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more developed regions (74.1), less developed regions (31.3), Western Europe (96.0), Northern America (91.6), Northern Europe (89.4), Australia and New Zealand (85.8), South-Central Asia (28.2), and Eastern Asia (27.0) [5

novel one, because it is geographically targeted, providing an extensive assessment of BC screening practices and potential obstacles relevant only to the women living in this region. In doing so, this study provides valuable information on the sociocultural and geographical context of Arar City to inform the planning of targeted public health interventions. ese recommendations are expected to contribute to improving early detection, health outcomes, and decreasing BC mortality in the Northern Border Region of Saudi Arabia.

Aim of the study

To determine the awareness, knowledge, attitudes, barriers, and intentions toward breast self-examination (BSE) and mammography among females in the Northern Region of Saudi Arabia, Arar City.

Specific objectives:

1 To assess the awareness of breast self-examination and mammography among females.
2 To evaluate the knowledge of BSE and mammography among females.
3 To explore the attitudes and intentions of females toward BSE and mammography.

Rationale of the study

is study is the first to investigate the awareness, knowledge, attitudes, and barriers related to breast self-examination (BSE) and mammography in the Arar region. Its findings aim to provide evidence for decision-makers to implement targeted screening and educational programs to promote early detection of breast cancer. e results will serve as a foundation for further research in this area and will be disseminated through publication in national and international journals, as well as presentations at scientific conferences, to ensure broad reach and impact.

Materials and methods

is cross-sectional study was conducted over a one-year period from May 2023 to April 2024 in Arar City, Saudi Arabia, targeting the city's population.

Inclusion criteria

- Female Residents of Arar City: Participants were required to be birth-assigned females residing in Arar City, Saudi Arabia. is ensures the study focuses on the target population most relevant to the research objectives.
- Age 18 Years or Older: e study included individuals aged 18 and above, as this age aligns with the legal age of adulthood in Saudi Arabia. is criterion ensured participants have the capacity to provide informed consent independently.
- Informed Consent: Only those who explicitly agreed to participate by completing the consent process were included. e consent form clearly explained the purpose of the study, its voluntary nature, confidentiality assurances, and participants' rights to withdraw at any time.

Exclusion criteria

- Under 18 Years of Age: Females below the age of 18 t , knowl

bachelor's degree (73.0%), followed by high school education (16.6%), less than high school (6.0%), a master's degree (3.4%), and a PhD (1.0%).As for occupation, 40.8% were employed, 5.7% were healthcare workers, 4.2% were medical students, 12.5% were non-medical students, and 36.9% were non-employed. Approximately 21.6% of the participants reported a family history of breast cancer, and 7.3% had a previous breast problem.

Table 2 indicates that among the 385 participants, the majority (84.2%) had heard about breast self-examination (BSE), reflecting a high level of awareness within the community. Most participants (93.5%) cited early detection of breast cancer as the primary reason for practicing BSE, while 6.5% were motivated by a family history of breast cancer. Despite this high awareness, only 33.5% of participants reported actually performing BSE. e most common reasons for practicing BSE included routine medical examinations (39.5%), advice from health workers (25.6%), medical reasons (12.4%), noticing a breast lump (11.6%), and a family history of cancer (10.9%). Among those who did not perform BSE (66.5%), responses revealed that many found it inconvenient (5.5%), deemed it unnecessary (15.6%), were too busy (19.1%), felt it was too expensive (2.3%), or provided other unspecified reasons (57.4%).

Figure 1 illustrates the primary barriers hindering

Table 3 Knowledge about breast self-exam and mammography

		N (%)
What do you know about the purpose of breast self-exam?	All the above	231 (60.0%)
	Assessment done by doctors/nurses to check for lumps	10 (2.6%)
	BSE is to detect lumps in the breast	105 (27.3%)
	*BSE is using your fingers around your breasts to detect lumps**	39 (10.1%)
How often do you think breast self-exam should be performed?	Daily	6 (1.6%)
	I do not know	85 (22.1%)
	*Monthly**	132 (34.3%)
	Weekly	8 (2.1%)
	Yearly	154 (40.0%)
When do you think is the right time for a woman to perform a breast self-exam?	*After menstruation**	167 (43.4%)
	Any day during menstruation	18 (4.7%)
	Anytime	133 (34.5%)
	Before menstruation	39 (10.1%)
	Middle of menstruation (days 3–5)	28 (7.3%)
How confident are you that you would notice a change in your breasts?	Highly confident	22 (5.7%)
	I Don't Know	184 (47.8%)
	Moderately confident	76 (19.7%)
	Not confident	55 (14.3%)
	Slightly confident	48 (12.5%)
Do you agree that early detection of breast cancer increases the chance of recovery?	*Agree**	362 (94.0%)
	Disagree	4 (1.0%)
	Neutral	19 (4.9%)
Do agree that females more than 20 years old should practice breast self-exams frequently?	*Agree**	305 (79.2%)
	Disagree	11 (2.9%)
	Neutral	69 (17.9%)
Do you agree that females must be educated about breast self-exam?	*Agree**	365 (94.8%)
	Disagree	4 (1.0%)
	Neutral	16 (4.2%)
Have you ever had a screening mammogram?	No	310 (80.5%)
	Yes	75 (19.5%)
Do you know how important that is?	No	138 (35.8%)
	*Yes**	247 (64.2%)
Do you believe Mammography is safe?	No	131 (34.9%)
	*Yes**	244 (65.1%)
Do you believe it is painful?	No	253 (65.7%)
	Yes	132 (34.3%)
Do you believe it reduces su□ering and death from breast cancer?	No	63 (16.4%)

Do yo

N Frequency, % Percentage, * Correct Answer

monthly. ese highlights the need for educational measures to clarify such important details. In line the present findings, other studies have further revealed better awareness of BC among women, however the practices were suboptimal [34, 35]. Furthermore, the discrepancies between knowledge and practice of BC screening have been attributed to amount of information received by women regarding BC; suggesting the significance of right and correct information in enhancing BC screening practices [36, 37].

Interestingly, 80% of participants in this study demonstrated good knowledge regarding BSE and mammography, which exceeds the findings of Salih et al. [38], where only 35.6% demonstrated good knowledge, and Ibnawadh et al. [39], who reported that 52.1% of female university students had adequate knowledge. ese di erences may reflect the e ectiveness of region-specific educational e orts in Arar City. However, further research is needed to explore how women acquire this knowledge and to identify potential barriers preventing its application. Alqahtani et al. (2019) reported similarly high knowledge levels of BSE in women from the Asir region, with over 90% of the female population demonstrating satisfactory levels of knowledge about the practice [40].

e level of awareness presented in this study is commendably high but this study has also portrayed another vital notion about the nature of awareness. Campaigns entail dissemination of information regarding the practice of BSE and what it entails without much emphasis on why it should be practiced and how to practice it. e gap therefore can be managed by implementing behavioral psychology into awareness strategies since women fail to act due to cognitive biases like optimism bias; assuming one will not be a ected by breast cancer [41]. Additionally, this study identified that the respondents had low confidence in detecting breast changes, with only 5.7% being highly confident. is lack of confidence may arise from inadequate training or fear of misdiagnosis, which could prevent women from regular self-examinations.

ese findings point to the crucial role of healthcare providers in bridging this gap through hands-on demonstrations and workshops that enhance both technical understanding and personal confidence. ese findings align with previous studies which identified inadequate confidence and skills related to BSE among women [42, 43].

Barriers to BSE practice

e most reported barrier to practicing BSE was a lack of perceived necessity, with 51.9% of participants indicating they did not perform BSE because they had no breast problems. is finding aligns with Salih et al. [38],who highlighted low perceived risk as a critical deterrent for Saudi women. Many participants associate BSE with the presence of symptoms, such as lumps, rather than recognizing it as a preventive measure. is emphasizes the need for public health initiatives that focus on educating women about the importance of early detection, even in the absence of symptoms.

Moreover, 19.5% of participants reported not knowing how to perform BSE, indicating gaps in practical knowledge despite high levels of awareness. is highlights the need for skill-based workshops or accessible video tutorials to help women feel confident and competent in performing BSE. Addressing these barriers is essential for improving screening practices and empowering women to take proactive steps toward their breast health. Shrestha et al. (2017) examined the knowledge of BSE among female health personnel, reporting that 72.5% had an average level of knowledge, while only 5.6% exhibited good knowledge of the practice [44].

is study's findings further highlight the need for culturally adaptive interventions based on identified barriers. For instance, in Saudi Arabia, societal norms may not allow for open discussions regarding breast health, particularly in conservative communities [45]. Health promotion e orts could counteract this by integrating breast cancer education into broader women's health initiatives, therefore reducing the stigma around the topic and allowing for open discussion. Further, the cited "lack of necessity" reveals an overreliance on symptom-based healthcare seeking. is may be due to limited exposure to preventive health education during the school years.

erefore, a life-course approach could begin with health education in schools and set an enduring pattern of e ective preventive behaviors. Gaining support from relevant role models in the community like social media personalities or renowned religious leaders could also be a way of enhancing support for BSE practices in the community [46, 47].

Demographic variations

Consistent with findings by Al-Mulhim et al. [48] and Pilehvarzadeh et al. [49], this study found that higher education levels and prior knowledge of BSE were significantly associated with better knowledge scores. Participants with advanced degrees, such as PhDs, had the highest knowledge scores, emphasizing the importance of formal education in improving health literacy. However, unlike studies by Kharaba et al. [33] and Salih et al. [38], this study did not identify significant associations between age or occupation and BSE knowledge. is difference could be due to regional or cultural di erences, as well as variations in sample demographics. Future studies should explore these factors in more depth to

better understand the determinants of BSE knowledge and practice.

Although education was strongly associated with knowledge scores, this study o ers a unique opportunity to examine intergenerational influences on health literacy. Participants who are older have fewer formal educational opportunities but may still influence younger women through familial or community roles. e education e orts could be amplified by intergenerational health campaigns that encourage older women to men-

from including broader, more diverse populations, utilizing a mixed-methods approach, and collecting detailed familial health history data.

Conclusion

is study found that while most participants were aware of breast self-examination (BSE) and demonstrated good knowledge, many did not practice BSE regularly due to barriers such as lack of time and confidence. Limited awareness of mammography was also observed, highlighting the need for targeted educational campaigns

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