and consistent in applying preventive measures. Such efforts have the potential to enhance early detection rates, reduce disease burden, and ultimately improve patient outcomes

Strengths and Limitations

A notable strength of this study is its use of a probability-based sampling method, which enhances the representativeness of the findings for the target population. The inclusion of a validated questionnaire and the application of appropriate statistical methods further strengthen the reliability of the results. Additionally, the focus on nursing students—a key group for future health promotion—provides valuable insights for integrating

preventive oncology education into nursing curricula. However, several limitations should be acknowledged. The cross-sectional design precludes establishing causal relationships between knowledge and preventive behaviors. The internal consistency of the instrument, while acceptable for exploratory purposes, was modest (Cronbach's $\alpha = 0.632$), potentially limiting measurement precision. Data collection relied on self-reported responses, which may be subject to recall bias or social desirability bias. Furthermore, the study was conducted at a single institution, which may limit the generalizability of the findings to other nursing student populations in different regions or countries. Future research should consider multi-center studies with longitudinal designs and more robust measurement tools to confirm and expand upon these findings.

CONCLUSION

The findings of this study reveal a statistically significant correlation ($p < 0.05$) between nursing students' knowledge of breast cancer and their adherence to preventive practices, underscoring the pivotal role of health education as a cornerstone of primary prevention. These results emphasize the need to: (1) strengthen nursing curricula by incorporating evidence-based educational modules on breast cancer prevention, (2) design and implement interventions that combine theoretical knowledge with hands-on training in breast self-examination, and (3) focus on outreach to vulnerable populations who face barriers to accessing preventive health services. Moreover, the data highlight the value of adopting an ecological model of prevention that addresses not only individual knowledge and behaviors but also the broader determinants of health. These include social factors such as educational attainment and socioeconomic status, cultural influences such as beliefs and stigma, and structural components such as the availability of healthcare services and the implementation of supportive public health policies. By integrating these multi-level considerations, preventive strategies can be optimized to enhance early detection, reduce disparities, and ultimately improve breast cancer outcomes.

Declaration of Interest

The authors declare no conflict of interest.

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Data Availability

None

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