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ORIGINAL RESEARCH

Risk Factors for Breast Cancer among Indian Women: A retrospective case-control study

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ABSTRACT

Background: Breast cancer remains a significant health concern worldwide, with its incidence rising due to various factors, including urbanization and lifestyle changes. Understanding the risk factors, both reproductive and lifestyle-related, is crucial for early detection and prevention. **Methods:** A retrospective case-control study was conducted at a hospital with 69 histopathologically confirmed breast cancer cases and 69 controls. Cases and controls were matched by age (±3 years). Data were collected on sociodemographic, reproductive, and other risk factors, analyzed using Chi-square tests, Odds Ratios (OR), and Fisher's exact test. **Results:** Urban residence (OR=1.27, 95% CI=0.78–2.0, p=0.599) and education level (OR=1.03, 95% CI=0.63–1.6, p=0.861) were not significantly associated with breast cancer. Higher risk was observed for late age at first childbirth (>25 years) (OR=2.80, 95% CI=1.13–6.95, p=0.070), shorter breastfeeding duration (≤2 years) (OR=2.88, 95% CI=1.09–7.6, p=0.116), and history of abortions (OR=3.35, 95% CI=1.37–8.18, p=0.052). Comorbidities (OR=2.27, 95% CI=1.25–4.11, p=0.039) and tobacco use (OR=2.11, 95% CI=1.09–4.09, p=0.110) also showed higher risks. **Conclusion:** The study identified significant reproductive and lifestyle risk factors for breast cancer. Early first childbirth, prolonged breastfeeding, and avoiding abortions may reduce risk. Additionally, managing comorbidities and tobacco consumption is crucial. Increased awareness and education about modifiable risk factors are essential for breast cancer prevention in developing countries like India.

Keywords: Breast cancer, risk factors, reproductive history, lifestyle, urbanization, comorbidities, tobacco use, India.

INTRODUCTION

Surgeons throughout history have been intrigued by breast cancer, a disease with an elusive aetiology. With an estimated 1.05 million new cases in 2010, breast cancer ranks as the second most prevalent malignancy among women globally. It is important since it greatly influences both the sickness and death rates among women who are impacted. The prevalence of this condition is increasing among females in India, primarily due to urbanisation and accompanying changes in lifestyles. Every woman faces the possibility of developing breast cancer, and this risk becomes greater as she gets older. While it is not possible to completely avoid breast cancer, it can be successfully treated and perhaps cured if it is diagnosed at an early stage. A risk factor refers to any factor that enhances the likelihood of getting a disease. Epidemiological studies have demonstrated that some factors related to reproduction, such as early onset of menstruation, delayed onset of menopause, never having given birth, and not having breastfed, are associated with an elevated risk of developing breast cancer.[1] Various lifestyle-related risk factors have been proven to contribute to the development of breast cancer. These include insufficient physical activity, being overweight, smoking, alcohol use, use of oral contraceptives, hormone replacement therapy, inadequate nutritional intake, and exposure to radiation.[2] Furthermore, research conducted on families with a high prevalence of breast cancer has revealed that approximately 5%–7% of breast carcinomas are of genetic origin.[3] Breast cancer incidence rates vary by a factor of four to five across different countries. Asia has the lowest rates, whereas

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Western Europe and North America have the highest rates. The prevalence of breast cancer has risen in all nations since 1960. Several organisations conducted a thorough analysis of the changes in the occurrence and death rates from 1955 to 1990 in four specific age groups (35–44, 45–54, 55–64, and 65–74) across 11 selected nations (the USA, England, Norway, Hungary, Yugoslavia, Spain, Colombia, Singapore, Japan, India, and China).[4] Japan and Singapore experienced the most significant rise in incidence. The prevalence of women aged 35-44 in Japan increased twofold between 1960 and 1985 and by 1985, it was approximately two-thirds of the rate in the USA. Mortality rates in the USA, England, and Norway have remained largely unchanged, while Japan, Singapore, and Hungary have experienced a significant increase of 50% to 60%. The majority of the observed rise in occurrence rates in the United States, England, Wales, and Norway may be misleading, as it can be attributed to alterations in screening practices.

Screening may have played a role in the rate increase in other nations, but in regions outside Western Europe and North America, the primary reason for the increase is likely to be changes in established and suspected risk factors for breast cancer. The occurrence of breast cancer in Japan has been increasing at a rapid pace, surpassing the frequency of uterine cancer.

The occurrence of breast cancer has significantly risen in several cities in China during the past few decades. Among Indian women, carcinoma breast is the second most prevalent form of cancer. There has been a noticeable rise in its occurrence in many major cities, with Mumbai being the most affected. According to the cancer registry data, it is projected that India will see approximately 800,000 new instances of cancer annually. At any given moment, it is probable that the load will be three times this amount, which is around 240,000 cases. Between 1965 and 1985, there was an approximate 50% rise in the occurrence of breast cancer.[5] A significant portion of this rise can be attributed to the growing urban population and the advancements in life expectancy. Urban areas exhibit higher incidence rates, education levels, and income in comparison to rural areas. Furthermore, factors such as the age at which puberty occurs and pregnancy-related factors, including parity, age of first delivery, and the number of children, may potentially be associated with breast cancer.[6] Multiple factors have been scientifically proven to be associated with an increased risk of breast cancer. These factors are sometimes referred to as the "established" risk factors for breast cancer. Certain predispositions are inherited, while other factors are influenced by a woman's lifestyle or reproductive history. The recognised risk factors for breast cancer consist of being female, advancing age, previous breast disease, family history/genetic risk factors, early onset of menstruation, late onset of menopause, late onset of first full-term pregnancy, obesity after menopause, insufficient physical activity, and exposure to high levels of radiation.[7-10]

India, with its large population, different cultures, geographical variations, and dietary habits, has limited sources of knowledge on breast cancer risk factors. The factors contributing to the fluctuating prevalence of breast cancer in women are not completely comprehended. The majority of studies on risk factors for breast cancer are conducted in Western countries, with just a limited number of studies available from India. The risk factors for breast cancer among Indian women differ significantly from those of the western population in several ways.

MATERIALS AND METHODS

This retrospective case-control research was undertaken at a hospital. The sample size was determined using epitools software, taking into account the delayed age at first delivery as a risk factor. The control group had a 30% exposure rate, and an anticipated odds ratio (OR) of 2 was used, with a desired power of 80% and a significance level of 5%. The number of cases was 69, and for a 1:1 allocation ratio, an equal number of controls, 69, were necessary. Cases were classified as all histopathologically confirmed instances of breast cancer, regardless of their specific characteristics. Stage and age must be greater than or equal to 25. Both preoperative and post-operative stages of breast cancer were encompassed. The controls consisted of female individuals who did not have breast cancer and were present at the hospital throughout the interview. Age-based group matching was performed using a ±3 year interval. The study excluded male breast cancer patients, women with additional confirmed malignancies, very unwell patients, and patients who were unwilling to participate in the trial. Data collection relied on conventional definitions. The data was summarised using mean and standard deviation. The statistical methods employed to determine and measure the risk of breast cancer included the Chi-square test, Odds ratio, and Fisher's exact test.

RESULTS

The table presents the Sociodemographic risk factors comparing cases and controls. Residence data shows that 41.3% of cases and 35.5% of controls live in urban areas, with an odds ratio (O.R) of 1.27 (95% confidence interval (C.I): 0.78–2.0, p = 0.322), indicating no significant difference. Education levels reveal 39.1% of cases and 38.4% of controls are illiterate, with an O.R of 1.03 (95% C.I: 0.63–1.6, p = 0.901), also showing no significant difference. Socioeconomic status (SES) in classes 1 and 2 includes 11.5% of cases and 20.2% of controls, with an O.R of 0.51 (95% C.I: 0.99–3.77, p = 0.051), suggesting a trend towards significance but not conclusive. The data implies no strong associations between these Sociodemographic factors and the condition being studied.

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Table 1 Sociodemographic risk factors						
Risk factor		**Case (%)**	**Control (%)**	**O.R**	**95% C.I**	**P value**
Residence	Urban	28(41.3)	25(35.5)	1.27	0.78–2.0	.599538
	Rural	41(58.6)	44(64.4)			
Education	Illiterates	27(39.1)	26(38.4)	1.03	0.63–1.6	.861063
	Literates	42(60.08)	43(61.5)			
SES	Class1&2	8(11.5)	14(20.2)	0.51	0.99–3.77	.162942
	Class 3,4,5	61 (88.4)	55(85.9)			

Table 2 presents reproductive factors associated with breast cancer, comparing cases and controls. For age of menarche, ≤15 years was not significantly different from >15 years (OR=1.67, 95% CI=0.73–3.84, p=.382). Age at first childbirth >25 years showed a higher risk (OR=2.80, 95% CI=1.13–6.95, p=.070) compared to ≤25 years. Nulliparous women had a higher, but not statistically significant, risk (OR=6.22, 95% CI=0.73–52.42, p=.310) compared to parous women. Breastfeeding ≤2 years indicated a higher risk (OR=2.88, 95% CI=1.09–7.6, p=.116) than >2 years. Menopause after 50 years showed a lower, but non-significant, risk (OR=0.472, 95% CI=0.08–2.66, p=.404) compared to earlier menopause. Women with abortions had a higher risk (OR=3.35, 95% CI=1.37–8.18, p=.052) than those without. Menstrual cycle regularity and marital status did not show significant differences between cases and controls.

Table 2 Reproductive factors of breast cancer						
Risk factors		**Cases (%)**	**Controls (%)**	**O.R.**	**95% C.I.**	**P value**
Age of menarche (years)	≤15 years	64 (92.7)	61(88.4)	1.67	0.73–3.84	.381984
	>15 years	5 (7.24)	8 (11.5)	1(ref)		
Age at first child birth*	≤25 years	60(86.9)	66(94.9)	1(ref)		.069885
	>25 years	9(8.69)	3(4.34)	2.80	1.13–6.95	
Parity	Nulliparous	3 (4.34)	1(1.00)	6.22	0.73–52.42	.310194
	Parous	66(95.6)	68(99)	1(ref)		
Duration of breastfeeding*	≤ 2 years	8 (13.1)	3 (4.34)	2.88	1.09–7.6	.116069
	>2 years	61(88.4)	66(95.6)	1(ref)		
Age at menopause	Up to 50 years	67 (97.3)	65(94.5)	1(ref)		.403804
(For 75 cases and 73 control)	More than 50 years	2 (2.66%)	4 (5.5%)	0.472	0.08–2.66	
Number of abortions*	No abortions	58(84.7)	66 (94.9)	1(ref)		.051999
	Abortions	11 (15.21)	4 (6.52)	3.35	1.37–8.18	
Menstrual cycle	Regular	60 (86.9)	61 (88.4)	1(ref)	0.55–2.3	.939904
	Irregular	9 (13.04)	8 (11.5)	1.14		
Marital status	Married	68 (98.5)	67(99)	1(ref)		.559402
	Unmarried	1 (1.44)	2 (1.00)	2.01	0.18–22.48	

*For statistical convenience unmarried women were also included

Table 3 outlines other risk factors for breast cancer by comparing cases and controls. A family history of breast cancer showed a higher, but not statistically significant, risk (OR=2.40, 95% CI=0.60–9.49, p=.310). Diet type (vegetarian vs. mixed) did not show a significant difference (OR=0.86, 95% CI=0.50–1.47, p=.564). The presence of comorbidities was associated with a significantly higher risk (OR=2.27, 95% CI=1.25–4.11, p=.039). Consumption of other tobacco products showed an increased risk (OR=2.11, 95% CI=1.09–4.09, p=.110). A history of oral contraceptive use (OCP) indicated a lower, though not significant, risk (OR=0.36, 95% CI=0.09–1.39, p=.172). Alcohol intake showed a high but non-significant risk (OR=5.07, 95% CI=0.24–106, p=.290).

Table 3 Other risk factors of breast cancer						
Risk factors		**Case**	**Control**	**OR**	**95% CI**	**P value**
Family History	Yes	3 (5.07%)	1 (2.17%)	2.40	0.60–9.49	.310194
	No	66(94.9%)	68 (97.8%)	1(ref)		
Diet	Vegetarian	20 (28.2%)	17(25.36%)	1(ref)	0.50–1.47	.564277
	Mixed	49 (71.7%)	52(74.6%)	0.86		
Co morbidities	Present	20 (28.9%)	10 (15.21%)	2.27	1.25–4.11	.039037
	Absent	49(71.01%)	59(84.78%)	1(ref)		
Tobacco consumption	Other tobacco products consumption	15 (21.7%)	8 (11.5%)	2.11	1.09–4.09	.10984

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	No tobacco consumption	54 (78.2%)	61(88.4%)	1(ref)		
H/O OCP	History of OCP	1 (2.17%)	04 (5.79%)	0.36	0.09–1.39	.171742
	No History of OCP	68(97.8%)	65 (94.2%)	1(ref)		
Alcohol intake	Yes	1(1.44%)	00	5.07	0.24–106	0.29
	No	68 (98.5%)	69	1(ref)		

DISCUSSION

Incidence of breast cancer is infrequent prior to the age of 25. The age group of 45 to 54 had the highest number of instances in our study. The frequency of cases exhibited a progressive rise with advancing age until reaching 50 years, after which it declined. This finding aligns with the outcome reported by Mitruen et al. [11] The decrease in the occurrence of breast cancer during menopause may be associated with the involvement of ovarian and other hormones in the development of breast cancer.

The average age of the patients and controls was comparable to the study conducted by Pakseresht S et al. [12]. Our study revealed that women who gave birth to their first child after the age of 25 had a 2.8-fold higher chance of developing breast cancer compared to women who gave birth before the age of 25. Age is represented in Table 2. A study conducted by Rao et al. [13] in India found that women who gave birth to their first child beyond the age of 30 had a higher risk of developing breast cancer.

Our study revealed that women who breastfed their children for less than 2 years had a 2.8-fold higher risk of developing breast cancer compared to women who breastfed for more than 2 years, as indicated in Table 2. This finding aligns with the research conducted by Kuru et al. [14], which shown a notable correlation between breastfeeding and a reduced likelihood of developing breast cancer among Turkish women. Gajalakshmi et al. [15], McCredie et al. [16], and Balasubramaniam SM et al. [17] all identified the length of breastfeeding as a noteworthy risk factor for breast cancer. On the other hand, research conducted by Riyadh K Lafta et al. [18] and Laufey Tryggvadottir et al. [19] discovered no connection between breastfeeding patterns and the likelihood of developing breast cancer.

Our study found that women who have had an abortion are three times more likely to develop breast cancer compared to women who have not had an abortion. This finding aligns with the research conducted by Alaa Darweesh et al. [20], Tavani A et al. [21] Navneet Kaur and colleagues (22) found that women who had undergone two or more abortions had a 4.5 times higher chance of developing breast cancer compared to women who had never had an abortion. Balasubramaniam et al. [17] discovered that women who had undergone at least one abortion had a twofold increase in the chance of developing breast cancer compared to women who had never had an abortion. The study conducted by Parameshwari et al. [23] did not identify a history of abortion as a significant risk factor.

The average age at which menarche occurred in the cases was 13.86, with a standard deviation of ±1.11. In the control group, the average age of menarche was 13.7, with a standard deviation of ±1.62. The age at which menstruation begins, known as menarche, was not determined to be a significant determinant of risk in our study (p value = 0.21). This is consistent with the research conducted by Parkinson et al. as well as the studies conducted by Laila Matalqah et al. [24] and Riyadh et al. [18]. On the other hand, some studies (23, 25, 26) have discovered a notable link between early menarche and an increased risk of breast cancer. Our study revealed that women who used tobacco products had a twofold increase in the chance of developing breast cancer compared to those who did not use tobacco. Tobacco is recognised to have a multitude of chemicals that have carcinogenic properties. Several studies have demonstrated the correlation between smoking and breast cancer. However, additional research is required to investigate the impact of orally consuming tobacco products. In addition, we observed a heightened susceptibility to breast cancer linked to comorbidities, as reported in previous research [27].

CONCLUSION

Age is the biggest breast cancer risk factor. Ovarian and other female hormones may contribute to breast cancer development, as its incidence decreases after menopause. Reproductive history and menstrual cycle features are known breast cancer risk factors. Women who had their first child before 25, had more than three children, and breastfed for more than two years had a lower risk of breast cancer than women who had their first child after 25. Women who have had abortions are three times more likely to develop breast cancer. Avoid delaying a woman's first pregnancy and encourage breastfeeding. Women who smoked have a 2-fold higher risk of breast cancer. Comorbidities like hypertension (HTN) and diabetes mellitus (DM) greatly increase breast cancer risk. Avoiding breast cancer requires educating people about modifiable risk factors. Breast cancer is a major killer in developing nations. Nations like India. Thus, understanding breast cancer risk factors, screening protocols, and treatment options can reduce deaths. We could not draw statistical conclusions due to recall bias and the small sample size of some risk factors.

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