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Breast Cancer Awareness in Different Socioeconomic Status, Ages and Impact of Education and Knowledge Gaps in Karachi, Pakistan

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Abstract

***Objective*:** This study aims to assess breast cancer awareness across different socioeconomic statuses, age groups, and regions while promoting awareness and educating the public about its signs, symptoms, and associated risk factors.

***Methodology*:** A cross-sectional study was conducted in Karachi, Pakistan, involving 602 participants from hospital outpatient departments, hospital employees, students, and the general public aged 18 and above. These people were not the patient of breast cancer. Data were collected using an online survey disseminated via Google Forms, and statistical analysis was performed using SPSS version 25.1. Ethical considerations included obtaining informed consent, ensuring participant anonymity, and maintaining data confidentiality.

***Results*:** Women comprised 83.4% of the study population. The primary risk factors identified physical inactivity (56.6%). obesity (46.3%), smoking (50.5%). obesity (46.3%). Common misconceptions included beliefs that wearing bras increases breast cancer risk (51.3%) and that surgery exacerbates the condition (78.6%). The most frequently recognized symptoms were breast puckering (68.6%), discomfort (58%), and lumps (46.5%). Notably, higher education levels, particularly postgraduate education, were significantly associated with greater awareness of risk factors ($p = 0.05$). However, age did not have a significant impact on symptom recognition.

***Conclusion*:** The study highlights prevalent misconceptions regarding breast cancer and varying levels of awareness based on education and socioeconomic status. Key risk factors include obesity, smoking, inactivity, and ovarian cancer, with higher education linked to improved awareness. These findings emphasize the need for targeted awareness campaigns to address knowledge gaps and promote early detection.

Keywords: Breast cancer, socioeconomic disparities, education, risk factors, public awareness.

1. INTRODUCTION

Breast cancer is the most prevalent form of cancer and the second leading cause of cancer-related deaths among women [1]. In 2020, approximately 2.3 million new cases of breast cancer were reported globally, accounting for 11.7% of all cancer incidences, making it the most commonly diagnosed cancer worldwide [2]. In Pakistan, the risk of developing breast cancer is increasing, with one in every nine women estimated to face a lifetime risk of diagnosis [3]. Women who use oral contraceptives have a slightly higher risk of developing breast cancer compared to those who have never used them [4].

Pakistan has the highest rate of breast cancer in Asia. Poor socioeconomic conditions, especially in rural areas, significantly contribute to the deteriorating health of women [5]. Major risk factors for breast cancer include advancing age, obesity or high body mass index (BMI), tobacco use, physical inactivity, a high-fat diet, early onset of menstruation (menarche), late age at first full-

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term pregnancy, shorter duration of breastfeeding, use of hormonal menopausal therapy or oral contraceptives, high breast density, and a family history of the disease [6].

Symptoms of early-stage breast cancer vary among individuals and may include breast pain or swelling, redness of the nipple or breast skin, nipple discharge, nipple erosion, and the presence of painless lumps [7]. Public awareness of breast cancer warning signs and screening protocols is essential for the successful implementation of screening programs, which play a crucial role in early detection and improving quality of life [8]. In Pakistan, delayed diagnosis is often attributed to a lack of public awareness and limited access to appropriate medical facilities [9]. Early detection of breast cancer can be improved through annual mammography, targeted screening of at-risk women, and public education campaigns [10]. Women with a family history of breast cancer are advised to begin mammography screening 10 years prior to the age at which their affected relative was diagnosed [11].

The aim of this study was to assess breast cancer knowledge and awareness across various socioeconomic groups, age brackets, and education levels in Karachi, Pakistan. The study population included female students, hospital outpatients, medical staff, and members of the general public aged 18 years and above.

2. METHODOLOGY

2.1. Study Design and Setting

This cross-sectional study was conducted in the Karachi region from January to June 2024 to assess knowledge, awareness, and perceptions related to breast cancer among the adult population.

2.2. Study Population and Sampling Technique

The study targeted adults aged 18 years and above residing in Karachi. A stratified random sampling technique was used to ensure proportional representation across gender and age groups. Stratification was based on gender, with two strata: male and female participants.

2.2.1. Sample Size Calculation

The sample size was calculated using Cochran's formula for population-based surveys:

$$n = \frac{Z^2 p(1-p)}{d^2}$$

Where:

- n = required sample size
- Z = standard normal variate at 95% confidence level (1.96)
- p = estimated prevalence of breast cancer awareness (assumed 50% or 0.5)
- d = margin of error (set at 4%)

$$n = \frac{(1.96)^2 \times 0.5 \times (1-0.5)}{(0.04)^2}$$

$$n = \frac{3.8416 \times 0.25}{0.0016}$$

$$n = 600.25$$

To account for non-responses or incomplete submissions, the final sample size was increased to 602 participants, comprising 422 females and 180 males to ensure adequate gender representation.

2.3. Inclusion and Exclusion Criteria

2.3.1. Inclusion Criteria

- Adults (≥18 years) residing in Karachi
- Individuals willing to provide informed consent

2.3.2. Exclusion Criteria

- Individuals with a prior diagnosis of breast cancer (to avoid bias)
- Healthcare professionals (to minimize professional bias)
- Individuals unwilling to participate

2.4. Ethical Considerations

The study was approved by the Sohail University Scientific Research Ethics Committee. Informed consent was obtained electronically before accessing the online survey, while written consent was collected for paper-based submissions. Participants were informed of their right to withdraw from the study at any point without consequence.

2.5. Data Collection Procedure

A self-administered structured questionnaire was used, distributed *via* a Google Forms link for online responses. The questionnaire contained 33 structured questions, categorized into seven sections:

1. Sociodemographic information
2. Sources of breast cancer information
3. Knowledge of breast cancer risk factors
4. Awareness and practice of breast self-examination (BSE)

5. Knowledge of signs and symptoms of breast cancer
6. Knowledge of breast cancer screening techniques
7. Perceptions regarding breast cancer treatment

2.6. Questionnaire Validation

A pilot study was conducted with 15 randomly selected participants from Karachi to ensure the validity and reliability of the questionnaire. Internal consistency was assessed, and no modifications were required. Pilot participants were excluded from the final analysis.

2.7. Data Analysis

Data were analyzed using SPSS version 25.1. Descriptive statistics (frequencies, means, and standard deviations) were used to summarize participant responses.

SPSS and GraphPad Prism Software were used for data analysis. Qualitative variables were reported as frequencies and percentages, and quantitative variables as means ± standard deviations (SD). Multivariate regression analysis was applied to examine associations between parental- newborn TL (T/S ratio) and various variables. A p-value <0.05 was considered statistically significant.

RESULTS

Among the 602 participants, the most commonly reported risk factor was being female, accounting for 83.4% (n = 502) of the sample. Physical inactivity was reported by 56.6% (n = 341), while 50.5% (n = 304) identified themselves as smokers. Obesity was observed in 46.3% (n = 279), and 39.2% (n = 236) were nulliparous. Exposure to chemicals was reported by 35.2% (n = 212), and alcohol consumption by 38.4% (n = 231). A history of miscarriage was noted in 37.7% (n = 227). The use of oral contraceptives was reported by 39.2% (n = 236). Additionally, 29.4% (n = 177) of the participants had a family history of breast cancer (Table **1**).

Participants also reported various myths associated with breast cancer. The most prevalent myth was the belief that surgery for other breast diseases can cause cancer (78.6%, n = 473), followed by misconceptions related to wearing bras (51.3%, n = 309), and the use of mammograms and herbal medicines (both 44.9%, n = 270). Additional myths included migraine (43.2%, n = 260), trauma (40.7%, n = 245), and perfume use (35.0%, n = 211) (Table **2a**).

The most frequently recognized signs and symptoms were breast puckering (68.6%, n = 413), itching around the breast (61.5%, n = 370), and breast tenderness (58.0%, n = 349). Rash (51.2%, n = 308) and breast lump (46.5%, n = 280) were also frequently identified. Nipple discharge and retracted/inverted nipples were noted in 44.0% (n = 265) and 40.5% (n = 244), respectively (Table **2b**).

Table 1: Risk factors for breast cancer among participants (n = 602).

Risk Factor	Frequency (n)	Percentage (%)
Female gender	502	83.4
Lack of exercise	341	56.6
Smoking	304	50.5
Obesity	279	46.3
Nulliparity	236	39.2
Oral contraceptive use	236	39.2
Alcohol use	231	38.4
Miscarriage	227	37.7
Exposure to chemicals	212	35.2
Family history of breast cancer	177	29.4

Table 2a: Myths regarding breast cancer (n = 602).

Myth	Frequency (n)	Percentage (%)
Surgery for other breast diseases	473	78.6
Wearing bras	309	51.3
Mammograms cause cancer	270	44.9
Herbal medicines prevent/cause breast cancer	270	44.9
Migraine as a cause	260	43.2
Breast trauma	245	40.7
Use of perfume	211	35

Table 2b: Signs and symptoms of breast cancer identified by participants (n = 602).

Sign/Symptom	Frequency (n)	Percentage (%)
Breast puckering	413	68.6
Itching around the breast	370	61.5
Breast tenderness	349	58
Rash	308	51.2
Breast lump	280	46.5
Nipple discharge	265	44
Breast pain	245	40.7
Inverted/retracted nipple	244	40.5
Thickening of breast skin	217	36

Participants were grouped into ≤25 and >25 years of age. The differences in mean scores for knowledge of risk factors, myths, and signs & symptoms between the two age groups were not statistically significant (Table **3a**).

Participants from the middle class had significantly higher awareness of signs and symptoms (Mean ± SD = 4.71 ± 1.75) compared to the upper middle class (4.25 ± 1.63), with the difference being statistically significant (p = 0.022).

Table 3a: Comparison of knowledge scores by age group.

Variable	≤ 25 Years (Mean ± SD)	> 25 Years (Mean ± SD)	p-value
Risk factors	4.69 ± 1.46	4.82 ± 1.52	0.493
Myths	3.55 ± 1.40	3.69 ± 1.34	0.161
Signs and symptoms	4.52 ± 1.71	—	0.276

Table 3b: Comparison of knowledge scores by educational level.

Comparison	Group 1 (Mean ± SD)	Group 2 (Mean ± SD)	p-value
Undergraduate vs Postgraduate	4.72 ± 1.52	5.19 ± 1.23	0.05
Graduate vs Postgraduate	4.66 ± 1.44	5.19 ± 1.23	0.045
Undergraduate vs Graduate	4.72 ± 1.52	4.66 ± 1.44	0.678

Participants with postgraduate qualifications had significantly higher scores on risk factor awareness compared to both graduates and undergraduates (Table **3b**).

3. DISCUSSION

The results of this study show that the study population had a broad range of breast cancer risk factors, myths, and symptoms. With 83.4% of the sample being female, female gender was the most common risk factor, which is consistent with breast cancer's biological characteristics as a disease that mostly affects women [12]. Lack of exercise (56.6%), obesity (46.3%), and smoking (50.5%) were reported by a sizable number of the sample. Numerous malignancies, including breast cancer, have been linked to these lifestyle variables [13].

Regarding reproductive health, 39.2% of individuals reported using oral contraceptives, and the same number were nulliparous. Since unbroken ovulatory cycles enhance lifetime exposure to estrogen, a hormone linked to the development of breast cancer, nulliparity is known to be a risk factor [14]. However, depending on the age and length of use, using oral contraceptives has been linked to both higher and lower risks [15]. Remarkably, 29.4% of people had a family history of breast cancer, which is a substantial risk factor because of hereditary mutations such BRCA1 and BRCA2, which raise the risk of ovarian and breast cancers [16]. This emphasizes how crucial early detection techniques and genetic counseling are for anyone with a family history of cancer.

There were many misconceptions about breast cancer in the public. Notably, 51.3% of respondents thought wearing bras could raise the chance of cancer, and 78.6% of respondents thought surgery for other breast disorders increased risk. Despite the lack of scientific evidence to support these assumptions, they underscore the need for improved public education to debunk myths surrounding the risk of breast cancer [17]. Further revealing gaps in information surrounding cancer screening and prevention, 44.9% of the population incorrectly believed that mammograms and herbal treatments increased cancer risk.

The most commonly reported symptom, affecting 68.6% of participants, was breast puckering. Itching (61.5%) and breast discomfort (58%) were other prevalent symptoms. These results are in line with the physical manifestations of breast cancer, which include nipple discharge, skin puckering, and lumps [18].

According to age, socioeconomic status, and educational attainment, the findings also revealed differences in awareness and misconceptions. Risk factors, misconceptions, and symptoms did not significantly differ between those under 25 and those over the reporting of signs and symptoms was similarly influenced by socioeconomic level, with middle-class people claiming greater awareness than their upper-middle-class counterparts. The importance of education and social variables in raising awareness of breast cancer is shown by this finding as well as the notable awareness gap by educational attainment, where postgraduates knew more than undergraduates [19].

All things considered, our results emphasize the significance of focused educational initiatives to address misconceptions and information gaps about the risk, symptoms, and prevention of breast cancer. In order to enhance early identification and outcomes, public health programs should place a high priority on raising awareness with lower mean scores for cancer awareness.

5. CONCLUSION

This study highlights the prevalence of misconceptions about breast cancer and the varying levels of awareness regarding its risk factors and symptoms among women. Common misunderstandings included the belief that wearing bras or undergoing surgery increases the risk of breast cancer, while the primary risk factors identified were obesity, smoking, and physical inactivity. Awareness of symptoms such as breast puckering, soreness, and lumps differed across demographic groups, socioeconomic status, and education level. Notably, individuals with postgraduate education demonstrated a higher awareness of risk factors, whereas age had no significant impact on misconceptions or symptom recognition.

A key strength of this cross-sectional study is its ability to provide a snapshot of breast cancer awareness across diverse population groups, allowing for the identification of disparities in knowledge and misconceptions. However, its limitations include the inability to establish causal relationships and potential self-reporting bias due to reliance on survey data.

Future research should focus on longitudinal studies to assess changes in awareness over time and evaluate the effectiveness of educational interventions. Additionally, targeted awareness campaigns should be developed, particularly for populations with lower education levels and limited access to healthcare resources, to improve knowledge, dispel myths, and promote early detection and prevention strategies.

ETHICAL APPROVAL AND CONSENT TO PARTICIPATE

The study was approved by the Sohail University Scientific Research Ethics Committee.

Consent was obtained electronically for online responses and in writing for paper-based submissions, with all participants informed of their right to withdraw at any time.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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AUTHOR CONTRIBUTIONS

AJ: Analysis and interpretation of data, conception and design.

SPK: Conception and design.

LI, NAS, MIK, S: Collection and assembly of data.

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