RESEARCH COMMUNICATION

Influence of Dietary Habits, Physical Activity and Affluence Factors on Breast Cancer in East India - A Case-control Study

Karabi Datta[1]*, Jaydip Biswas[2]

Abstract

The upward trend in breast cancer globally and in India has become a matter of great concern. The higher incidences generally seen in developed countries has lead to the postulation that the disease is due to life style so that growing industrialization and urbanization may be a major factor. Keeping this in mind, the present case-control study was undertaken in Chittaranjan National Cancer Institute, Kolkata from 2002 to 2003, focusing on 267 female breast cancer patients and an equal number of age matched controls. The analysis of study reports demonstrated a positive correlation with a higher standard of living, higher educational status, and higher intake of animal protein, fat and deep fried foods. This study is the first report from Eastern India to attempt to correlate different life style and dietary factors with breast cancer development.

Key Words: Breast cancer - physical activity - dietary habits - BMI - East India

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Introduction

Globally breast cancer is the most frequent malignancy among women, with an estimated 422,000 new cases every year and it is the leading cause of death in women next to lung cancer. The American Cancer Society estimates that 178,480 new cases of invasive breast cancer were diagnosed in 2007 and about 40,910 breast cancer deaths took place. The likelihood of breast cancer in women increases with age, being about 2% by 50 years of age, 4% by age 60, 7% by age 70 and 10% by age 80. Among Indian women breast cancer incidences are increasing although age-adjusted rates vary with the different regions and cancer registries. During the period 2001-2003 the recorded incidences were 26.60 in Chennai, 29.20 in Delhi, 27.50 in Mumbai, 27.50 in Bangalore, 22.10 in Bhopaland and 7.60 in Ahmedabad district (Consolidated Report of Population Based Cancer Registries 2001-2004). It is about 26.8 in Kolkata (2005).

The well established risk factors that contribute to breast cancer as reported in women from the western world like late age at first pregnancy, lack of breast feeding and family history of breast cancer are of less practical significance for women of Eastern India. Judging by these criteria, they have a low risk life style since marriage, child bearing and long breast-feeding are almost universal and occur at a relatively early age during the reproductive life. In order to reduce the incidence of breast cancer in this region, it was therefore of interest to investigate the specific risk factors related to their life style. The objective of the present study, therefore, was to identify and wherever possible, quantify the important modifiable risk factors attributable to breast cancers. The study is the first of its kind where an attempt has been made to correlate different life style and dietary factors with breast cancer in Eastern India.

Subjects and Methods

This study was conducted on female breast cancer patients admitted to the hospital of Chittaranjan National Cancer Institute, Kolkata, India during the period 2002-2003. These patients were taken as cases and female neighbours or friends who visited from the same localities was taken as controls. Information was collected from both the groups by direct interview method using a well designed questionnaire about different parameters like major dietary habits ie. per capita fat intake per week, per capita protein intake per week, habit of consuming deep fried food, hours of physical activity per day, body mass index , standard of living, level of education and marital status.

It is always difficult to define standard of living. In this study, a data driven method was defined to assess the standard of living in consultation with a statistician. In the questionnaire the possession of a number of items were asked from each of cases and controls. Each item on the basis of their market prices and usability is assigned a weight. The total of weights of all the items possessed by the family of the female respondent is taken as an indicator of her standard of living. Table 1 shows the weights of different items.

Again, the standard of living of the pooled sample i.e. both for controls and cases was broadly classified into 4

*[1]Department of Epidemiology & Bio-Statistics, [2]Director, Chittaranjan National Cancer Institute, Kolkata, India *For Correspondence: karabi_bhanja@yahoo.co.in*

Table 1. Items for Judging the Standard of Living and the Weighting Applied

Item	Weight
Electrical or gas stove	1
Refrigerator	4
TV-colour	3
TV-black and white	2
Disk player	4
Radio	1
Exhaust fan	4
Air conditioner	8
Washing machine	8
Car	12
Motorcycle/ scooter	4
Bicycle	1
Computer	4

categories as per the value of the total of the weights of Indices of an individual. The lower 25% were treated as 'Low standard of living', next 35% as 'medium standard of living', next higher 25% as 'high standard of living' and the top 15% as 'very high standard of living'.

Item wise amounts of time spent in each on different physical activities like cleaning the house, cooking, washing clothes, walking, etc. on a normal day were determined. Information was also collected on the dietary habits of the individuals. Consumption of meat (mutton, beef, chicken, others) and fish (fresh and dry) as source of animal protein was considered and the unit (grams) and frequency were collected for family proportions. The data on frequency of consumption was collected in 6 groups, namely, never, once in less than one month, once in less than one week, 2-4 times a week , once in about one day and once or more in a day. On the basis of that average, weekly consumption of the family was calculated taking sum over all such types of consumption. Then under the assumption that each family member consumes almost an equal amount, per capita consumption of animal protein was calculated. Then this consumption was grouped into three classes namely low (160 gm or less), average (161-625 gm) and high (more than 625 gm). These cut-off points of consumption were determined on the basis of lower 30%, next 50% and upper 20% of the pooled sample.

Information was also collected on the consumption of fat (oil or ghee) used to season food. The data were collected on family consumption per week in grams. Individual consumption was obtained for mixed vegetable oils, sunflower oil, cornflower oil, Soya oil, mustard oil, ginger oil, palm oil, coconut oil, vegetable ghee and animal ghee. Like in the case of animal proteins under the assumption of equal consumption of all family members the total of all types of fat used were divided by number of family members to get the weekly per capita fat intake. Then this consumption was grouped into three classes namely low (80 gm or less), average (81- 250 gm) and High (more than 250 gm). These cut-off points of consumption were determined on the basis of lower 40%, next 35% and upper 25% of the pooled sample.

Information was also collected on type of cooking in the preparation of food, with a focus on the frequency of deep-frying of vegetables, meat and fish. For each the classification was into four, namely never, rarely, often and most of the time. For each individual we considered the highest frequency in the three subgroups i.e. if the frequency of vegetable was rarely, that of meat was never and that of fish was often for an individual then her frequency was considered as often.

Table 2. Background Factors for the Study Subjects

	Cases		Controls	
Marital status				
Unmarried	58	21.70	25	9.36
Married	209	78.30	242	90.64
Education				
Illiterate	14	5.20	16	5.99
Literate	35	13.11	55	20.60
Less than 5 years schooling	41	15.36	54	20.22
5-8 years schooling	104	38.95	96	35.96
High school	56	20.97	38	14.23
College/graduation or more	17	6.37	8	3.00
Standard of living				
Low standard of living	56	20.97	74	27.72
Medium standard of living	89	33.33	98	36.70
High standard of living	69	25.84	69	25.84
Very high standard of living	53	19.85	26	9.74
Body Mass Index				
Normal	79	29.59	104	38.95
Overweight	180	67.42	159	59.55
Obese	8	3.00	4	1.50
Physical activity per day				
Low (4 hours or less)	115	43.07	14	5.24
Normal (4 – 8 hours)	116	43.45	148	55.43
High (8-12 hours)	35	13.11	101	37.83
Very high (>12 hours)	1	0.37	4	1.50
Per capita protein intake				
Low	90	33.71	78	29.21
Average	116	43.45	140	52.43
High	61	22.85	49	18.35
Per capita fat intake				
Low	107	40.07	111	41.57
Average	84	31.46	110	41.20
High	76	28.46	46	17.23
Frequency of consuming deep fried food				
Never	13	4.87	48	17.98
Rarely	27	10.11	61	22.85
Often	140	52.43	124	46.44
Most of the times	87	32.58	34	12.73

Results

Table 2 provides data on the important factors of the study. The mean age ± SD was 41.25 ± 10.9 for control and 45.30 ± 10.23 for cases. The minimum and maximum ages in cases were 20 and 75 respectively whereas those in controls were 17 and 72 respectively. 78.3% cases were married whereas 90.64% of controls were married. A level of education was on the higher side in cases than controls. Overall Standards of Living of cases were lower than controls. Body Mass Indices were as a whole in a higher side in cases than controls. It was noted that the cases have significantly low hours of physical activity per day whereas controls have reported much higher hours of physical activity per day. Per capita protein intake and per capita fat intake in both case and control households

Table 3. Co-efficients of Logistic Regression

Variables	Status	Odds ratio	95.0% CI
Marital status	Unmarried	2.104	0.841-5.263
Education	Illiterate	-	- -
	Literate	0.368	0.087-1.557
	<5 years	0.336	0.100-1.136
	5-8 years	0.376	0.113-1.251
	High school	1.522	1.167-2.633
	College	1.709	0.899-3.407
Physical activity	Low	-	- -
	Normal	237.8	17.32- 3266
	High	20.17	1.599-254.7
	Very high	8.446	0.665-107.2
Deep fry	Never	-	- -
	Rarely	0.095	0.036-0.253
	Often	1.134	1.057-1.316
	Most times	1.420	1.221-1.798
Standard of living	Low	-	- -
	Medium	0.452	0.204-1.000
	High	0.923	0.440-1.935
	Very high	1.356	0.832-2.512
BMI	Normal	-	- -
	Overweight	0.834	0.182-3.833
	Obese	1.886	0.943-3.856
Per capita protein consumption per week			
	Low	-	- -
	Average	1.217	0.633-2.341
	High	1.635	1.350-2.554
Per capita fat consumption per week			
	Low	-	- -
	Average	1.171	0.582-2.356
	High	1.598	1.310-1.852
Constant		0.183	- -

were also studied. It is seen that per capita consumption of both protein and fat are in the higher side in Cases than Controls. Consumption of deep fried food is believed to be another possible cause of breast cancer. In our study we tried to judge the effect of these type of food consumption. One individual may consume vegetables and /or meat and /or fish as deeply fried. We considered the consumption pattern of that individual as her highest consumption pattern in any of these three groups i.e., If she consumes deep fried vegetables 'often' deep fried meat 'never' and deep fried fish 'rarely' then her consumption pattern of deep fried food was taken as 'often'.

Table 3 gives the odds ratios and their 95% confidence intervals. It was found that unmarried females are at 2.104 times more risk than married females. Interestingly, females with higher education have more odds of breast cancer. Generally, in this part of the country higher education, especially in females shows the higher standard of living. It was seen that females with education level up to high school or college are at 1.522 and 1.709 times higher odds than the illiterates. Strange set of results are seen in case of physical activity, it is seen higher the amount of physical activity higher the odds of breast cancer. The reason for such result was investigated and it was found that after being diagnosed with cancer the physical movement of the females reduced significantly and at the time of the survey they reported this reduced time. This experience should be taken into account in future while collecting data for similar studies.

Never consuming deep fried food was taken to be the baseline value and odds ratio (O.R.) with 95% Confidence Interval (C.I.) are computed for all the groups. The group which 'often' consume deep fried food and 'most of the times' consume deep fried food are found to be most vulnerable groups so far the risk of breast cancer is concerned. Similarly, it was seen female with very high standard of living and B.M.I. more than 30 are in high risk group. Also, high per capita protein consumption per week and high per capita fat consumption per week are found to be most at risk group.

Discussion

This study is the first to relate the different factors associated with breast cancer in Eastern India. Higher risk is found to be associated with higher standard of living, higher consumption of deep fried food, higher B.M.I, higher per capita protein and fat consumption per week. Further studies are necessary with improved Data collection and including other parameters like hours and type of physical activity, awareness of the disease and psychosocial states of the subject.

Etiology of breast cancer has been determined by several case-control studies across the globe Friedenreich et al (2001) through a population based case control study in Alberta, Canada, in 1995-1997 examined the effect of lifetime physical activity patterns on breast cancer risk. No association between physical activity and breast cancer was found for premenopausal women. This study provides evidence that lifetime total activity reduces risk of post menopausal breast cancer. Steindrof et al (2003) collected data on physical activity from sports, occupational activity, household tasks, walking and cycling by reported frequency, duration and intensity during adolescence and young adulthood in 1999-2000 from 360 premenopausal breast cancer cases and 886 control who had previously participated in a German population based case control study. Through a multivariate conditional logistic regression they showed that no association between total physical activity and premenopausal breast cancer was found in two age periods. These data do not suggest and inverse monotonic association between physical activity and breast cancer risk in premenopausal women. This study prevalence of cycling and walking for transportation demonstrated that national habits need consideration in the exposure assessment.

Wu et al (2004) conducted a study to identify reproductive and dietary factors associated with benign proliferative mammary epithelial cell changes among women enrolled in a randomized trial of breast self-examination in Shanghai, China. It was found that no single nutrient or botanical family was appreciably more strongly associated with proliferative conditions than with non proliferative conditions, after result were control for total fruit and vegetable consumption. A diet rich in fruits and vegetables may reduce cellular proliferation in the mammary epithelium; this is one mechanism by which such a diet significantly increases with higher

consumption of total fat, frequent intake of fried food and sweets. Some Cohort studies report modest association in relation to consumption of vegetables and fruits (Smith-Warner et al., 2001). Wakai et al (2000) showed that consumption of macro nutrients particularly fat intake is a major determinant of breast cancer risk in Indonesia. Stronger association of macro nutrients were detected among premenopausal women than among postmenopausal women. Hunter and Willett (1996) claimed that no association between fat and breast cancer would be found even in a setting where fat intake is low, because international ecological studies suggested a linear correlation between par capita fat intake and breast cancer incidence and gave no evidence for a threshold.

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