

Received: 2024.12.10

Accepted: 2025.01.30

Available online: 2025.02.19

Published: 2025.04.02

# Factors Influencing Breast Cancer Knowledge and Attitudes of Women in Abbottabad, Pakistan

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Data Collection B  
Statistical Analysis C  
Data Interpretation D  
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Project (RSPD2024R856), King Saud University, Riyadh, Saudi Arabia

## Conflict of interest:

None declared

## Background:

Breast cancer (BC) is a significant health issue in Pakistan, leading to higher mortality rates compared to other countries. Therefore, this questionnaire-based study aimed to assess knowledge, awareness, and beliefs about BC in 300 women in Abbottabad, Pakistan, between January and April 2019.

## Material/Methods:

A cross-sectional study was conducted among healthy adult female residents of Abbottabad between January and April 2019 using structured, pre-validated questionnaires. Data collection was conducted through face-to-face interviews. The questionnaire was divided into 3 sections with 17 items, including demographic information, knowledge about BC, and beliefs about BC. Data were analyzed using the SPSS version 25. A total of 300 women responded to the study invitation.

## Results:

Of 300 respondents, 87.3% (n=262) were aware of BC. Among them, only 37 (14.1%) had good knowledge, 90 (34.4%) had average knowledge, and 135 (51.5%) had poor knowledge about BC. The majority of respondents exhibited positive beliefs (74%). Knowledge was significantly higher among single ( $6.77 \pm 2.87$ ) and widowed ( $6.00 \pm 3.65$ ) women compared to married women ( $p=0.001$ ). Similarly, knowledge and beliefs about BC were higher among women with higher education ( $6.79 \pm 2.93$ ;  $p=0.001$ ;  $6.76 \pm 2.12$ ;  $p=0.025$ ) compared to those with lower education. Women living in urban areas had greater knowledge ( $5.89 \pm 2.75$ ) than those in rural areas ( $4.58 \pm 2.78$ ), suggesting a significant difference. A weak positive correlation between knowledge and beliefs ( $r=0.336$ ,  $p=0.001$ ) was identified.

## Conclusions:


Study participants had low knowledge about BC but generally positive beliefs, highlighting the need for targeted education and awareness programs to improve knowledge about BC among women in Abbottabad.

## Keywords:

**Breast Cyst • Cancer Care Facilities • Diagnosis • Knowledge**

## Full-text PDF:

<https://www.medscimonit.com/abstract/index/idArt/947608>

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## Introduction

Cancer is the pathological condition in which abnormal cell growth occurs, leading to uncontrolled division of cells within the body [1,2]. These cancerous cells can form a mass or lump called a tumor [1,3]. Cancer can be benign, meaning the cancerous cells do not invade other parts of the body, which is also known as primary cancer [1]. These cells can also metastasize to another region of the body and grow there, known as secondary cancer [4]. The burden of non-communicable diseases is increasing worldwide, with cancer being one such disease [1]. Globally, cancer is considered one of the major causes of death in both developed and developing countries [4]. Breast cancer (BC) is among the most common types of cancer, with a high incidence rate worldwide [5]. According to 2020 statistics, over 2.3 million new cases and 685 000 deaths were reported, making it the most frequently diagnosed cancer worldwide [6]. It is projected that by 2030, the incidence of BC will reach 2.64 million, with related deaths totaling 1.7 million [7].

Cancer is becoming more prevalent in Pakistan, with 19 million new cancer cases reported in 2020 [3]. Among the different types of cancer, there is a growing burden of breast cancer (BC) in Pakistan, leading to high mortality rates related to BC [8,9]. In comparison to Western countries, the occurrence of BC is higher in Pakistan [8]. The frequency of BC in Pakistan is 24.1-34.6%, which is 2.5 times higher than in neighboring countries [8]. In India, the literature suggests that an estimated 28.2% of women will develop BC [10]. Additionally, according to GLOBOCAN, 14.3% of women in Afghanistan will develop BC [11]. In the United States of America (USA), estimates in 2019 suggested that there were more than 3.8 million women with a history of BC [12]. Furthermore, the literature reveals that approximately 13% of women (1 in 8) will be diagnosed with invasive BC in their lifetime [13]. This indicates that the occurrence of BC is higher in Pakistan than in other Asian countries [14,15]. The literature demonstrates that at least 1 in 9 Pakistani women will develop BC [14]. BC is the leading cause of death worldwide and is ranked as the second most prevalent type of cancer [16].

The incidence of BC among women is higher after menopause and is defined as the uncontrolled multiplication of cells in breast tissues [17,18]. Normal cells in the breast are differentiated, meaning they have a specific shape and appearance that indicates their function [19,20]. When these normal cells become cancerous, this differentiation is lost [18,20]. Based on this, BC can be graded as low-, intermediate-, or high-grade as the normal cells lose their identity [18,20]. BC can either be benign or can metastasize to other parts of the body. BC that originates in the tissues of the milk production glands is known as lobular cancer, while BC that arises in the inner side of the milk duct is known as ductal cancer [18,20].

BC significantly impacts physical and emotional health, daily routines, and treatment management. Physically, patients may experience weight gain, metabolic syndrome, reproductive problems, and reduced physical activity [21-23]. Emotionally, patients face anxiety, depression, and loss of control and empowerment [24,25]. Lifestyle changes, including exercise, a balanced diet, smoking cessation, and limited alcohol consumption, are crucial for better outcomes [23]. There are multiple risk factors associated with an increased rate of BC, with hormonal factors considered one of the most important [20]. Other risk factors include age, family history of BC, and genetic mutations, as well as reproductive and menstrual factors, lack of physical activity, and overweight or obesity after menopause are the most common risk factors. In addition, defects in DNA and breast genes, including BRCA1 and BRCA2, are also contributing risk factors for BC [20,26]. Understanding and preventing BC is crucial because, if left untreated, the tumors can spread throughout the body and become deadly [26].

Previous studies among females in Pakistan have shown limited BC knowledge and poor practices [9,27-31]. For instance, Ali et al surveyed 385 women in Karachi, Pakistan, and discovered that 68% lacked knowledge about BC [27]. Another study of 1184 Pakistani women also revealed a lack of knowledge and practice regarding BC screening and self-examination [32]. Similarly, another study in Pakistan revealed that the most common primary tumor was BC, followed by head and neck cancer [9], and the study participants had limited BC knowledge [9]. However, earlier studies have shown positive beliefs about BC [27]. For example, women in Pakistan expressed their intention to see a doctor immediately if they ever felt a breast lump [31]. Similarly, the literature from developed countries like Saudi Arabia indicates a lack of knowledge and awareness of BC [33]. The neighboring country of Pakistan also demonstrated inadequate knowledge and awareness of BC [34]. A previous study found that the baseline knowledge about BC among females was insufficient, but it significantly improved, from about 40% to over 90% following an educational intervention [30].

The most important symptom of BC is the presence of a mass in the breast region that is felt as a separate lump compared to the breast tissue. Other signs include pain, swelling, and changes in the shape, appearance, and color of the nipples and breasts [18,20]. Various methods are used to diagnose BC, including physical examination and breast imaging tests [20]. Treatment and management of BC depend on various factors, including the grade of the cancer. BC can be treated with chemotherapy, radiation therapy, and/or breast surgery [5,14,20]. In developing countries with limited resources, the majority of women present with advanced stages of BC, resulting in late diagnosis and poor treatment outcomes. This late presentation may be due to a lack of awareness about the disease and

limited socioeconomic resources. Therefore, this questionnaire-based study aimed to assess knowledge, awareness, and beliefs about BC in 300 women in Abbottabad, Pakistan, between January and April 2019.

## Material and Methods

### Study Design, Setting, and Population

After receiving approval from the Institutional Review Board Committee at the Registrar's Secretariat Academic Unit (PS), Department of Pharmacy, COMSATS University Islamabad, Abbottabad Campus (Reference No. CUI-Reg/Notif-1712/19/2000), informed consent was obtained from all participants. Participants were informed about the purpose of the survey and assured that their information would remain confidential and be used solely for research purposes. The study's objectives and methodology were clearly explained to participants. A prospective, cross-sectional study was conducted to understand beliefs and associated factors of BC among women in Abbottabad. The study took place in Abbottabad, Khyber Pakhtunkhwa (KPK), Pakistan. Data were collected from women in Abbottabad between January 1, 2019, and April 30, 2019. All women aged 21 and older were included, while those with BC or any other major illness were excluded. Participants who were unwilling to participate or unfamiliar with the term "BC" were also excluded.

### Estimation of Sample Size

According to previous reports, the prevalence of BC among Pakistani women was 46.3% [8]. The sample size for the current study was calculated by using the following equation:

$$n = z^2 \times p \times q / d^2$$

Where n is the minimum sample size, z is the constant (1.96), p is the prevalence of BC was (0.463%), q is (1 - p), Z is the standard normal deviation of 1.96 corresponding to the 95% confidence interval, and d is the desired degree of accuracy.

$$n = (1.96)^2 \times 0.463(1-0.463) / (0.05)^2$$

$$n = 127$$

According to theoretical calculations, the required sample was 127, but to avoid missing responses and to further add strength to the study, we invited 300 women to participate.

### Questionnaire Design and Data Collection

A semi-structured questionnaire containing both open- and closed-ended questions was developed and validated to assess

the understanding, beliefs, and associated factors regarding BC among women in Abbottabad. The questionnaire was divided into 3 sections with a total of 17 items [5,14,29,35]. The first section focused on the socio-demographic characteristics and consisted of 6 items: age, marital status, education, occupation, rural or urban residence, and their source of BC information. The second section assessed knowledge about BC with 6 items on a binary scale (Yes/No). The last section evaluated beliefs about BC and consisted of 5 items: Do you believe that you could ever get breast cancer? How would you feel if you were diagnosed with BC? Do you think breast self-examination is useful? Would you volunteer yourself for BC screening? Who would you prefer to first talk to about your diagnosis if positive?

To ensure cultural relevance and clarity, the questionnaire was translated into Urdu, the local language. The translated questionnaire was reviewed by a team of experts in the field (3 academic professors from the pharmacy department and a researcher) for feedback on content, flow, and suitability. Later, the questionnaires were subjected to a pilot study among 30 randomly selected respondents to test the questionnaire's reliability and validity. The reliability of the questionnaires was determined using Cronbach's alpha, which showed an overall reliability coefficient of 0.72. The Cronbach's alpha values for individual domains are presented in **Figure 1**.

In this study, we defined BC knowledge as being aware of the information and having understanding of BC [3,36]. Awareness is the quality or state of being conscious, [3,37], while belief is something that is accepted, considered to be true, or held as an opinion [37,38]. Data collection was carried out through face-to-face interviews with healthy female respondents from Abbottabad, Pakistan. Informed consent was obtained from all participants before data collection. A convenience sampling procedure was used, and data collection continued until the required sample size was achieved. Each respondent was given sufficient time to answer the interview questions. A knowledge score was prepared for each section of the questionnaires [3,39]. In the knowledge section, there were 6 questions and every 'yes' answer was assigned a score of 1 while a 'no' answer was assigned a score of 0. In the beliefs section, each answer that showed a positive belief was given a score of 1, and a score of 0 was given for a negative belief.

### Statistical Analysis

Data analysis was conducted using SPSS version 27. Descriptive statistics were utilized to summarize the study variables. Frequencies (n) and percentages (%) were calculated for categorical variables. Normality testing was performed using the Shapiro-Wilk test to assess the data distribution. The results indicated that the data were not normally distributed ( $p < 0.05$ ).

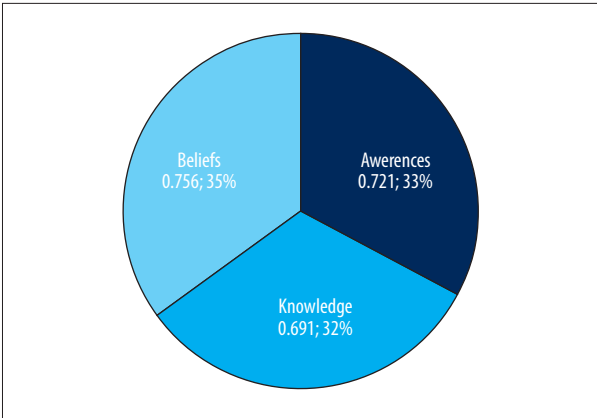


Figure 1. Reliability of the questionnaires.

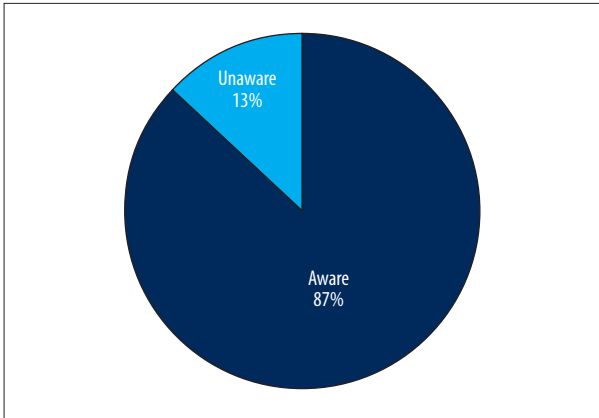


Figure 3. Awareness of BC among respondents.

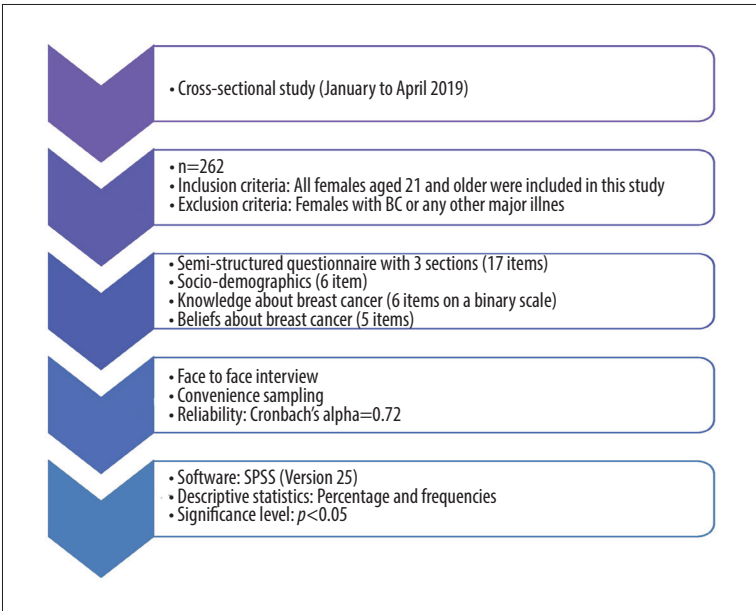


Figure 2. Flowchart summarizing steps taken in carrying out the research.

Due to the non-normal distribution, non-parametric tests were used for inferential statistics. The Mann-Whitney U test was employed to compare median differences between groups and assess the relationship between participant characteristics and study variables. Correlations between study variables were determined using Spearman's rho correlation test. The study design and steps are outlined in **Figure 2**.

## Results

### Participant Characteristics

A total of 300 respondents were enrolled in the study, of whom 38 (12.7%) showed a lack of awareness regarding the first question of the questionnaire. This led to the conclusion that 87.3% (n=262) of respondents from both urban and rural areas of Abbottabad, Pakistan were aware of BC (**Figure 3**).

Therefore, only the results of respondents who were aware of the BC (262 questionnaires) were included in the final study.

Out of the 262 respondents, 61 (23%) did not have any formal education. There were 148 (56.5%) respondents from urban areas and 114 (43.5%) from rural areas. The main source of birth control information among respondents was family and friends, accounting for 119 (45.4%). The mean age of the respondents was 34.13 years with a standard deviation of  $\pm 9.71$ . Detailed descriptions of the respondents' demographic characteristics from rural and urban areas of Abbottabad, Pakistan are presented in **Table 1**.

The respondents' overall knowledge about BC was poor. A majority of the population had poor knowledge (135, 51.5%), about one-third of the respondents had average knowledge (90, 34.4%), while the remaining participants had good knowledge regarding BC (37, 14.1%) (**Table 2**).

**Table 1.** Socio Demographics characteristics of the respondents (n=262).

| Characteristics         | Frequency (%) | Characteristics                 | Frequency (%) |
|-------------------------|---------------|---------------------------------|---------------|
| <b>Age (34.13±9.71)</b> |               | Intermediate                    | 30 (11.5)     |
| 21-30                   | 119 (45.4)    | Graduation or above             | 89 (34)       |
| 31-40                   | 82 (31.3)     | <b>Occupation</b>               |               |
| 41-50                   | 36 (13.7)     | Housewife                       | 170 (69.4)    |
| 51-60                   | 24 (9.2)      | Private employee                | 23 (8.8)      |
| ≥61                     | 1 (0.4)       | Government employee             | 5 (1.9)       |
| <b>Marital status</b>   |               | Others                          | 64 (24.4)     |
| Single                  | 81 (30.9)     | <b>Locality</b>                 |               |
| Married                 | 176 (67.2)    | Urban                           | 148 (56.5)    |
| Divorced                | 4 (1.5)       | Rural                           | 114 (43.5)    |
| Widowed                 | 1 (0.4)       | <b>Source of BC information</b> |               |
| <b>Education</b>        |               | Books/magazines                 | 34 (13.0)     |
| No formal education     | 61 (23.3)     | TV/radio/internet               | 98 (37.4)     |
| Primary/secondary       | 82 (31.3)     | Family/friends                  | 119 (45.4)    |
|                         |               | Others                          | 11 (4.2)      |

**Table 2.** Knowledge about BC among respondents (n=262).

| Breast cancer knowledge                             | Frequency (%)<br>Yes | Frequency (%)<br>No |
|---|----------------------|---------------------|
| Do you know the factors that lead to BC?            | 73 (27.9)            | 189 (72.1)          |
| Do you know the early signs and symptoms of BC?     | 144 (55.0)           | 118 (45.0)          |
| Do you know which age group is most affected by BC? | 88 (33.6)            | 174 (66.4)          |
| Do you know that BC is a hereditary disease?        | 43 (16.4)            | 219 (83.6)          |
| Do you know about the breast self-examination?      | 90 (34.4)            | 172 (65.6)          |

The study population had a mean beliefs score of 6.32. A total of 164 respondents (62.4%) had positive beliefs regarding BC, while the remaining 98 respondents (37.4%) had negative beliefs regarding BC (**Table 3**).

Knowledge of BC was significantly higher among single women ( $6.77 \pm 2.87$ ) and widowed women ( $6.00 \pm 3.65$ ) compared to married women ( $p=0.001$ ). Similarly, knowledge and beliefs about BC were higher among women with higher education ( $6.79 \pm 2.93$ ;  $p=0.001$ ) and ( $6.76 \pm 2.12$ ;  $p=0.025$ ) compared to those with lower education. Women with government employment ( $8.40 \pm 3.84$ ) had greater knowledge of BC compared to others ( $p=0.001$ ). Similarly, women living in urban areas had more knowledge ( $5.89 \pm 2.75$ ) than those in rural areas

( $4.58 \pm 2.78$ ), suggesting significant differences. In addition to education, marital status ( $p=0.001$ ), occupation ( $p=0.001$ ), locality ( $p=0.001$ ), and source of BC information ( $p=0.001$ ) were significantly associated with knowledge of BC, as shown in **Table 4**.

There was a significant weak positive correlation between knowledge and beliefs ( $r=0.336$ ,  $p=0.001$ ) (**Table 5**).

## Discussion

BC is the most common type of cancer in females worldwide [5,6,14,15,29,35]. Compared to other Asian countries, Pakistan has a high prevalence of BC. In Pakistan, females



Table 3. Beliefs about breast cancer among respondents (n=262).

| Beliefs items   | Frequency (%) |
|---|---------------|
| Do you believe that you could ever get BC?                              |               |
| Yes   | 85 (32.4)     |
| No  | 177 (67.6)    |
| How would you feel if you were diagnosed with BC?                       |               |
| Fear  | 193 (73.7)    |
| Anger   | 12 (4.6)      |
| Shame   | 11 (4.2)      |
| Disappointed  | 46 (17.6)     |
| Do you think breast self-examination is useful?                         |               |
| Yes   | 175 (66.8)    |
| No  | 34 (13.0)     |
| Not sure  | 53 (20.2)     |
| Will you volunteer yourself for BC screening?                           |               |
| Yes   | 135 (51.5)    |
| No  | 101 (38.5)    |
| Not sure  | 26 (9.9)      |
| Who would you prefer to first talk to about your diagnosis if positive? |               |
| Physician   | 69 (26.3)     |
| Spouse  | 104 (39.7)    |
| Parents/children  | 67 (25.6)     |
| No one  | 22 (8.4)      |

develop BC at a younger age but are often diagnosed at an advanced stage [14,35]. The survival rates of BC patients depend on the stage at which the cancer is diagnosed [20]. Early detection is possible if women are aware of the signs, symptoms, and underlying risk factors of BC [20]. The current study aimed to assess the knowledge and beliefs of women regarding BC. The average age of the participants was 34.13 years, with 67% of them being married. A majority (76.8%) of the participants were educated, with family and friends being the main source of information about BC. However, 87% of the participants were aware of BC, suggesting that awareness is good among respondents. These findings were similar to earlier studies published elsewhere [40,41]. For example, a previous study in Punjab, Pakistan found that 66.6% of females were educated and 83% were aware of BC [40]. Similarly, in another recent study of college students, it was revealed that 40% of the students were fully aware of BC, while 55.1% of them were partially aware of BC [41]. On the other hand, another study among Pakistani women concluded that on average, only 2 in 5 women are aware of 1 or more risk factors, symptoms, or diagnostic modalities of BC [15].

Awareness of breast self-examination was low in earlier studies [15,33,35], with findings showing that 45% of Pakistani women never noticed a change in their breasts [35]. Most women were unaware that BC development is age-related and has a lifetime risk [35]. Similarly, a study in Saudi Arabia found that awareness and practice of breast self-examination and screening methods were weak [33]. These results were consistent with the present findings, as women reported a lack of awareness of breast self-examination. Family and friends remained the primary source of information on BC for participants in both studies. Less than half of the participants in the current study were aware of the signs and symptoms of BC, highlighting the need for increased education and awareness efforts.

In this study, knowledge of BC among respondents was poor, with only 34.4% having average knowledge and 14.1% having good knowledge regarding BC. These findings were similar to earlier studies [35,41]. For example, Shoukat et al revealed that 63.2% of women lacked knowledge of breast carcinoma, 64.7% lacked knowledge of mammography, and 83.2% lacked knowledge of BRCA tests for early detection [35]. Similarly, another

**Table 4.** Association between knowledge and beliefs of BC and demographic characteristics of the respondents (n=262).

| Description                      | Frequency (%) | Knowledge (mean±SD) | p-value | Beliefs (mean±SD) | p-value |
|----------------------------------|---------------|---------------------|---------|-------------------|---------|
| <b>Age*</b>                      |               |                     |         |                   |         |
| 21-30                            | 119           | 5.71 (2.74)         | 0.114   | 6.40 (2.33)       | 0.887   |
| 31-40                            | 82            | 5.12 (2.98)         |         | 6.17 (2.43)       |         |
| 41-50                            | 36            | 4.50 (2.54)         |         | 6.17 (2.04)       |         |
| 51-60                            | 24            | 5.33 (3.15)         |         | 6.67 (1.83)       |         |
| 61 and above                     | 1             | 8.00                |         | 6.00              |         |
| <b>Marital status*</b>           |               |                     |         |                   |         |
| Single                           | 81            | 6.77 (2.87)         | 0.001   | 6.37 (2.14)       | 0.326   |
| Married                          | 176           | 4.66 (2.58)         |         | 6.36 (2.29)       |         |
| Divorced                         | 4             | 6.00 (3.65)         |         | 4.00 (3.65)       |         |
| Widowed                          | 1             | 6.00                |         | 4.00              |         |
| <b>Level of education*</b>       |               |                     |         |                   |         |
| No formal education              | 61            | 3.80 (2.33)         | 0.001   | 5.57 (2.45)       | 0.025   |
| Primary/secondary                | 82            | 4.78 (2.47)         |         | 6.54 (2.08)       |         |
| Intermediate                     | 30            | 5.67 (2.52)         |         | 5.93 (2.54)       |         |
| Graduation or above              | 89            | 6.79 (2.93)         |         | 6.76 (2.12)       |         |
| <b>Occupation*</b>               |               |                     |         |                   |         |
| Housewife                        | 170           | 4.55 (2.46)         | 0.001   | 6.21 (2.35)       | 0.298   |
| Private employee                 | 23            | 5.74 (2.91)         |         | 6.96 (2.24)       |         |
| Government employee              | 5             | 8.40 (3.84)         |         | 7.60 (1.67)       |         |
| Other                            | 64            | 7.03 (2.85)         |         | 6.28 (2.10)       |         |
| <b>Locality**</b>                |               |                     |         |                   |         |
| Urban                            | 148           | 5.89 (2.75)         | 0.001   | 6.55 (2.26)       | 0.061   |
| Rural                            | 114           | 4.58 (2.78)         |         | 6.02 (2.28)       |         |
| <b>Source of BC information*</b> |               |                     |         |                   |         |
| Books/magazines                  | 34            | 7.29 (2.90)         | 0.001   | 6.67 (2.51)       | 0.336   |
| TV/radio/internet                | 98            | 5.14 (2.66)         |         | 6.24 (2.15)       |         |
| Family/friends                   | 119           | 4.82 (2.69)         |         | 6.18 (2.34)       |         |
| Other                            | 11            | 6.55 (3.35)         |         | 7.09 (1.86)       |         |

\* Kruskal Wallis H Test; \*\* Mann Whitney U Test, p<0.05.

**Table 5.** Correlation between knowledge and attitude regarding BC.

| Variable          | Correlation coefficient | p-value |
|-------------------|-------------------------|---------|
| Knowledge-beliefs | 0.336*                  | 0.001   |

study concluded that 45% of female Pakistani students lacked knowledge of BC [41]. A systematic review of 18 studies also showed alarmingly low levels of knowledge of risk factors for BC (42.7%) and symptoms (41.8%). The prevalence of breast self-examination and ever having undergone a clinical breast exam (CBE) was 28.7% [15]. Contrary to these findings, a 2016 study in Ethiopia by Segni et al found that only 8.7% of participants had good knowledge about BC, while the rest had satisfactory to poor knowledge [16]. This difference may be attributed to the smaller study area in the previous research. In both studies, however, 60% of participants had positive beliefs towards BC [16].

A cross-sectional study conducted in developed countries also reported low knowledge and awareness of BC among participants [42]. According to their study, the overall knowledge of the participants regarding BC was poor, which agrees with our findings. The degree of knowledge was significantly associated with education and a family history of BC [42]. Fear of a BC diagnosis and concerns regarding test procedures were the most common barriers to seeking BC examination [43]. A previous study from Pakistan reported that females had good knowledge and beliefs regarding BC [41]. The study participants showed good knowledge of the signs and symptoms of BC, but poor knowledge of the risk factors. Their knowledge was assessed using a 3-point scale categorizing scores as “poor”, “average”, or “good”. The study population had a good knowledge score of 27%, higher than in the present study [41]. This difference may be attributed to the fact that participants in the previous study were females from educational institutes who were more knowledgeable about the disease. In 2006, Ahmed et al [44] conducted a study on knowledge of BC risk factors and found that only 35% of participants had poor knowledge of BC. In comparison, the current study showed that participants had a slightly higher knowledge level of risk factors, at 27.9% [44]. This difference may be attributed to the fact that the study participants in the previous research had a medical background, giving them more knowledge compared to the general population [41]. Previous studies have indicated positive beliefs among participants towards BC [16]. For instance, 60% of respondents showed a positive attitude toward breast self-examination, which is slightly lower than the 66.8% response rate in the present study. This difference could be due to variations in the education levels of the respondents. Gilani et al reported that the majority of participants (97.6%) had a positive attitude about discussing the diagnosis if positive, which is higher than the 91.6% in the current study [41]. This difference may be attributed to the availability of medical facilities and awareness programs in the study area, which influenced the participants' attitudes [41].

Although this study has several limitations, there are ways to improve its validity and reliability. Firstly, the data obtained from this study was limited to one region in Pakistan; therefore, the findings cannot be generalized to all Pakistani women. Future studies could consider increasing the sample size by conducting research in multiple regions and states to enhance the external validity of the research. Secondly, the nature of the study was cross-sectional, which limited the ability to establish a cause-and-effect relationship. Thirdly, this study relied on self-report measures, which may be susceptible to response bias. Participants may have provided socially desirable answers or misunderstood the questions, leading to inaccurate findings. Studies such as ours can serve as baseline studies for future research, providing evidence to support the design of targeted campaigns aimed at improving knowledge.

## Conclusions

Knowledge regarding BC was low among the study participants; however, the majority of respondents held positive beliefs about the disease. A weak positive linear correlation was found between knowledge and beliefs about BC. It is recommended that awareness campaigns need to be organized to reach a large number of women easily. Encouraging women to discuss self-examination methods with friends and families at home and motivating them to get regular mammograms can help prevent diseases and complications. This study is expected to help assess awareness levels and develop practical solutions to increase awareness, potentially leading to a decrease in the death rate, an improvement in quality of life, and higher survival rates due to early detection. There is a need for a platform where healthcare professionals and experts can educate women about risk factors, early symptoms, and other aspects related to BC.

## Acknowledgments

The authors of this study extend their appreciation to the Researchers' Supporting Project (RSPD2024R856), King Saud University, Riyadh, Saudi Arabia.

## Data Availability Statement

The datasets used and analyzed during the current study are available from the corresponding author upon reasonable request.

## Declaration of Figures' Authenticity

All figures submitted have been created by the authors, who confirm that the images are original with no duplication and have not been previously published in whole or in part.



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