Original Research Article

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Study of risk factors associated with breast cancer: a case control study

Ashok R. Jadhao¹, B. K. Sharma², Sanjivani A. Jadhao³, Hitesh C. Tayade¹*

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*Correspondence:

Dr. Hitesh C. Tayade,

E-mail: tayade.hitesh76@gmail.com

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ABSTRACT

Background: Developing countries are facing double burden of infectious and non-communicable diseases. Omran gave epidemiological transition theory, which can be seen in India also. Lifestyle changes made Indian prone to non-communicable diseases. Cancer is among the most common non communicable diseases in India. Breast cancer contributes one fourth of all cancer burden in India. It is noted that more number of cases are being seen in 25 to 40 years age group. Objective of the study was to study risk factor associated with breast cancer.

Methods: Hospital based case control study was conducted in tertiary cancer centre from July 2017 to December 2019. Sample size of 96 cases was calculated, though 100 cases was interviewed and similar number of age group matched controls was selected. Sociodemographic, past history of benign breast lesion, family history of breast cancer, body mass index, waist to hip ratio and reproductive risk factors was assessed.

Results: The significant risk factors on multiple logistic regression were (adjusted odds ratios with 95% CI) age at menarche \leq 11 years (1.16, 1.025–1.451), waist to hip ratio more than 0.85 (1.61, 1.473–1.963) and history of abortion (1.14, 1.006–1.366).

Conclusions: Women with early age of menarche, higher waist to hip ratio and history of abortion were found to be at higher risk of developing breast cancer. Annual screening of high risk women, teaching self-breast examination to all women and promoting physical activity to maintain waist to hip ratio less than 0.85 should be done.

Keywords: Breast cancer, Case control study, Risk factors

INTRODUCTION

In many developing countries, common infectious diseases are still major unresolved health problem, emerging non-communicable diseases related to diet and lifestyle have been increasing over the previous two decades, which had created a double burden of disease and impacting severely on already inadequate health services in these countries. There is a gradual shift in the age pattern of mortality from younger to older ages, as acute infectious diseases are reduced, and chronic degenerative diseases are increasing. In industrialized countries epidemiologic transition was observed to be emerged towards the early 1900s, with an increasing trend of non-communicable diseases (NCD)

that certainly peaked by the mid - 1950s, accompanied by a significant fall in infectious-disease morbidity and mortality.²

Omran has described the epidemiologic transition to occur in 3 stages in 1971, first being the pre-transitional stage, the second stage is the age of receding pandemics and third stage as the age of degenerative and manmade diseases.³ India has been described as-nations within a nation because of the marked differences in the epidemiological transition levels (ETLs) between its states.⁴ Kerala showed the fastest epidemiological transition in India. Whereas the most populous empowered action group state of Uttar Pradesh remained in the lowest ETL group.⁵ The cancers types in India are also undergoing a transition, similar to

¹Department of Community Medicine, Indira Gandhi Government Medical College, Nagpur, Maharashtra, India

²Department of Head and Neck Cancer Surgery, RSTRCH and RC, Nagpur, Maharashtra, India

³Department of Anatomy, DMACH and RC, Nagpur, Maharashtra, India

Japan.⁶ There has been an decline of cancers in India caused by infections, such as cervical, stomach, and penile cancer, and an increase in cancers associated with lifestyle and ageing, such as breast, colorectal, and prostate cancers.⁷

Incidence of all cancers

An estimated 18,078,957 cases new cancer cases and 9.555.027 death cancer related death occurred in 2018 globally. Out of these total new cancer cases, 9.456.418 (52.30%) were males and 8,622,539 (47.70%) were females. Worldwide age standardised incidence rate shows that there are 218.6 new cancer cases per lakh males and 182.6 cases per lakh females. The most commonly diagnosed cancers worldwide were those of the lung 2,093,876 (11.6%), breast 2,088,849 (11.6%), colorectum 1,849,518 (10.2%), stomach 1,033,701 (5.7%), prostate 1,276,106 (7.1%), liver 841,080 (4.7%), oesophagus 572,034 (3.2%), and cervix uteri 569,847 (3.2%). The most common causes of cancer death were cancers of lung 1,761,007 (18.4%), colorectum 880,792 (9.2%), liver 781,631 (8.2%), stomach 782,685 (8.2%), breast 626,679 (6.6%), oesophagus 508,585 (5.3%), pancreas 432,242 (4.5%), and prostate 358,989 (3.8%). Incidence cases and mortality due to cancer in Asia was 8,750,932 and 5,477,064 respectively in 2018. Age standardised incidence rate in Asia shows that shows that there were 147.2 new cancer cases per lakh population. Age standardised incidence rate in males was 156.1 per lakh males and in females it was 142.5 cases per lakh females.

Incidence of breast cancer

Breast cancer is the most frequently occurring cancer among women, affecting 2.1 million women each year and also causes the highest number of cancer-related deaths among women in 2018. Breast cancer accounts for nearly 1 in 4 cancer cases among women. It is estimated that 627,000 women died from breast cancer that is approximately 15% of all cancer deaths among women. While breast cancer rates are higher among women in more developed regions however, rates are increasing in almost every region worldwide. Among females, breast cancer is the most commonly diagnosed cancer and the principal cause of cancer death. It is the most frequently diagnosed cancer in 154 out of 185 countries and is also the leading cause of cancer death in 100 countries.8 India is witnessing more and more increasing cases of breast cancer in the younger age group. Almost 48% patients are below 50 years of age. Increasing numbers of patients are in the age group of the 25 to 40 years, which is an alarming trend. One-fourth of all female cancer cases are breast cancers.9 Cancer of breast has replaced cancer of the cervix as the leading site of cancer in all urban population-based cancer registries. Age-adjusted incidence rates vary from place to place region-wise in different cancer registries. During the period 2012 to 2014, age-adjusted incidence per 100, 000 population was highest in Delhi which was 41.0, among others it was 37.9 in Chennai, 34.4 in Bangalore and 33.7 in Thiruvananthapuram.¹⁰ Breast cancer is the most common cancer in women in Nagpur. 31.9% of all cancers in women accounts for breast cancer in Nagpur.¹¹ Breast cancer resulted in 15.1 million disability-adjusted life years for both sexes worldwide. 95% of which came from years of life lost and 5% from years lost due disability.¹² Cancers are caused by mutations that may be inherited, induced by environmental factors, or result from deoxyribonucleic acid (DNA) replication errors.¹³

Hereditary, genetic factors, family history of breast and inherited mutations in BRCA1, BRCA2, and other breast cancer responsible genes, account for 5% to 10% of breast cancer cases. Studies of migrants' population have shown that nonhereditary factors are mainly responsible for the observed international and interethnic differences in incidence. On Comparing, low-risk populations migrating to high-risk populations have shown that breast cancer incidence rates increase in successive generations.14 Increased incidence rates in higher Human Development Index countries are attributed to a higher prevalence of known risk factors and the increased incidence rates in transitioned countries are the result of a higher prevalence of known risk factors related to menstruation (early age at menarche, late age at menopause), reproduction (nulliparity, late age at first birth, and fewer children), exogenous hormone intake (oral contraceptive use and hormone replacement therapy) and anthropometry (greater weight, weight gain during adulthood, and body fat distribution); whereas breastfeeding is known protective factors.¹⁵ Most of the breast cancer cases are generally diagnosed in the advanced stages, though screening tests and biomarkers for early detection are available. Early detection helps in preventing complications, improve quality of life and increase survival period. Hence, it is essential to identify women at risk and to benefit them by avoiding adverse complication following disease initiation.16

Considering the high burden of breast cancer in India and various factors affecting its occurrence, this study was conducted to determine the risk factors that contributed to the development of breast cancer.

METHODS

The present study was conducted in research institute and tertiary care centre for cancer in central India to study various risk factors associated with breast cancer. Histopathologically confirmed cases of breast cancer from female surgery ward and surgery out patients department were selected. Controls were women accompanying patients coming to general outpatient department of rural and urban field practice area of study institute. One age group matched control with matching for urban and rural place of residence was selected for each case.

Study design

The study was a hospital based case control study.

Study period

The period of the study was from July 2017 to December 2019.

Study settings

The study was conducted at the research institute and tertiary care centre for cancer in central India.

Study participants

Cases

Histo-pathologically confirmed cases of breast cancer were taken from female surgery ward and surgery out patients department of same hospital.

Controls

Women without any palpable lump in breast at time of study. Controls were women accompanying patients coming to general outpatient department of rural and urban field practice area of study institute.

Matching

One age group matched control with matching for urban and rural place of residence was selected for each case.

Inclusion criteria

The study included histopathologically confirmed female cases of breast cancer; and patients willing to participate and giving written informed consent.

Exclusion criteria

The study excluded: bed ridden patients, male cases with breast cancer, and patients suffering along with other cancer.

Sample size

Sample size of 96 for cases was calculated with odds ratio for duration between age at menarche and age at first child birth more than 6 years with power of 80% and confidence level of 95% using the data from Balasubramaniam et al study. ¹⁷ Considering ratio 1:1, sample size for control came to be 96. Though, 100 cases and 100 controls were included in the final study.

The study subjects were interviewed with a pre-tested interview schedule after obtaining informed consent. Presence of female attendant was ensured during the interview of the subject. Variables studied were, marital status, education, occupation and socioeconomic status, present and past history of medical illness and personal habits, age at menarche, age at birth of first child,

difference between age at menarche and birth of first child, parity, duration of breast feeding, age at menopause, history of abortion, family history of breast cancer, history of benign breast condition, use of oral contraceptive pills, use of hormonal replacement therapy, history of radiation exposure during thelarche, body mass index, waist to hip ratio and dietary habits. Controls were enrolled after explaining to them in detail about the purpose of the study and their role in the study.

This study was done after getting clearance from Institutional Ethics committee of Indira Gandhi Government Medical College and General Hospital, Nagpur.

Standard definitions were used for data collection. The economic status of an individual was determined by B. G. Prasad's classification based on per-capita income and consumer price index as per August 2019. Body mass index (BMI) was classified according to cut off values for Asian population given by World Health Organization (WHO) expert consultation. Statistical analysis was done Microsoft office excel 2013, Epi info 7.1.4, 2014, and STATA 13.0, 2013. Mean and standard deviation were used to summarize data. Chi-square test, odds ratio and logistic regression (backward stepwise method) were used to identify and quantify the risk. P value less than 0.05 was taken as statistically significant.

RESULTS

Mean age of cases was 48.47±9.50 years and mean age of controls was 48.00±10.13 years. This difference of ages between cases and controls (p<0.73) was not statistically significant. Table 1 shows the sociodemographic characteristics of cases and controls. The age of women in both groups varied from 31 to 75 years. Maximum number of cases and controls was observed in 41 to 50 years (50% of a cases and controls). Most of cases and control were Hindu by religion, 69% and 70% respectively. Table 2 shows univariate analysis of socio-demographic, past history of benign breast lesion, family history, dietary and anthropometric risk factors associated with breast cancer. The women with education of graduation or of above level were found to be at higher risk of developing breast cancer than women having education less than graduation (OR=3.58, 95% CI=1.12-11.41). Majority of cases 39 [39%] and controls 33 [33%] were belonging to class IV of B.G. Prasad's socio-economic class. For analysis purpose class I, II, III were grouped together as upper class and was analysed against taking together class IV and V as lower class. Socio-economic status was not found to be significantly associated with breast cancer (OR=0.92, 95% CI=0.52-1.60, p=0.88). Women with history of benign breast disease were at higher risk of developing breast cancer as compared to those who don't have history of benign breast disease. (OR=2.68, 95% CI=1.16-6.20). 4% cases and 1% control were having family history breast cancer in first degree relatives. This difference was

statistically not significant (OR=4.12, 95% CI=0.45-37.5). Type of diet (vegetarian versus non-vegeterian) was not found to be significantly associated with breast cancer. Body mass index was not found to be significantly associated with Breast cancer, whereas, women with waist/hip ratio more than 0.85 was having higher risk of developing breast cancer (OR=2.30, CI=1.24-4.16). Table 3 shows univariate analysis of reproductive risk factors associated with breast cancer.

Following reproductive risk factors were found significant on univariate analysis, mean age at menarche for cases was 12.64±1.59 years and for controls was 13.96±1.44 years. This difference between age at menarche of cases and controls was statistically significant, (p=0.000). Women who attained menarche by less than or equal to 11 were having higher risk of development of breast cancer as compared to those who attained menarche at more than 11 years. (OR=4.69, 95% CI=2.02-10.8). 3 [3%] cases and 2 [2%] controls were nulliparous and nulliparity was not found to be statistically significant with risk of developing breast cancer. Mean age at first child birth for cases was 22.24±2.95 years, and for controls was 20.88±3.5 years, this difference between cases and controls for age at first child birth was statistically significant (p=0.004). Women with age at first child birth more than or equal to 21 years were at higher risk of development of breast cancer as compared to women having age at first child birth less 21 years (OR=2.62, 95% CI=1.44-4.77). 12 [12%] cases and 4 [4%] controls reported no history of breast feeding. Cumulative duration of breast feeding in month was assessed from 0 month to 60 months. Significant decreasing risk of breast cancer was noted as cumulative duration of breastfeeding increases (x2 for linear trend p=0.01). Women who had breastfeeding duration for less than or equal to 24 months were at higher risk of developing breast cancer than those women who had breastfeeding for more than 24 months (OR=3.02, 95% CI=1.31-6.91). Cases and Controls those have attained menopause were 52% and 56% respectively. Majority of cases 23/52 [53.85%] and controls 26/56 [46.42%] has attained menopause in age group of 46 to 50 years and 41 to 45 years respectively. Mean age at menopause for cases was 46.88±3.26 years and for controls was 44.46±3.45 years, controls were having early age at menopause than cases, this difference for age at menopause between cases and controls was statistically significant (p=0.000). Women achieving menopause at age more than 45 years were having higher risk for breast cancer than those with age at menopause less than or equal to 45 years (OR=2.71, 95% CI=1.24-5.91). Also, it was observed that as the age at menopause increases odds for risk of breast cancer increases. Rising trend between age at menopause and risk of breast cancer was observed (x^2 for linear trend p=0.004). Odds for breast cancer for age at menopause 41 to 45 years, 46 to 50 years and more than 50 years as compared to less than or equal to 40 years was (OR=4.57, 95% CI=0.51-

40.5), (OR=9.33, 95% CI=1.06-81.7), (OR=21.0, 95% CI=1.50-293.2) respectively. 46/52 [88.47%] cases and 25/56 [44.65%] control were having duration of reproductive life more than 30 years. Women with reproductive life duration for more than 30 years were at higher risk of developing breast cancer than those women who had reproductive life duration for less than or equal to 30 years (OR=9.50, 95% CI=3.49-25.8). Women with difference of age at first childbirth and age at menarche with 7 to 12 years are having higher risk of developing breast cancer than those with difference of less than or equal to 6 years (OR=6.42, 95% CI=3.24-12.9). Those with difference greater than 12 years are having risk of developing breast cancer than those with difference of less than or equal to 6 years. (OR=6.44, 95% CI= 2.31-17.9). Women with history of abortion were at higher risk of developing breast cancer (OR=2.25, 95% CI=1.30-4.46). Induced abortion was studied against natural abortion but it was not found to be significantly associated with breast cancer (OR=0.78, 95% CI=0.22-2.72). Irregular menses was not found to be significantly associated with breast cancer (OR=1.27, 95% CI=0.69-2.36). Women consuming oral contraceptive pills for more than 6 months were at higher risk of developing breast cancer than those women consuming OC pills for less than or equal to 6 months (OR=4.88, 95% CI=1.21-19.71). History of radiation exposure during thelarche and consumption of hormonal replacement therapy was also asked.

None of the study participants was able to recall the history of radiation exposure and all the study participants had no history of consumption of hormonal replacement therapy. Table 4 gives the factors independently associated with breast cancer as identified by a backward stepwise logistic regression analysis of all factors, which were significant in cases by univariate analysis. As there were 48 [48%] cases and 44 [44%] controls who had not attended menopause, hence age at menopause and duration of reproductive life could not be entered as it was calculated only for those who had attained menopause. As there were 3 [3%] cases and 2 [2%] controls who were nulliparous hence age at first childbirth, difference between age at first childbirth and age at menarche were not entered and as 12 [12%] cases and 4 [4%] controls had never done breastfeeding hence breast-feeding duration was also not entered. 76 [76%] cases and 84 [84%] controls had never consumed oral contraceptive pills hence duration of consumption of oral contraceptive pills was not entered. A full model of multiple logistic regression was prepared and individual effect of each risk factor was studied when all other factors were adjusted. The final model of multiple logistic regression was thus prepared by backward deletion of nonsignificant factors, (p>0.05). On multiple logistic regression, age at menarche, history of abortion, waist/hip ratio more than 0.85 were found to be significantly associated with risk of breast cancer.

Table 1: Sociodemographic characteristics of study participants.

Variables	Cases (N=100)		Controls (N=100)		
variables	No.	%	No.	%	
Age (years)					
31-40	20	20	20	20	
41-50	50	50	50	50	
51-60	18	18	18	18	
60-70	10	10	10	10	
70-80	2	2	2	2	
Residence					
Rural	38	38	38	38	
Urban	62	62	62	62	
Religion		•			
Hindu	69	69	70	70	
Bauddha	20	20	13	13	
Muslim	7	7	15	15	
Others	4	4	2	2	
Marital status					
Ever Married	98	98	99	99	
unmarried	2	2	1	1	
Education					
Illiterate	26	26	30	30	
Less than middle school certificate	34	34	19	19	
Middle school certificate	2	2	12	12	
High school certificate	15	15	25	25	
High secondary school certificate	10	10	10	10	
Graduate or Above	13	13	4	4	
Socio-economic class					
I	7	7	2	2	
II	14	14	27	27	
III	25	25	19	19	
IV	39	39	33	33	
V	15	15	19	19	

Table 2: Univariate analysis of socio-demographic, past history of benign breast lesion, family history, dietary and anthropometric risk factors associated with breast cancer.

D. I. C. A	Cases		Controls	Controls		OFO CT	W ² (DOE) # 1	
Risk factor	N=100 % N=100 % Odds rat	Odds ratio	95% CI	X ² , [DOF], *p value				
Education								
Graduate or above	13	13	4	4	3.58	1.12-11.41	4.11, [1], *0.04	
Less than graduate	87	87	96	96	Reference ca	tegory		
Socio-economic class [B.G. Prasad]								
Upper class [I+II+III]	46	46	48	48	1.08	0.52-1.60	0.02, [1], *0.88	
Lower class [IV+V]	54	54	52	52	Reference category			
History of benign brea	ast disease							
Yes	21	21	9	9	2.68	1.16-6.20	4.74, [1], *0.02	
No	79	79	91	91	Reference category			
Family history of breast cancer in first degree relative								
Yes	4	4	1	1	4.12	0.45-37.5	0.82, [1], *0.36	
No	96	96	99	99	Reference ca	Reference category		
Diet								
Vegetarian	24	24	20	20	Reference ca	tegory		
Mix	76	76	80	80	1.26	0.64-2.47	0.26, [1], *0.60	
BMI kg/m ²								

Continued.

Risk factor	Cases		Controls	Controls		059/ CI	X ² , [DOF], *p value		
	N=100	%	N=100	%	Odds ratio	95% CI	A, [DOF], 'p value		
<23	30	30	43	43	Reference ca	itegory			
≥23	70	70	57	57	1.76	0.98-3.15	3.10, [1], *0.07		
Waist/hip ratio									
≤0.85	27	27	46	46	Reference ca	Reference category			
>0.85	73	73	54	54	2.30	1.27-4.16	6.98, [1], *0.008		

Table 3: Univariate analysis of reproductive risk factors associated with breast cancer.

Risk factor	Cases			ol	Odds	CI	X ² , [DOF], *p value	
	No.	%	No.	%	ratio	CI	A, [DOF], 'p value	
Age at menarche (ye	ears)							
≤11	29	29	8	8	4.69	2.02-10.8	13.2, [1], *0.0002	
>11	71	71	92	92	Reference	Reference category		
Parity								
Nulliparous	3	3	2	2	1.51	0.24-9.27	0.00, [1], *1.00	
Parous	97	97	98	98	Reference	category		
Age at first childbirth [years]								
<21	26	26.80	48	48.98	Reference	ecategory		
≥21	71	73.20	50	51.02	2.62	1.44-4.77	9.26, [1], *0.002	
Ever breastfeeding								
Yes	88	88	96	96	Reference	category		
No	12	12	4	4	3.27	1.01-10.5	3.32, [1], *0.06	
Cumulative duration	n of breast	feeding [mor	nths]#					
≤24	23	23	9	9	3.02	1.31-6.91	6.28, [1], *0.01	
>24	77	77	91	91	Reference category			
Menopausal status								
Pre-menopausal	48	48	44	44	1.17	0.67-2.04	0.18, [1], *0.67	
Post-menopausal	52	52	56	56	Reference category			
Age at menopause [years]*							
≤45	18	34.61	33	58.92	Reference	category		
>45	34	65.39	23	41.08	2.71	1.24-5.91	5.45, [1], *0.01	
Duration of reprodu	ictive life [y	years]*						
≤30	6	11.53	31	55.35	Reference category			
>30	46	88.47	25	44.65	9.50	3.49-25.8	21.1, [1], *0.00	
Difference between	age at first	child for par	ous wome	en and age	at menarche	[years] ^A		
≤6	16	16.49	55	56.12	Reference category			
>6	81	83.51	43	43.88	6.47	3.31-12.63	31.37, [1], *0.00	
History of abortion								
No	70	70	84	84	Reference category			
Yes	30	30	16	16	2.25	1.13-4.46	4.77, [1], *0.02	
Method of abortion								
Induced	13	43.33	6	37.50	1.27	0.36-4.41	0.004, [1], *0.94	
Natural	17	56.67	10	62.50	Reference	category		
Menstrual cycle								
Regular	69	69	74	74	Reference	category		
Irregular	31	31	26	26	1.27	0.69-2.36	0.39, [1], *0.53	
Oral contraceptive	pills consur	nption [mont	hs] ^b					
≤6	5	20.83	9	56.25	Reference	category		
>6	19	79.17	7	43.75	4.88	1.21-19.71	3.85, [1], *0.04	

^{*}For statistical convenience unmarried and nulliparous women were also included, *only 52 cases and 56 controls those attained menopause were analysed, *a3 cases and 2 controls, those were nulliparous was excluded from analysis, and *bonly 24 cases and 16 controls those consumed OC pills were analysed

Table 4: Factors found to be independently associated with breast cancer (backward stepwise method).

Risk factors	Adjusted odds ratio	95% C.I.	— D volue		
KISK Tactors	Aujusteu odus ratio	Lower	Upper	P value	
Age at menarche less than or equal to 11 years	1.161	1.025	1.451	0.02	
History of abortion	1.143	1.006	1.366	0.04	
Waist/hip ratio more than 0.85	1.610	1.473	1.963	0.00	

DISCUSSION

Breast cancer is showing an upward trend in Indian women which is reflected in the cancer registries. 10 The change in reproductive pattern, lifestyle, dietary patterns and demographic features may be contributing to this increase. This study was hence conducted to explore these risk factors. This study was feasible because study institute had a tertiary care cancer specialty centre. All incident cases were chosen to avoid the survival bias due to prevalent cases. Controls were chosen by random sampling and no major exclusion criteria were used to avoid selection bias. The major confounders were identified from prior literature and their individual risks were quantified. Confounding was adjusted using the multiple logistic regression methods. Our study population consisted of hospital population, which was mainly from adjoining urban areas of Nagpur. On univariate analysis, education of graduation or of above level, waist/hip ratio more 0.85, age at menarche less than or equal to 11 years, age at first child birth more than or equal to 21 years, breastfeeding duration for less than or equal to 24 months, age at menopause more than 45 years, reproductive life duration of more than 30 years, difference of age at first childbirth and age at menarche more than 6 years, history of abortion, history of benign breast disease, OC pills consumption for more than 6 months was found to associated with risk of developing breast cancer. There was no sufficient gradient with respect to many variables. Hence, we found large confidence intervals, even for significant variables. On multiple logistic regression age at menarche, history of abortion, waist/hip ratio were found to be significantly associated with risk of breast cancer. Mean age of cases was 48.47±9.50 years, and that of controls was 48.00±10.13 years. Age incidence in present study was comparable with studies of Balasubramaniam et al, Kamath et al, Pakseresht et al, Augustine et al, Okobia et al. 17-23 However, age incidence of more than 50 years was found in studies conducted by Vidya et al, Lodha et al, and Agrawal et al.²⁴⁻²⁶

In our study education status of graduation or above was found to be associated with three fold risk of developing breast cancer. It could be the reason that higher education increase health awareness and health seeking behaviour and hence more representation in cases. Association of breast cancer with higher education is in consistence with findings of Gajalakshmi et al, Balasubramaniam et al, Yavari et al, Das et al, and Datta et al.^{17,27-30}

We found no association between body mass index and breast cancer because, bias of temporal causality might have played role over here, as the anthropometry was measured in present condition, whereas, disease had already occurred. Similarly, Ozmen et al, Sepandi et al, Meshram et al found no association between breast cancer and body mass index. 31-33

We found one and half times increased risk of breast cancer with waist to hip ratio of more than 0.85 which in accordance with study findings of Nagrani et al and Fei et al. 34,35 Though this factor was found significant, bias of temporal causality might have affected this factor also.

We found one and half times increased risk of breast cancer with early age at menarche. This finding was in consistence with findings of Bhadoria et al and Montazeri et al. Whereas, Mohite et al and Rajbongshi et al found early age at menarche protective against breast cancer. ³⁶⁻³⁹

Mohite et al, Balasubramaniam et al, and Takalkar et al found significant association between history of abortion and breast cancer. We also found one and half times more risk of breast cancer with history of abortion. 17,38,40

We had not any significant assocition between breast cancer and family history of breast cancer. One of the reasons for the family history of breast cancer not showing up as a factor may be that the sample size was ineffective to find this risk. Pakseresht et al and Montazeri et al also not found family history of breast cancer associated with risk of breast cancer.^{21,37}

The strength of this study was the care taken to control biases. Selection bias was controlled with careful selection of controls. Information was collected over a year by the same interviewer and allotting similar time to both the groups and hence avoiding information bias. Confounding was managed well with regression models. This was the first study in central India to look at the all the possible risk factors of breast cancer in women, which was identified through extensive search of literature. The main limitation of this study was that it was a hospital-based study and may not be representative of the underlying population. Many of the factors after adjustment had wide confidence intervals even though they were statistically significant. This may be due to small numbers in the risk group and needs careful interpretation.

The other limitation was that we had calculated waist to hip ratio and BMI at present condition whereas disease had

already occurred. We tried to assess radiation exposure history during thelarche period among participants but recall bias hindered its assessment. This study gives an insight into the central obesity but needs follow up study and detailed assessment on this aspect and radiation exposure history during thelarche period.

CONCLUSION

Women with age at menarche less than or equal to 11 years, history of abortion, waist/hip ratio more than 0.85 were found to be significantly associated with increased risk of breast cancer. Screening of high-risk group by yearly breast examination of nulliparous women and women with previous history of biopsy for a benign breast lesion can help in early detection. Teaching self-breast examination to these individuals will be beneficial. Breastfeeding for longer duration should be promoted. Increased awareness regarding physical activity for those at risk as well as maintenance of waist/hip ratio less than 0.85 should be promoted.

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REFERENCES

- 1. Amuna P, Zotor FB. Epidemiologic and Nutritional Transition in developing countries: impact on human health and development. Proceedings of The Nutrition Society. 2008;67(1):82-90.
- 2. Detels R, Breslow L. Current scope and concerns in public health. In Oxford Textbook Public Health. Oxford: Oxford University Press. 1997;1:3-17.
- 3. Omran AR. The Epidemiologic Transition: a theory of epidemiology of population change. Milbank Q49. 1971;509-38.
- India State-Level Disease Burden Initiative Collaborators: Nations within a nation: Variations in epidemiological transition across the states of India, 1990-2016 in the Global Burden of Disease Study. Lancet. 2017;390:2437-60.
- Indian Council of Medical Research, Public Health Foundation of India, Institute for Health Metrics and Evaluation: GBD India Compare Data Visualization: New Delhi—ICMR, PHFI, and IHME, 2017.

- Available at: http://vizhub.healthdata.org/gbd-compare/india. Accessed on 20 November 2020.
- 6. Gersten O, Wilmoth JR. The cancer transition in Japan since 1951. Demogr Res. 2002;7:271-306.
- 7. Bentall WC: Cancer in Travancore: A resume of 1,700 cases. Ind Med Gaz. 1908;43:452-8.
- 8. Bray F, Ferlay J, Soerjomataram I, Siegel RL, Torre LA, Jemal A. Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA Cancer J Clin. 2018;68(6):394-424.
- Consolidated Report of the Hospital Based Cancer Registries 2012–2014, Three Year Report of the Population Based Cancer Registries. Available at: https://ncdirindia.org/ncrp/Annual_Reports.aspx. Accessed on 20 November 2020.
- 10. Malvia S, Bagadi SA, Dubey US, Saxena S. Epidemiology of breast cancer in Indian women. Asia Pac J Clin Oncol. 2017;13(4):289-95.
- 11. Breast Cancer in Nagpur. Available at: http://www.breastcancerindia.net/statistics/stat_nagp ur.html. Accessed on 30 November 2019.
- Maurice C. Global, Regional, and National Cancer Incidence, Mortality, Years of Life Lost, Years Lived With Disability and Disability-Adjusted Life-Years for 29 Cancer Groups, 1990 to 2016. A Systematic Analysis for the Global Burden of Disease Study. JAMA Oncol. 2018;4(11):1553-68.
- 13. Tomasetti C, Li L, Vogelstein B. Stem cell divisions, somatic mutations, cancer etiology, and cancer prevention. Science. 2017;355:1330-4.
- 14. Ziegler RG, Hoover RN, Pike MC. Migration patterns and breast cancer risk in Asian-American women. J Natl Cancer Inst. 1993;85:1819-27.
- Brinton LA, Gaudet MM, Gierach GL. Breast cancer.
 In: Thun MJ, Linet MS, Cerhan JR, Haiman CA, Schottenfeld D, eds. Cancer Epidemiology and Prevention. 4th ed. New York: Oxford University Press. 2018;861-88.
- Breast cancer: Prevention and Control. Available at: http://www.who.int/ cancer/detection/breastcancer/en/index3.html. Accessed on 14 January 2014.
- 17. Balasubramaniam SM, Rotti SB, Vivekanandam S. Risk factors of female breast carcinoma: a case control study at Puducherry. Indian J Cancer. 2013;50(1):65-70.
- 18. Sharma R. Revision of Prasad's social classification and provision of an online tool for real-time updating. South Asian J Cancer. 2013;2(3):157.
- 19. WHO expert consultation. Appropriate body-mass index in Asian populations and its implications for policy and intervention strategies. Lancet. 2004;363(9403):157-63.
- 20. Kamath R, Mahajan KS, Ashok L, Sanal TS. A study on risk factors of breast cancer among patients attending the tertiary care hospital, in udupi district. Indian J Community Med. 2013;38(2):95-9.
- 21. Pakseresht S, Ingle GK, Bahadur AK, Ramteke VK, Singh MM, Garg S, Agarwal PN. Risk factors with

- breast cancer among women in Delhi. Indian J Cancer. 2009;46(2):132-8.
- 22. Antony MP, Surakutty B, Vasu TA, Chisthi M. Risk factors for breast cancer among Indian women: A case-control study. Niger J Clin Pract. 2018;21(4):436-42.
- 23. Okobia MN, Bunker CH, Okonofua FE, Osime U. Knowledge, attitude and practice of Nigerian women towards breast cancer: A cross-sectional study. World J Surg Oncol. 2006;4:11.
- Vidya DC, Shalini CN, Nandakumar BS, Murthy NS, Nagnoor I. Risk factors associated with breast cancer among women attending a tertiary care hospital in Bangalore: a case control study. 2018;5(12):5413-9.
- Lodha R, Joshi A, Paul D, Lodha KM, Nahar N, Shrivastava A, Bhagat VK, Nandeshwar S. Association between reproductive factors and breast cancer in an urban set up at central India: a casecontrol study. Indian J Cancer. 2011;48(3):303-7.
- 26. Agrawal KH, Rajderkar SS. Clinico-Epidemiological Profile of Female Breast Cancers and Its Important Correlates: a Hospital Based Study. 2012;3(2):316-20.
- Gajalakshmi V, Mathew A, Brennan P, Rajan B, Kanimozhi VC, Mathews A, Boffetta P. Breastfeeding and breast cancer risk in India: A multicenter case-control study. 2009;665:662-5.
- 28. Yavari P, Mosavizadeh M, Sadrol-Hefazi B, Mehrabi Y. Reproductive characteristics and the risk of breast cancer A case-control study in Iran. Asian Pac J Cancer Prev. 2005;6(3):370-5.
- 29. Das S, Sen S, Mukherjee A. Risk factors of breast cancer among women in eastern India: A tertiary hospital based case control study. Asian Pacific J Cancer Prev. 2012;13(10):4979-81.
- 30. Datta K, Biswas J. Influence of Dietary habits, Physical Activity and Affluence Factors on Breast cancer in East India A Case-Control Study, Asian Pacific J Cancer Prev. 2009;10:219-22.
- 31. Ozmen V, Ozmen V, Ozcinar B, Karanlik H. Breast cancer risk factors in Turkish women a University Hospital based nested case control study. World J Surg Oncol. 2009;7(37):1-8.
- 32. Sepandi M, Akrami M, Tabatabaee H. Breast cancer risk factors in women participating in a breast

- screening program: a study on 11,850 Iranian females. Asian Pacific J Cancer Prev. 2014;15(19):8499-502.
- 33. Meshram II, Hiwarkar PA, Kulkarni PN. Reproductive Risk Factors for Breast Cancer: A Case Control Study. Online J Health Allied Sci. 2009;8(3):5.
- 34. Nagrani R, Mhatre S, Rajaraman P, Soerjomataram I. Science Direct Central obesity increases risk of breast cancer irrespective of menopausal and hormonal receptor status in women of South Asian Ethnicity. Eur J Cancer. 2016;66:153-61.
- 35. Wang F, Liu L, Cui S, Tian F, Fan Z, Geng C, et al. Distinct Effects of Body Mass Index and Waist/Hip Ratio on Risk of Breast Cancer by Joint Estrogen and Progestogen Receptor Status: Results from a Case-Control Study in Northern and Eastern China and Implications for Chemoprevention. Oncologist. 2017;22(12):1431-43.
- 36. Bhadoria AS, Kapil U, Sareen N, Singh P, Bhadoria A. Reproductive factors and breast cancer: A case-control study in tertiary care hospital of North India. Indian J Cancer. 2013;50(4):316.
- 37. Montazeri A, Sadighi J, Farzadi F. Weight, height, body mass index and risk of breast cancer in portmenopausal women: a case control study. BMC Cancer. 2008;8(278):1-7.
- 38. Mohite V, Pratinidhi A, Mohite R. Reproductive risk factors and breast cancer: a case control study from rural India. Bangl J Med Sci. 2015;14(3):258-64.
- 39. Rajbongshi N, Mahanta LB, Nath DC. A Matched Case Control Study of Risk Indicators of Breast cancer in Assam, India. Myemensingh Med J. 2015;24(2):385-91.
- Takalkar U, Asegaonkar S, Kodlikeri P, Kulkarni U, Borundiya V, Advani S. Hormone Related Risk Factors and Breast Cancer: Hospital Based Case Control Study from India. 2014.

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