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Deciphering the Role of Demographic and Its Associated Factors at Different Strategies of Breast Cancer

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Abstract **Background:** Breast cancer is one of the leading causes of morbidity and mortality among women worldwide. **Objective:** To evaluate the role of demographic characteristics and associated factors across different clinical and risk profiles in patients with breast cancer. **Methods:** This cross-sectional analytical study was conducted at IMBB, the university of Lahore during September 2024 to September 2025. A total of 158 female patients diagnosed with breast cancer were included using non-probability consecutive sampling. Data were collected through structured questionnaires and medical record review, including demographic variables, reproductive history, lifestyle factors and clinical characteristics such as TNM staging and recurrence. **Results:** The mean age of participants was 54.01±16.65 years. Left-sided breast cancer was more common (56.3%). Most patients presented at Stage II (45.6%) and Stage III (33.5%), with recurrence observed in 34.2% of cases. Overweight and obesity were prevalent in 76.6% of patients. A majority belonged to the middle socioeconomic class (54.4%) and had low educational levels. Reproductive factors showed high parity, with 46.8% having three pregnancies, while miscarriage (92.4%) and abortion (74.7%) histories were notably high. Lifestyle factors revealed high rates of smoking (53.2%), low physical activity (61.4%) and frequent fast-food intake (70.3%). Contraceptive use was reported in 71.5% of patients and all participants had exposure to paraben-containing products. **Conclusion:** It is concluded that breast cancer is influenced by a multifactorial interplay of demographic, reproductive, lifestyle and environmental factors.

Key Words Breast Cancer, Demographic Factors, Lifestyle Factors, Reproductive History, TNM Stage, Recurrence, Risk Factors

INTRODUCTION

Breast cancer is one of the most common and life-threatening cancers affecting women worldwide [1]. According to the World Health Organization (WHO), breast cancer accounts for nearly 25% of all cancer cases in women, with more than 2 million new cases and over 600,000 deaths reported annually [2]. This stark statistic highlights the global burden of the disease, which not only impacts the health and well-being of women but also brings significant psychological, emotional and socioeconomic consequences [3]. Breast cancer is not only a major health issue but also a complex, multifactorial disease influenced by both genetic and environmental factors. Despite the advancements in screening, diagnosis and treatment over the years, breast cancer remains a significant health challenge, especially in regions with limited access to healthcare and early detection programs [4]. Breast cancer's oetiology is influenced by a combination of genetic, environmental and lifestyle factors. The role of genetics in breast cancer development has been well-documented, with mutations in genes like BRCA1 and BRCA2 being strongly associated with a higher lifetime risk of developing the disease. However, genetic factors alone do not fully explain the prevalence of breast cancer [5]. Environmental exposures, such as diet, lifestyle choices and exposure to certain chemicals and hormones, can also significantly increase the risk of breast cancer. Moreover, reproductive history has long been recognized as a key factor in breast cancer risk [6]. For example, women who have their first child later in life or who have fewer children are at a higher risk of developing the disease. Additionally, early menarche, late menopause and the use of oral contraceptives are all factors that can influence the likelihood of developing breast cancer [7].

Recent studies have also pointed to lifestyle factors, such as physical activity, dietary habits, alcohol consumption and smoking, as playing a significant role in both the onset and progression of breast cancer [8]. Women with a higher body mass index (BMI), particularly after menopause, are at increased risk of breast cancer, especially in oestrogen receptor-positive types of the disease. Furthermore, research has suggested that high-fat diets, excessive alcohol consumption and lack of physical activity may promote tumorigenesis, whereas a healthy diet, regular exercise and weight management may reduce the risk [9]. Understanding these modifiable risk factors is crucial for developing preventive strategies that could significantly decrease the incidence of breast cancer [10]. In addition to these well-established factors, emerging evidence has pointed to the potential role of environmental toxins and endocrine-disrupting chemicals, such as parabens, found in many personal care products and their association with breast cancer [11]. This research explores how prolonged exposure to chemicals, particularly in cosmetics, can influence the onset of breast cancer, raising concerns about the safety of common consumer products [12]. Other environmental factors, such as air pollution, pesticides and radiation exposure, have also been implicated in increasing breast cancer risk, though further investigation is needed to confirm these links [13]. The role of socioeconomic status (SES) is another important but often overlooked factor in breast cancer outcomes. Lower socioeconomic status has been linked to increased risk of breast cancer and worse prognosis, primarily due to delayed diagnosis, limited access to high-quality healthcare and poor health literacy [14]. Women from lower-income backgrounds may not have access to regular screening, early diagnosis or advanced treatment options, which can contribute to higher mortality rates [15]. Socioeconomic factors also impact reproductive health and lifestyle choices, with lower SES populations often facing greater barriers to maintaining a healthy lifestyle, such as access to nutritious food, safe environments for physical activity and healthcare services [16].

Objective

This study aims to explore the relationship between various demographic factors, clinical data and lifestyle factors in the development, progression and recurrence of breast cancer. It focuses specifically on how age, body mass index (BMI), socioeconomic status, education level, marital status, reproductive history and lifestyle habits (including diet, smoking and physical activity) influence the disease's onset and recurrence.

METHODS

This Cross-sectional study was conducted at IMBB, the university of Lahore during September 2024 to September 2025.

Inclusion Criteria

- Female patients diagnosed with breast cancer, confirmed by clinical examination, histopathological examination and imaging
- Age between 25 and 81 years
- Patients with no history of other malignancies or significant comorbidities that might interfere with the analysis
- Inclusion of both early-stage and advanced-stage breast cancer patients, including those with remission or recurrence
- Patients who are willing to participate in the study and provide written informed consent

Exclusion Criteria

- Male patients with breast cancer
- Patients with cognitive impairments or language barriers preventing understanding and participation
- Patients with severe comorbid conditions (e.g., cardiovascular diseases, uncontrolled diabetes or other cancers) that may confound results
- Patients unwilling to provide consent for participation or unable to follow the study procedures
- Patients with incomplete or missing clinical records relevant to the study (e.g., missing data on demographic or clinical factors)

Data Collection

Data for this study was collected through a combination of structured interviews and the review of medical records from the oncology department of a tertiary care hospital. A detailed questionnaire was administered to participants to gather demographic information, including age, marital status, socioeconomic status, education level and family history of cancer. Clinical data, such as the side of breast cancer (left or right), TNM stage, recurrence status and any previous organ involvement (e.g., uterus, cervix), were obtained from patient medical records. Information regarding reproductive history, such as age at menarche, age at marriage, number of pregnancies and any history of miscarriage or abortion, was also collected through interviews. Additionally, lifestyle factors, including smoking status, dietary habits, physical activity, contraceptive use and paraben product use, were gathered through self-report. Finally, health indicators like Body Mass Index (BMI), menstrual cycle regularity and sleeping patterns were measured and recorded. Data were meticulously collected to ensure a comprehensive overview of the various factors potentially influencing breast cancer outcomes.

Statistical Analysis

The data collected were analysed using statistical software (SPSS v23). Descriptive statistics, including frequency distributions and percentages, were calculated for categorical variables (e.g., marital status, recurrence status, TNM stage), while mean and standard deviation were used to describe continuous variables (e.g., age, BMI, weight and height). Chi-square tests were employed to determine associations between categorical variables, such as the relationship between socioeconomic status and disease stage

or recurrence. A significance level of $p < 0.05$ was considered statistically significant and confidence intervals were calculated to assess the precision of the results.

RESULTS

Data were collected from 158 patients, mean age of participants was 54.01±16.65 years, indicating a wide age distribution. The majority were married (94.9%), with only a small proportion unmarried (5.1%). Most participants belonged to the middle socioeconomic class (54.4%), followed by lower (38.6%) and upper class (7.0%). In terms of education, a considerable proportion had no formal education (30.4%), while smaller groups had primary (25.9%), matric (19.0%), graduate (20.9%) and master-level education (3.8%).

More than half of the participants were overweight (56.3%), while 20.3% were obese and only 23.4% had a healthy BMI. Smoking was reported in 53.2% of individuals. A majority followed a non-vegetarian diet (70.9%) and lacked regular physical activity (61.4%). Frequent fast-food intake was common (70.3%) and most participants were early risers (90.5%).

Most participants had regular menstrual cycles (78.5%), with nearly equal distribution between premenopausal (48.7%) and postmenopausal (51.3%) status. The mean age at menarche was 13.44±1.02 years and mean age at marriage was 17.64±5.19 years. The majority had three pregnancies (46.8%) and a high proportion reported a history of miscarriage (92.4%) and abortion (74.7%). Breastfeeding was common (84.2%). Disease involvement was more frequent on the left side (56.3%). Most cases were diagnosed at stage II (45.6%) and stage III (33.5%). Recurrence was observed in 34.2% of patients, while previous organ involvement was absent in 65.2%, with some involvement of breast (27.2%), uterus (7.0%) and cervix (0.6%).

A large proportion of participants reported contraceptive use (71.5%), though only 29.1% used oral contraceptive pills. All participants reported exposure to paraben-containing products (100%), with soap being the most common source (57.0%), followed by makeup (27.8%) and shampoo (11.4%).

Table 1: Demographic Characteristics of Study Participants (n = 158)

Variable	Category	Number (Percent)
Age (years)	Mean±SD	54.01±16.65
Marital Status	Married	150 (94.9)
	Unmarried	8 (5.1)
Socioeconomic Status	Lower	61 (38.6)
	Middle	86 (54.4)
	Upper	11 (7.0)
Education Level	None	48 (30.4)
	Primary	41 (25.9)
	Matric	30 (19.0)
	Graduate	33 (20.9)
	Masters	6 (3.8)

Table 2: Anthropometric and Lifestyle Characteristics (n = 158)

Variable	Category	Number (Percent)
BMI	Healthy weight	37 (23.4)
	Overweight	89 (56.3)
	Obese	32 (20.3)
Smoking Status	Yes	84 (53.2)
	No	74 (46.8)
Dietary Pattern	Non-vegetarian dominant	112 (70.9)
	Vegetarian dominant	46 (29.1)
Physical Activity	Yes	61 (38.6)
	No	97 (61.4)
Fast Food Intake	Frequent	111 (70.3)
	Occasional	45 (28.5)
	None	2 (1.3)
Sleeping Pattern	Early riser	143 (90.5)
	Late riser	15 (9.5)

Table 3: Reproductive and Hormonal Characteristics (n = 158)

Variable	Category	Number (Percent)
Menstrual Cycle	Regular	124 (78.5)
	Irregular	33 (20.9)
Menopausal Status	Premenopausal	77 (48.7)
	Postmenopausal	81 (51.3)
Age at Menarche (years)	Mean±SD	13.44±1.02
Age at Marriage (years)	Mean±SD	17.64±5.19
Number of Pregnancies	None	21 (13.3)
	1	37 (23.4)
	2	19 (12.0)
	3	74 (46.8)
	>3	7 (4.4)
History of Miscarriage	Yes	146 (92.4)
	No	12 (7.6)
History of Abortion	Yes	118 (74.7)
	No	40 (25.3)
Breastfeeding History	Yes	133 (84.2)
	No	25 (15.8)
Side of Disease	Left	89 (56.3)
	Right	69 (43.7)
TNM Stage	I	10 (6.3)
	II	72 (45.6)
	III	53 (33.5)
	IV	23 (14.6)
Recurrence	Yes	54 (34.2)
	No	104 (65.8)
Previous Organ Involvement	None	103 (65.2)
	Breast	43 (27.2)
	Uterus	11 (7.0)
	Cervix	1 (0.6)

DISCUSSION

This study aimed to evaluate the role of demographic characteristics and associated factors in shaping the clinical presentation and risk profile of breast cancer patients. The findings highlight a complex interaction between demographic, reproductive, lifestyle and clinical variables, reinforcing the multifactorial nature of breast cancer. In the present study, the majority of patients were middle-aged with a mean age of 54.01±16.65 years, which is consistent with previous research showing peak incidence of breast cancer in the fifth and sixth decades of life. However, the wide age range (25–81 years) reflects the shifting epidemiology of breast cancer toward younger populations, particularly in developing countries, as also observed in previous research. The predominance of married women (94.9%) and those belonging to the middle socioeconomic class (54.4%) suggests that social and cultural dynamics may influence healthcare-seeking behaviour and disease detection

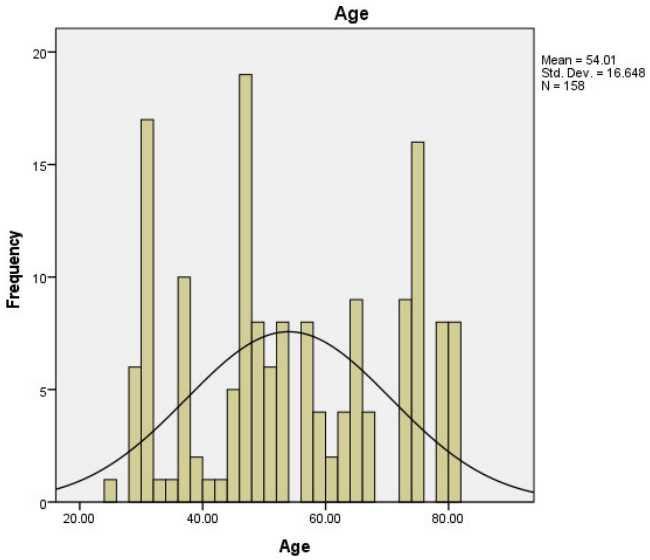

Figure 1: Age of the Respondents

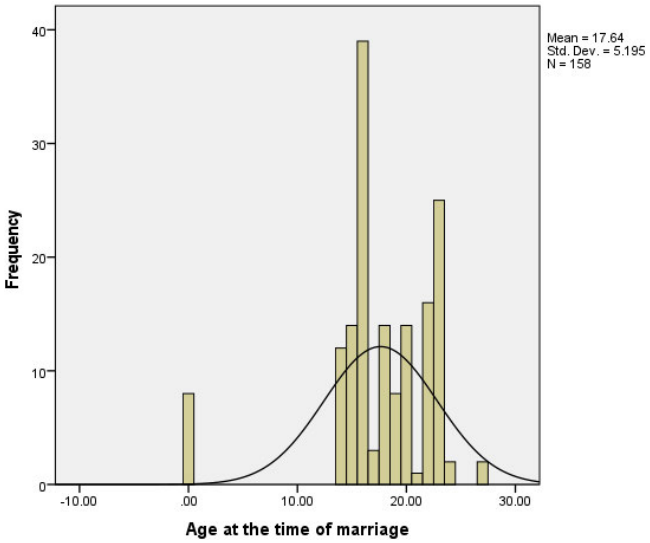

Figure 2: Age at the Time of Marriage

Table 4: Exposure and Risk-related Factors (n = 158)

Variable	Category	Number (Percent)
Contraceptive Use	Yes	113 (71.5)
	No	45 (28.5)
Oral Contraceptive Pills	Yes	46 (29.1)
	No	112 (70.9)
Paraben Product Use	Yes	158 (100)
Type of Paraben Products	Soap	90 (57.0)
	Makeup	44 (27.8)
	Shampoo	18 (11.4)

patterns. A notable finding was the high prevalence of overweight and obesity (76.6%), which is a well-established risk factor for breast cancer, particularly in postmenopausal women [17]. This aligns with previous research demonstrating a strong association between increased body mass index and breast cancer incidence and recurrence. Additionally, the low levels of physical activity (61.4% inactive) and high fast-food consumption (70.3%) observed in this cohort further emphasize the contribution of lifestyle-related risk factors. Previous research has similarly highlighted sedentary behaviour and unhealthy dietary patterns as significant contributors to carcinogenesis through hormonal imbalance and chronic inflammation [18].

Reproductive and hormonal factors also played a significant role in this study. The nearly equal distribution between premenopausal (48.7%) and postmenopausal (51.3%) women reflects the broad demographic involvement of breast cancer. High parity was observed, with 46.8% of patients having three pregnancies, which contrasts with some previous research suggesting a protective effect of multiparity. However, the extremely high prevalence of miscarriage (92.4%) and abortion (74.7%) in this study raises concerns and may indicate recall bias, reporting error or underlying reproductive health issues that warrant further investigation. Breastfeeding was reported in 84.2% of participants, which is generally considered protective, as supported by previous research, although its protective effect may be modified by other coexisting risk factors [19]. From a clinical perspective, the majority of patients presented at Stage II (45.6%) and Stage III (33.5%), indicating delayed diagnosis in a significant proportion of cases. This pattern is consistent with previous research from low- and middle-income settings, where limited screening programs, lack of awareness and healthcare access barriers contribute to late-stage presentation [20]. Recurrence was observed in 34.2% of patients, which is relatively high and may reflect aggressive disease biology, delayed treatment initiation or inadequate follow-up care, as also reported in previous research. Interestingly, left-sided breast cancer was more common (56.3%), a finding that has been variably reported in previous research, though its clinical significance remains unclear [21]. Previous organ involvement was noted in a subset of patients, particularly involving the breast (27.2%), which may indicate disease progression or secondary malignancies. The study also highlighted widespread exposure to potential environmental and hormonal risk factors. A large proportion of patients reported contraceptive use (71.5%), although only 29.1% used oral contraceptive pills [22]. Previous research has shown mixed evidence regarding the association between hormonal contraceptives and breast cancer risk, suggesting that duration and timing of use may be critical determinants. Additionally, universal exposure to paraben-containing products (100%) is noteworthy, given growing concerns about their potential endocrine-disrupting effects. While previous research suggests a possible link between parabens and breast carcinogenesis, definitive causal relationships remain inconclusive [23,24].

CONCLUSIONS

It is concluded that breast cancer is influenced by a multifactorial interplay of demographic, reproductive, lifestyle and environmental factors. A significant proportion of patients presented at advanced stages, reflecting gaps in early detection and awareness. The high prevalence of

modifiable risk factors, including overweight status, physical inactivity, unhealthy dietary habits and smoking, highlights their potential role in disease progression. Furthermore, reproductive characteristics and widespread exposure to environmental factors may contribute to the overall risk profile. These findings emphasize the need for improved screening programs, increased public awareness and targeted lifestyle interventions to reduce disease burden and improve outcomes in breast cancer patients.

Limitations

This study has several limitations that should be considered while interpreting the findings. First, the cross-sectional design limits the ability to establish causal relationships between demographic factors and breast cancer outcomes; only associations can be inferred. Second, the study was conducted at a single tertiary care centre, which may limit the generalizability of the results to the broader population. Additionally, data on lifestyle and reproductive factors were largely based on self-report, making them susceptible to recall bias and reporting inaccuracies. Certain variables, such as history of miscarriage and abortion, showed unusually high frequencies, which may reflect over-reporting or misclassification. The absence of longitudinal follow-up data also restricted the ability to assess survival outcomes and long-term disease progression. Furthermore, potential confounding factors such as genetic mutations (e.g., BRCA status), detailed treatment regimens and molecular subtypes of breast cancer were not included, which may influence disease behaviour and recurrence. Lastly, some variables lacked standardized measurement or validation tools, which may affect the precision of the findings.

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