## **Original Research Article**

DOI: http://dx.doi.org/10.18203/2394-6040.ijcmph20183966

# Risk factors of breast cancer among women admitted to a tertiary care hospital: a case-control study

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Received: 19 June 2018 Accepted: 25 July 2018

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#### **ABSTRACT**

**Background:** Breast cancer is the most common diagnosed cancer in women. Regional assessment of risk factors may help to increase awareness and management of breast cancer. The aim was to evaluate the risk factors of breast cancer among women.

**Methods:** A total of 210 women were included with 42 newly diagnosed breast cancer cases, and 84 women each as hospital and community controls. The data were analyzed using SPSS. Multinomial logistic regression and odd's ratio was used to find the association of risk factors with breast cancer. The association between the risk factors and breast cancer was analyzed using chi-square test.

**Results:** The most prevalent age-group was 41–50 years. Significant association was observed between breast cancer and area of residence, religion, education, occupation, type of family, socioeconomic status, attainment of menopause, and breastfeeding when compared among cases and community controls (p<0.05). Significant association was observed between breast cancer and education, occupation, socioeconomic status, attainment of menopause, age at first child, breast feeding, and body mass index among cases and hospital controls (p<0.05). The risk of breast cancer was more in illiterates, women who attained menopause, women in joint family, and high socioeconomic class women when compared among cases and hospital controls and community controls.

**Conclusions:** The important risk factors of breast cancer include literacy level, occupation and socioeconomic status, attainment of menopause, and breastfeeding. There is a strong need for general public-awareness policies and programs to reduce the prevalence, risks, morbidity, and mortality.

Keywords: Breast cancer, Risk factors, Incidence, Menopause, Breast feeding

#### INTRODUCTION

Breast cancer is one of the most common cancers in women. The incidence and rate of breast cancer differ worldwide. Compared to western countries, the incidence of breast cancer in Indian women is significantly lower. However, there are few alarming facts about breast cancer in India, such as increasing incidence of breast cancer at a younger age, accelerated increase in the number of cases of breast cancer; especially a six-fold increase in urban areas, decreased long-term survival due to late representation of signs and symptoms, and lack of screening facilities and awareness programs. Breast cancer has become one of the ten leading causes of death

in India. In 2012, among Asian countries, the highest number of deaths due to breast cancer was reported from India.<sup>1</sup>

Geographical variations in the incidence and mortality rates of breast cancer suggest that the known risk factors for breast cancer may vary in different parts of the world. Breast cancer is highly related to lifestyle changes, urbanization, and industrialization.<sup>2-4</sup> There are a number of modifiable and non-modifiable factors that may increase the risk of breast cancer. Increasing age, genetic mutations, early menstrual period, late or absence of pregnancy, obesity, and family history of breast cancer are most prevalent among them. Data on role of diverse

culture, geographical variations, diets and habits, sources of information on cancer risk factors are considerably limited. The data regarding the reasons for the varying incidence of breast cancer among women are neither well established, nor fully understood.

Assessing risk factors based on various regions and implementing the necessary actions such as increasing disease awareness, detection, and management programs can impact in the reduction of morbidity and mortality associated with breast cancer. Thus, the present casecontrol study was conducted to evaluate the risk factors of breast cancer among women admitted in a tertiary care hospital.

#### **METHODS**

This case-control study was conducted from January to December 2015 at the Department of Community Medicine. Ethical approval was obtained before commencing the study.

#### Data collection and statistical analysis

A total of 210 women was included in the study including 84 women in both hospital and community controls. A total of 42 newly diagnosed women with breast cancer, confirmed by histopathology report/fine needle aspiration cytology were included in the case group. Women admitted at the Department of Medicine, Surgery, and Obstetrics and Gynecology were included in the hospital controls. Women with malignancy of the uterus, ovary, and cervix were excluded from the study. Community controls were identified from the urban health center. After obtaining the informed consent, data were collected through personal interview using a pretested questionnaire. The information related to the sociodemographic data including residence, religion,

literacy status, occupation, type of family, socioeconomic status, family history of breast cancer, type of diet and clinical details regarding menopause, age at menarche, age at first child, duration of breastfeeding, body mass index (BMI) were collected from the women in both case and control group. Women who could not read and write were considered as illiterate. Information regarding per capita income (in Rupees/month) was collected and socioeconomic status was classified using modified B. G. Prasad's classification. BMI categories were followed based on the World Health Organization and the International Obesity Task Force Guidelines. The data were analyzed using SPSS 20 statistical software. Multinomial logistic regression was used to find the association of risk factors with breast cancer. The strength of association was obtained using odd's ratio (OR). The association and relationship between the risk factors and breast cancer was analyzed using chi-square

#### **RESULTS**

The demographic parameters of the study population are represented in Table 1. The most prevalent age-group was 41-50 years in all the study groups. All the community controls were from urban area, while most of the cases (57.1%) and hospital controls (72.6%) were from rural area. Hindu religion was the predominant religion among cases (85.7%) and hospital controls (89.3%). Number of Hindus (48.8%) and Muslims (51.2%) in community controls was almost equal. High number of illiterates was observed in cases (54.7%) and hospital controls (46.4%). Most of the patients in all the groups were housewives and from joint family. For 38.1% of women, age at first child was <18 years in cases compared with hospital controls (25%) and community controls (26.2%). A total of 18% of women in cases were not having children.

**Table 1: Demographic parameters of the study population.** 

Parameters	Cases n (%)	Hospital controls n (%)	Community controls n (%)
Age (in years)			
31–40	12 (28.6)	25 (29.9)	25 (29.8)
41–50	17 (40.5)	32 (38.0)	31 (36.9)
51–60	7 (16.7)	15 (17.9)	15 (17.9)
≥60	6 (14.2)	12 (14.2)	13 (15.5)
Residence			
Urban	18 (42.9)	23 (27.4)	84 (100)
Rural	24 (57.1)	61 (72.6)	0 (0)
P value	Ref	0.080	<0.001*
Religion			
Hindu	36 (85.7)	75 (89.3)	41 (48.8)
Muslim	5 (11.9)	9 (10.7)	43 (51.2)
Christian	1 (2.4)	0 (0)	0 (0)
P value	Ref	0.560	<0.001*

Continued

Parameters	Cases n (%)	Hospital controls n (%)	Community controls n (%)	
Education				
Illiterate	23 (54.7)	39 (46.4)	27 (32.1)	
Primary	11 (26.2)	26 (30.9)	31 (36.9)	
High school	1 (2.3)	16 (19.5)	23 (27.4)	
Pre-university 1	2 (4.6)	2 (2.3)	0 (0)	
Pre-university 2	0 (0)	0 (0)	2 (2.3)	
College	5 (11.9)	1 (1.2)	1 (1.2)	
P value	Ref	0.007	<0.001*	
Occupation				
Housewife	19 (45.3)	64 (76.2)	78 (92.8)	
Government job	2 (4.7)	1 (1.2)	2 (2.4)	
Private job	3 (7.1)	3 (3.6)	3 (3.6)	
Others	18 (42.8)	16 (19.0)	1 (1.2)	
P value	Ref	0.001*	<0.001*	
Type of family				
Joint	20 (47.6)	46 (56.0)	46 (56.0)	
Nuclear	16 (38.0)	36 (42.8)	37 (44.0)	
Broken	6 (14.2)	2 (2.4)	1 (1.2)	
P value	Ref	0.035*	0.010*	
Socioeconomic status		-		
Class I	4 (9.5)	9 (10.7)	9 (10.7)	
Class II	6 (14.2)	19 (22.6)	29 (34.5)	
Class III	8 (19.0)	26 (30.9)	36 (42.8)	
Class IV	12 (28.4)	26 (30.9)	10 (11.9)	
Class V	12 (28.4)	4 (4.7)	0 (0)	
P value	Ref	0.005*	<0.001*	
Body mass index (kg/m²)				
<18.5	6 (14.3)	4 (4.8)	5 (6.0)	
18.5–22.9	14 (33.3)	51 (60.7)	20 (23.8)	
≥23	22 (52.4)	29 (34.5)	59 (70.2)	
P value	Ref	< 0.009	0.102	
Age at first child (years)	<del></del>			
<18	16 (38.1)	21 (25.0)	22 (26.2)	
≥18	18 (42.9)	62 (73.8)	62 (73.8)	
No child	8 (19.0)	1 (1.2)	0	
P value	Ref	<0.001*	<0.001*	
Breastfeeding (years)				
1–2	4 (9.5)	4 (4.8)	6 (7.1)	
>2	29 (69.0)	79 (94.0)	78 (92.9)	
Not breast fed	9 (21.5)	1 (1.2)	0	
P value	Ref	<0.001*	<0.001*	

<sup>\*</sup>Significant; Ref, Reference.

The association between breast cancer and various parameters is represented in Table 2. Significant association was observed between breast cancer and area of residence, religion, education, as well as socioeconomic status in cases and community controls ( $p \le 0.001$ ). The results showed an increased prevalence of breast cancer among working women in cases; significant association was observed between breast cancer and occupation among cases and hospital and community controls ( $p \le 0.001$ ). Association between breast cancer

and type of family between cases and community controls (p=0.010) and cases and hospital controls (p=0.035) was significant. In addition, the association in attainment of menopause and breast cancer between cases and hospital controls (p=0.004) and cases and community controls (p=0.013) was significant. No significant difference (p=0.254) was observed between breast cancer and age at menarche in our study subjects. The association between breast cancer and women's age at first childbirth was significant (p<0.001).

Table 2: Association between breast cancer and various parameters.

Parameter	Case vs. hospital controls		Case vs. community controls	
	$\chi^2$	P value	$\chi^2$	P value
Residence	3.06	0.080	59.29	<0.001*
Religion	0.34	0.560	16.046	<0.001*
Education	12.072	0.007*	18.756	<0.001*
Occupation	11.933	0.001*	35.834	<0.001*
Type of family	6.677	0.035*	9.171	0.010*
Socioeconomic status	15.042	0.005*	29.948	<0.001*
Attainment of menopause	11.286	0.004*	8.759	0.013*
Age at menarche	1.303	0.254	1.303	0.254
Age at first child	18.360	<0.001*	21.541	<0.001*
Breastfeeding	17.492	0.001*	20.069	<0.001*
Diet	7.421	0.006*	0.016	0.899
Body mass index	9.475	<0.009*	4.55	0.102

<sup>\*</sup>Significant.

Table 3: Univariate and multivariate analysis for risk factors of breast cancer: cases vs. hospital controls.

Parameter     Unadjusted OR (95% CI)     P value       Education     Ref       High school     Ref     Ref       PUC + College     9.01 (1.12–71.42)     0.039     4.13 (0.37–47.6)     0.242       Primary     7.35 (0.87–62.5)     0.066     2.65 0.24–47.6)     0.377       Illiterate     37.03 (3.28–500)     <0.027     20.83 (0.83–500)     0.064       Occupation       Housewife/working     0.26 (0.12–0.57)     0.001     0.46 (0.14–1.53)     0.209
High school     Ref     Ref       PUC + College     9.01 (1.12–71.42)     0.039     4.13 (0.37–47.6)     0.242       Primary     7.35 (0.87–62.5)     0.066     2.65 0.24–47.6)     0.377       Illiterate     37.03 (3.28–500)     <0.027     20.83 (0.83–500)     0.064       Occupation       Housewife/working     0.26 (0.12–0.57)     0.001     0.46 (0.14–1.53)     0.209
PUC + College   9.01 (1.12–71.42)   0.039   4.13 (0.37–47.6)   0.242     Primary   7.35 (0.87–62.5)   0.066   2.65 0.24–47.6)   0.377     Illiterate   37.03 (3.28–500)   <0.027
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Occupation       Housewife/working     0.26 (0.12–0.57)     0.001     0.46 (0.14–1.53)     0.209
Housewife/working 0.26 (0.12–0.57) 0.001 0.46 (0.14–1.53) 0.209
Family type
Broken Ref Ref
Nuclear 6.75 (1.23–37.14) 0.028 0.82 (0.07–8.92) 0.873
Joint 6.90 (1.28–34.18) 0.025 1.18 (0.11–12.5) 0.891
Socioeconomic status
Class I Ref Ref
Class II 0.71 (0.16–3.16) 0.654 1.18 (0.06–24.39) 0.914
Class III 0.69 (0.17–2.86) 0.612 1.97 (0.07–55.55) 0.687
Class IV 1.04 (0.27–4.05) 0.957 1.35 (0.05–37.03) 0.858
Class V 6.75 (1.32–34.48) 0.022 7.93 (0.23–2.50) 0.250
Menstrual history
Hysterectomy Ref Ref
Attained menopause 17.0 (1.91–151.25) 0.011 9.20 (0.71–119.63) 0.09
Not attained menopause 16.33 (1.89–141.69) 0.011 7.56 (0.59–96.7) 0.119
Age at first child
No child Ref Ref
<18 years 10.5 (1.19–92.72) 0.034 0.08 (1.19–92.72) 0.045
$\geq$ 18 years 27.55 (3.23–235.16) 0.002 2.23 (0.69–7.91) 0.173
Diet
Veg/Non-veg. 0.35 (0.16–0.25) 0.007 0.22 (0.07–706) 0.011
Body mass index
$<18.5 \text{ kg/m}^2$ Ref Ref
$18.5-22.9 \text{ kg/m}^2$ $1.97 (0.49-7.86)$ $0.333$ $1.45 (0.56-25.46)$ $0.169$
$\geq$ 23 kg/m <sup>2</sup> 5.46 (1.35–22.08) 0.017 3.79 (0.23–9.17) 0.689

Ref, Reference; PUC, Pre-university course; OR, Odd's ratio; CI, Confidence interval.

A total of 69% of women in cases and 94% of women in hospital controls and 92.9% of women in community controls were under the category of breastfeeding >2 years. The result showed that, 21.9% women in case having no history of breast feeding. A statistically significant association between duration of breastfeeding and breast cancer was observed in cases and both hospital and community controls (p=0.001). History of benign breast disease and breast cancer were very less prevalent among the patients. Association between type of diet and breast cancer among cases and hospital controls was significant (p=0.006). A total of 52.4% of the cases were in the category of BMI levels > 23 kg/m<sup>2</sup>; however, in hospital controls, it was only 34.5%. Association between breast cancer and BMI levels in cases and hospital controls was significant (p<0.009).

Tables 3 and 4 represent the univariate and multivariate analysis of risk factors of breast cancer in cases with hospital and community controls, respectively. In the analysis of cases vs. hospital controls, the highest risk of breast cancer was observed among illiterate women (OR=37.03, 95% CI=3.28–50.0, p<0.027). Women of

class V of socioeconomic class had risk of developing breast cancer 6.75 times more compared to women of class I (95% CI=1.32–34.48, p=0.022). Housewives had a lower risk as compared to working women (OR=0.26, p=0.001). Hysterectomy found to be protecting women from breast cancer as compared to women who attaining menopause naturally or not attaining menopause, as the risk of breast cancer was 17 times higher in them. In the present study, as the number of women who had no children were very less among the controls, a reverse association was shown as far as age at 1st child and breast cancer were concerned. Breastfeeding for >2 years has beneficial effects in preventing breast cancer as compared to those who never breastfed (OR=0.111); however, statistically this was not significant. Higher the BMI, more the risk of breast cancer. Women with BMI > 23 kg/m<sup>2</sup> were 5.46 times at higher risk as compared to those with BMI <18 kg/m<sup>2</sup>. This difference was statistically significant (p=0.017). Multivariate analysis showed that, the risk factors such as age at first child<18 years (OR=0.08, 95% CI=1.19–92.72, p=0.045), vegetarian diet (OR=0.22, 95% CI=0.07-0.706, p=0.011), found to be significantly associated with reduced risk of developing breast cancer.

Table 4: Univariate and multivariate analysis for risk factors of breast cancer: cases vs. community controls.

	Univariate analysis		Multivariate analysis	
Parameter	Unadjusted OR (95% CI)	P value	Adjusted OR (95%CI)	P value
Religion				
Hindu/Others	6.29 (2.39–16.5)	<0.001*	7.05 (1.62–3.81)	0.009*
Education				
PUC+College	Ref		Ref	
High school	2.86 (0.662–12.382)	0.159	3.22 (0.21–52.46)	0.394
Primary	6.03 (1.33–27.27)	0.020	6.32 (0.41–96.65)	0.185
Illiterate	53.66 (4.79–601.2)	0.001*	19.24 (0.72–517.54)	0.078
Occupation				
Housewife/working	0.06 (0.02-0.18)	<0.001*	0.04 (0.01–28)	0.001*
Family type				
Broken	Ref		Ref	
Nuclear	13.80 (1.56–122.21)	0.018	7.29 (1.56–247.36)	0.269
Joint	13.87 (1.54–124.81)	0.019	9.14 (0.27–38.74)	0.216
Socioeconomic status				
Class I	Ref		Ref	
Class II	0.46 (0.11–2.02)	0.308	10.10 (0.53–258)	0.120
Class III	0.5 (0.12–2.03)	0.334	0.5 (0.52–200)	0.126
Class IV + V	5.40 (1.34–21.73)	0.017	142.8 (6.17–286.3)	0.002*
Menstrual history		·		
Hysterectomy	Ref		Ref	
Attained menopause	9 (1.66–48.69)	0.011*	11.38 (0.43–298.7)	0.145
Not attained menopause	7.67 (1.46–40.08)	0.016	14.91 (0.54–408)	0.110

<sup>\*</sup>Significant; Ref, Reference; PUC, Pre-university course; OR, Odd's ratio; CI, Confidence interval.

In the analysis of cases vs. community controls, the highest risk of breast cancer was observed among illiterate women (OR=53.66, 95% CI=4.79–601.2, p=0.001). Housewives had a lower risk as compared to working women (OR=0.06, p<0.001). Women of class IV+V of socioeconomic class had risk of developing

breast cancer 5.4 times more compared to women of class I (95% CI=1.34–21.73, p=0.017). Hysterectomy found to be protecting women from breast cancer. Risk of breast cancer was nine times higher in women who attained menopause when compared to those who underwent hysterectomy among cases and community controls

(p=0.011). Multivariate analysis showed that, the risk factors such as religion (OR=7.05, 95% CI=1.62–3.81, p $\leq$ 0.009), occupation (OR=0.04, 95% CI=0.01–0.28, p=0.001), socioeconomic class IV+V (OR=142.8, 95% CI=6.17–286.3, p=0.002) were independently associated with breast cancer.

#### **DISCUSSION**

A high prevalence of breast cancer cases was observed in the age-groups 41-50 (40.5%) and 31-40 years (28.6%). Studies conducted by Balasubramaniam et al and Augustine et.al also found similar prevalence of breast cancer in these age groups.<sup>5,6</sup> This emphasize the need for attention toward the development of breast cancer in Indian women at their younger age. Most of the cases were from rural areas. Even though there are study reports showed high prevalence of breast cancer among patients from urban area, this difference may be explained through the regional variations in the study sites. A few Indian studies have shown higher prevalence of breast cancer in rural areas. 7-11 Awareness, education, early detection, and screening of breast cancer are less in rural areas. This may be a contributing factor for the high prevalence of breast cancer among rural Indian women. It is important to observe the increased illiteracy rate in the case group (54.7%). This observation was almost matching with the other Indian studies.<sup>8,11</sup> There was a high prevalence of Hindu religion in cases and hospital controls. This may be due to the difference in pattern of prevalence of religions in various regions under the study.

Socioeconomic status was found to be a well-known risk factor in various similar studies from India as well as abroad.<sup>5,12-14</sup> Similar increase in the prevalence of breast cancer was observed in high socioeconomic class in case group, compared to hospital and community controls. Nevertheless, it is not easy to conclude this observation, as there is a lack of literature regarding association between socioeconomic status and hormone receptor subtypes in breast cancer. <sup>15</sup> Study reports from Augustine et al, Kamath et al, and Das et al from various parts of India found high prevalence breast cancer cases among the patients with low socioeconomic status. 6,11,16 This difference in observations might be due to the variation of socioeconomic levels of the region selected for the study. BMI value  $\ge 23 \text{ kg/m}^2$  was prevalent in half of the breast cancer patients in the present study. Reports from the previous studies concluded that there is positive association and high prevalence of increased BMI in breast cancer patients, especially in postmenopausal women. 17-19 The study conducted by Hildebrand et al found 14% lower risk of breast cancer in women who walk  $\geq$ 7 h/week compared to women who walk  $\leq$ 3 h/week.20 Increased prevalence of high BMI values was observed in community controls. This indicates the poor health awareness and health monitoring in the community sector.

In the comparison of case vs. hospital controls, a significant difference was observed in parameters including education, occupation, type of family, socioeconomic status, BMI, and diet. Highest risk of breast cancer was observed among illiterates. Literacy not only can enhance the awareness and importance of early breast cancer screening, but also develops a positive attitude towards the disease and its management. The results of the current study strongly recommend a vital need for the education and awareness programs for breast cancer. Women of class V of socioeconomic class had 6.75 times more risk of developing breast cancer compared to women of class I. Reproductive parameters such as attainment of menopause, age at first child, and breast feeding also significantly differed among this group. Hysterectomy found to be protecting women from breast cancer as compared to attaining menopause naturally or not, as the risk of breast cancer was 17 times higher in them. Studies conducted by Press et al also observed similar lower risk with breast cancer in patients who had undergone hysterectomy with ovarian conservation or partial ovary removal.<sup>21</sup> Breastfeeding for >2 years has beneficial effect in preventing breast cancer as compared to those who never breast fed. There are well-established clinical study reports on reduced breast cancer risk with prolonged breastfeeding. 22-25 Multivariate analysis showed that, the risk factors such as the age at first child <18 years and vegetarian diet found to be significantly associated with reduced risk of developing breast cancer. Study conducted by MacMahon et al found that breast cancer risk was only one-third in women having their age at first child<18 years compared to women delayed first birth until age of 35 years or more.26

#### CONCLUSION

The study suggests that the important risk factors of breast cancer include literacy level, occupation and socioeconomic status, attainment of menopause, and breastfeeding. Postmenopausal hysterectomy, age at first child <18 years, and breastfeeding for >2 years were found to be beneficial in reducing the risk of breast cancer. There is a strong need for efficient and effective general public-awareness policies and programs to reduce the prevalence, risks, morbidity, and mortality associated with breast cancer.

#### **ACKNOWLEDGEMENTS**

We thank all the participants (patients and healthy controls) of the study.

Funding: No funding sources Conflict of interest: None declared

Ethical approval: The study was approved by the

Institutional Ethics Committee

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Cite this article as: Chaubey JK, Walvekar PR. Risk factors of breast cancer among women admitted to a tertiary care hospital: a case-control study. Int J Community Med Public Health 2018;5:4316-22.