Risk Factors Associated with Breast Cancer among Women in Warri and Ibadan, Nigeria

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ABSTRACT

OBJECTIVE

Breast cancer is a common cause of death among Nigerian women. Identifying some of the risk factors is vital to strategic intervention in breast cancer control. This study was carried out to determine risk factors associated with breast cancer among women in two referral hospitals in Nigeria.

METHODS

A case control study was carried out among 266 women aged 20-80 years. The participants with breast cancer and the comparison group (controls) were matched in the ratio of 1:3 respectively for age and duration of stay in the area of residence. A semi-structured questionnaire was used to collect data on socio-demographic characteristics, family history of breast cancer, dietary pattern, nutritional status, physical activity and environmental factors.

RESULTS

The mean age of the respondents was 48.7±11.8 years. Family history of breast cancer was reported by 6.2% of the cases and 5.0% of control group. Dietary pattern revealed that the cases (69.2%) significantly had high risk consumption pattern for high calorie containing foods than the controls (54.7%). Significantly more of the controls than cases had engaged in good physical exercise (17.9% versus 6.2%). The odds of developing breast cancer was four times higher among women who reported daily exposure to fumes from automobiles and electricity generating plants than those who were rarely exposed (OR=4.40, CI=1.25-15.57) and seven times higher among women who reported occasional exposure to wastes from operating industries than those who were rarely exposed (OR=6.91, CI=2.87-16.66).

CONCLUSION

Major risk factors for breast cancer among women in this study were lack of exercise, high calorie intake, and environmental pollutants. Health education to improve knowledge of self-protection against pollutants and healthy dietary habits may reduce risk of breast cancer.

Keywords: *Breast cancer; Risk factors; Environmental pollutants; Dietary pattern; Nigeria.*

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INTRODUCTION

Breast cancer is the most common malignancy in women with one million new cases in the world each year, accounting for up to 18% of all female cancers[1]. The actual cause of breast cancer is unclear but studies in Nigeria and globally have implicated a wide variety of factors like age [2] gender[3], heredity [4], reproductive status [5], diet [6], anthropometric characteristics [7,8], psychological factors [9] and environmental factors [2,10] as possible etiological factors.

The high morbidity and mortality associated with the breast cancer in Nigerian women is

very disturbing. This is because of late detection and diagnosis of the disease a scenario that also occurs in other developing countries[11]. However, breast cancer remains one of the most preventable and manageable cancers with the improved understanding of the aetiology and predisposing risk factors in specific geographical areas. To enhance our understanding of the disease, there is a need to carefully evaluate earlier proposed risk factors and offer recommendations suitable for each society [8]. The present study was aimed at determining risk factors associated with breast cancer among women in two Nigerian referral hospitals located in Warri (South-South) and Ibadan (South-West), Nigeria.

METHODOLOGY

A case control study in the ratio of 1:3 matching for age and duration of stay in area of residence was conducted. The study population consisted of 266 women aged 20-80years. All consecutive cases of breast cancer in the Departments of Surgery and Radiotherapy of the Warri Central Hospital, Delta State and University College Hospital (UCH), Ibadan, Nigeria, from June 2011 to February 2012 were recruited at their first clinic presentation, after obtaining informed consent. There were 35 cases from Warri Central Hospital, Delta State and 30 cases from University College Hospital, Ibadan. At the UCH, all breast cancer patients not residing in Ibadan were excluded from the study. Comparison group were community-based and purposively selected from the enumeration areas where cases were resident in Warri (111) and Ibadan (90). A semi-structured questionnaire was used to collect data on socio-demographic characteristics, family history of breast cancer, dietary pattern, nutritional status, physical activity and environmental factors. Food frequency questionnaire was developed for the purpose of this study and used to assess high risk food intake where consumption of high calorie-containing foods ≥ 3 times a week was categorized as high and <3 times a week as low. Body mass index (kg/m^2) and waist-to-hip ratio were used to determine respondent's nutritional status and abdominal fat, respectively. Physical activity was measured using World Health Organisation standard [12] where exercise for at least three times per week was categorised as good while less than three times a week as poor. Frequency of exposure to automobile, generator, industrial fumes and effluents was categorised qualitatively as daily, occasional and rarely. Data were analysed using descriptive statistics, Chi-square test and logistic regression at 5% level of significance. In the statistical analysis, breast cancer was made the dependable variable while variables that were significant from the Chi square analysis were made the independent variables for stepwise logistic regression analysis.

RESULTS

Table I shows the socio demographic distribution of the respondents. There were more cases 35(53.8%) in Warri than Ibadan 30(46.2%). As shown in Table I, the control group had more education than the cases as most of them had tertiary education while most of the cases did not have more than secondary education. This difference was however not statistically significant. A higher proportion of cases 9(13.8%) also engaged in semi-skilled occupation compared to controls 17(8.5%) who were more skilled.

Table I: Socio Demographic Characteristics of Respondents

Variable	Case N=65 n(%)	Control N=201 n(%)	Total N=266 n(%)
Location			
Warri	35(53.8)	111(55.2)	146(54.9)
Ibadan	30(46.2)	90(44.8)	120(45.1)
Educational level			
No formal education	11(16.9)	23(11.4)	34(12.8)
Primary	12(18.5)	27(13.4)	39(14.7)
Secondary	23(35.4)	70(34.8)	93(35.0)
Tertiary	19(29.2)	81(40.3)	100(37.6)
Occupation			
Skilled	18(27.7)	58(28.9)	76(28.6)
Semi skilled	9(13.8)	17(8.5)	26(9.8)
Unskilled	38(58.5)	126(62.7)	164(61.7)
Marital status			
Married	46(70.8)	151(75.1)	197(74.1)
Single/never married	7(10.8)	7(3.5)	14(5.3)
Separated	0.0	10(5.0)	10(3.8)
Widowed	12(18.5)	33(16.4)	45(16.9)

The relationship between family history of breast and other cancers among cases and the control group is presented in Table II. A small proportion (5.3%) and (3.4%) of the respondents reported a family history of breast and/or other types of cancers respectively.

Table II: Family History of Breast and other Cancers

Variable	Case N=65 n(%)	Control N=201 n(%)	Total N=266 n(%)	Level of significance
Family history of breast cancer				
Yes	4(6.2)	10(5.0)	14(5.3)	χ^2= 0.14,
No	61(93.8)	191(95.8)	252(94.7)	p = 0.71
Relationship with family member who had breast cancer				
Maternal	3(75.0)	5(50.0)	8(57.1)	χ^2= 1.14,
Paternal	1(25.0)	3(30.0)	4(28.6)	p = 0.57
Both	0.0	2(20.0)	2(14.3)	
Family history of other cancer types				
Yes	1(1.5)	8(4.0)	9(3.4)	χ^2= 0.90,
No	64(98.5)	193(96.0)	257(96.6)	p = 0.34

The consumption pattern for some selected high calorie containing food items by cases and the control group is presented in Table III. It was found that there was a higher proportion of controls than cases who significantly had high consumption of melon/ogbono (44.3% versus 20.0%), fresh meat (93.0% versus 83.1%) and canned foods like tin tomatoes, canned corn, sardines, etc (21.4% versus 4.6%), respectively. On the other hand, more cases 45(69.2%) than controls 110(54.7%) significantly had high consumption of frozen chicken.

Table III: Selected Calorie Containing Food Consumption Pattern

Food items	Cases N=65 n(%)	Control N=201 n(%)	Total N=266 n(%)	Level of significance
Melon/Ogbono				
Low	52(80.0)	112(68.7)	164(61.7)	χ^2= 12.25, p
High	13(20.0)	89(44.3)	102(38.3)	< 0.001
Groundnut/cashew nut				
Low	55(84.6)	159(79.1)	214(80.5)	χ^2= 0.95, p
High	10(15.4)	42(20.9)	52(19.5)	= 0.33
Palm/Vegetable oil				
Low	5(7.7)	11(5.5)	16(6.0)	χ^2= 0.43, p
High	60(92.3)	190(94.5)	250(94.0)	= 0.51
Butter/Mayonnaise				
Low	44(67.7)	143(71.1)	187(70.3)	χ^2= 0.28, p
High	21(32.3)	58(28.9)	79(29.7)	= 0.60
Red meat				
Low	11(16.9)	14(7.0)	25(9.4)	χ^2= 5.72, p
High	54(83.1)	187(93.0)	241(90.6)	= 0.02
Frozen chicken				
Low	20(30.8)	91(45.3)	111(41.7)	χ^2= 4.25, p
High	45(69.2)	110(54.7)	155(58.3)	= 0.04
Smoked fish				
Low	35(53.8)	124(61.7)	159(59.8)	χ^2= 1.26, p
High	30(46.2)	77(38.3)	107(40.2)	= 0.26
Suya				
Low	59(90.8)	172(85.6)	231(86.8)	χ^2= 1.16, p
High	6(9.2)	29(14.4)	35(13.2)	= 0.28
Beer				
Low	60(92.3)	91(95.0)	251(94.4)	χ^2= 0.68, p
High	5(7.7)	10(5.0)	15(5.6)	= 0.41
Ogogoro				
Low	61(93.8)	192(95.5)	253(95.1)	χ^2= 9.67, p
High	4(6.2)	9(4.5)	13(4.9)	= 0.59
Canned foods				
Low	62(95.4)	158(78.6)	220(82.7)	χ^2= 3.74, p
High	3(4.6)	43(21.4)	46(17.3)	= 0.00

Respondents' anthropometric indices are presented in Table IV below. The prevalence of obesity (as measured by BMI) was 45.5% and was significantly more among the control group than the cases (51.2% vs. 27.7%), p=0.00. The overall prevalence of high abdominal fat was 44.4% and was significantly more among cases than the comparison group (78.5% vs. 48.3%), p=0.00.

Table IV: Anthropometric Indices of Respondents

Variable	Case N=65 n(%)	Control N=201 n(%)	Total N=266 n(%)	Level of significance
BMI				
Normal	20(30.8)	55(27.4)	75(28.2)	χ^2= 13.77, p <
Overweight	27(41.5)	43(21.4)	70(26.3)	0.001
Obese	18(27.7)	103(51.2)	121(45.5)	
WHR				
High abdominal fat	51(78.5)	97(48.3)	148(55.6)	χ^2= 18.15, p <
Low abdominal fat	14(21.5)	104(57.1)	118(44.4)	0.001

The lifestyle of respondents is presented in Table V below. Higher proportion of the comparison group 36(17.9%) compared with cases 4(6.2%) reported having engaged in exercise for at least three times a week. The difference was statistically significant.

Table V: Respondents lifestyle based on physical activity, alcohol intake and cigarette smoking

Variable	Case N=65 n(%)	Control N=201 n(%)	Total N=266 n(%)	Level of significance
Exercise at least 3x a week				
Yes	4(6.2)	36(17.9)	40(15.0)	χ^2= 5.31, p = 0.02
No	61(93.8)	165(82.1)	226(85.0)	
Exercise when younger				
Yes	14(21.5)	51(25.4)	65(24.4)	χ^2= 2.06, p = 0.36
No	50(76.9)	140(69.7)	190(71.4)	
Don't know	1(1.5)	10(5.0)	11(4.1)	
Type				
Exercise(running,	15(23.1)	48(23.9)	63(23.7)	χ^2= 0.02, p = 0.90
dancing etc)	50(76.9)	153(76.1)	203(76.3)	
None				
Do you take alcohol				
Yes	18(27.7)	49(24.4)	67(25.2)	χ^2= 0.29, p = 0.59
No	47(72.3)	152(75.6)	199(74.8)	
Ever smoked cigarettes?				
Yes	0.0	2(1.0)	2(0.8)	P= 1(Fisher's
No	65(100.0)	199(99.0)	264(99.2)	

The environmental factors that the cases and the comparison group were exposed to are presented in Table VI below. A significantly higher proportion of the cases 61(93.8%) than comparison group 142(70.6%) mentioned they were always exposed to fumes from exhaust of cars, motor bikes or generators. Also, significantly more cases 47(72.3%) than comparison group 72(35.8%) reported that they were sometimes exposed to effluents from industries. There were significantly higher proportion of the cases 29(44.6%) than comparison group 48(23.9%) among those who reported borehole as the main source of water for domestic use.

Table VI: Frequency distribution of exposure to environmental pollutants among case and control

Frequency of exposure to environmental pollutants	Case N=65 n(%)	comp group N=201 n(%)	Total N=266 n(%)	Level of significance
Fumes from exhaust of cars or motorbikes, or generators				
Daily	61(93.8)	142(70.6)	203(76.3)	χ^2= 14.63,
Sometimes	4(6.2)	59(29.4)	63(23.7)	p = 0.00
Smoke from cooking with firewood				
Daily	17(26.2)	58(28.9)	75(28.2)	χ^2= 0.90,
Sometimes	42(64.6)	131(65.2)	173(65.0)	p = 0.64
Rarely	6(9.2)	12(6.0)	18(6.8)	
Insecticides/pesticides				
Daily	2(3.1)	12(6.0)	14(5.3)	χ^2= 10.63,
Sometimes	53(81.5)	181(90.0)	234(88.0)	p = 0.01
Rarely	10(15.4)	8(4.0)	18(6.8)	
Effluents from industries				
Daily	4(6.2)	17(8.5)	21(7.9)	χ^2= 27.06,
Sometimes	47(72.3)	72(35.8)	119(44.7)	p = 0.00
Rarely	14(21.5)	112(55.7)	126(47.4)	
Telecommunication mast				
Daily	1(1.5)	33(16.4)	34(12.8)	χ^2= 11.60,
Sometimes	58(89.2)	141(70.1)	199(74.8)	p = 0.00
Rarely	6(9.2)	27(13.4)	33(12.4)	
Domestic wastes				
Daily	57(87.7)	146(72.6)	203(76.3)	χ^2= 6.21,
Sometimes	7(10.8)	46(22.9)	53(19.9)	p = 0.05
Rarely	1(1.5)	9(4.5)	10(3.8)	
Water source for domestic use				
Borehole	29(44.6)	48(23.9)	77(28.9)	χ^2= 12.07,
Tap water	5(7.7)	10(5.0)	15(5.6)	p = 0.00
Well	31(47.7)	143(71.1)	174(65.4)	

Table VII below presents results for the logistic regression to determine possible predictors of breast cancer. Women with high waist-hip ratio tended to be at lower risk of developing breast cancer (odds ratio, OR = 0.24, 95% CI=0.10-0.60). The odds of developing breast cancer was found to be 4.40 (95% CI=1.25-15.57) times among women who were always exposed to fumes from motorbikes, vehicles, or generators compared with women who were sometimes exposed. Women who were sometimes exposed to effluents from industries showed increased risk of developing breast cancer (OR=6.91, 95% CI=2.87-16.66) compared with those who were never exposed.

Table VII: Logistic regression of predictors for breast cancer

Predictor	OR	95% C.I for OR	P Value
WHR			
High abdominal fat	0.24	0.10-0.60	0.00
Low abdominal fat (Ref)	1		
BMI			
Overweight	1.03	0.38-2.78	0.96
Obese	0.38	0.14-1.02	0.05
Normal(Ref)	1		
Do you engage in anything to keep weight low?			
Yes	0.50	0.00-96.85	0.79
No (Ref)	1		
Type of activity			
Exercise	0.50	0.00-96.85	0.79
Diet	1.13	0.003-17.92	0.97
None(Ref)	1		
Do you do any vigorous exercise at least three times a week?			
Yes	0.46	0.10-2.18	0.33
No(Ref)	1		
How frequent are you exposed to fumes from motor bikes, vehicles, generators			
Always	4.40	1.25-15.57	0.02
Sometimes(Ref)	1		
How frequent are you exposed to insecticides or other pesticides			
Always	0.23	0.02-2.62	0.24
Sometimes	0.38	0.09-1.67	0.20
Never(Ref)	1		
How frequent are you exposed to effluents from industries			
Always	5.07	0.95-26.93	0.06
Sometimes	6.91	2.87-16.66	0.00
Never(Ref)	1		
How frequent are you exposed to telecommunication mast	0.03	0.00-0.42	0.01
Always	0.50	0.12-2.19	0.36
What are your water sources for domestic use?			
Borehole	1.17	0.53-2.60	0.70
Tapwater	3.22	0.44-23.72	0.25
Well	1		

DISCUSSION

This study sought to identify the relationships of a number of risk factors, both known and suspected, with breast cancer risk among women in Warri and Ibadan communities. There were no established risk factors from past studies that were identified to be risk factor in this study. Only few suspected but not established risk factors were identified after adjusting for confounding factors.

This study did not show a relationship between breast cancer risk and family history of breast cancer and other types of cancer. This does not support the findings from past case control studies [2,8],carried out to identify risk factors for breast cancer among Nigeria women which found family history to have a positive association with breast cancer. Though studies have implicated inheritable genes like the Br Ca genes in the aetiology of breast cancers[13,14], less than 5% of the total breast cancer incidence can be explained by known breast cancer susceptibility genes, and little is still known about how they confer their increased risk for breast cancer susceptibility [15] This may explain the reason why though family history of breast cancer remains among the most important risk factors for the disease, the risk conferred is not absolute or certain[15].

Several studies have looked at possible linkages between single nutrient intake as well as foods or dietary patterns and breast cancer [15-18, 19,20]. There has only been limited evidence suggesting that consumption of total dietary fat and special dietary patterns influence breast cancer risk, but no internationally accepted conclusion has been reached up till now[12,21]. However in the current study, at bivariate analysis, possible association of reported consumption of frozen chicken, red meat, melon/ogbono and canned food with breast cancer was demonstrated as shown by higher proportion of these food items among cases than control. Alcohol, smoked fish, fats and oils consumption did not show positive associations with breast cancer. The influence of anthropometric measures on breast cancer risk has been the subject of many studies [7, 24,25]. In the present study, no significant relationship was found between BMI and breast cancer. Although this study used a fewer sample size, the findings are consistent with that of Ogundiran, et al[25],who conducted a case control study in Ibadan using 1,000 cases and 1,000 controls. Their study did not find a significant relation between body weight and breast cancer risk but rather found an inverse relationship between BMI and breast cancer risk. The inverse association between BMI and breast cancer in Nigerian women was consistent with many previous studies [7], though some contrasting reports exist. A cohort study in African Americans also showed that a high BMI was associated with reduced risk of

breast cancer [26]. However, several studies of African Americans also found inconsistent results, with high BMI being associated with an increased risk of postmenopausal breast cancer [27], or showing no association [28].

Furthermore, another observation in this study was that high abdominal fat showed an inverse relationship with breast cancer risk. This finding is in contrast to that of Adebamowo, et al[7]who found a positive relationship between waist-hip ratio (WHR) and breast cancer risk among postmenopausal women. However, it is important to note that majority of the women in the present study are in their premenopausal stage thus probably the reason for the inverse relationship found between WHR and breast cancer risk.

There is convincing evidence for a decreased risk of breast cancer with increased physical activity[29]. Uncertainties remain, however, about the role of different types of physical activity on breast cancer risk and the potential effect modification for these associations [30]. In this study, it was found that higher proportion of the women with breast cancer reported that they had little or no exercise both when younger and currently. The frequency distribution of those who reported they engaged in physical activity in this study showed that a significant higher proportion of controls than cases reported that they exercise currently for at least three times a week. It may be deduced that the reason why more controls than cases currently exercise for at least three times a week was because the cases are already sick with breast cancer therefore lack energy and motivation to exercise unlike the controls.

Polycyclic aromatic hydrocarbons are very common in the environment and are largely present in the atmosphere, rivers and oceans, soil and processed foods [7]. Similarly the finding in this study suggested significant association between some environmental factors and breast cancer risk after adjusting for confounding factors. A similar study conducted in Ibadan and Port Harcourt have implicated environmental factors especially high levels of aromatic hydrocarbons and living in industrialised zones as risk factors for cancers[10]. The main limitation of this study is recall bias and this could have resulted in misclassification bias with effect on the measured effect.

CONCLUSION

The study aimed at identifying risk factors for breast cancer among women in Warri, Delta State and Ibadan in Oyo state. The study design was analytical and a total of 65 breast cancer cases and 201 community controls were recruited from June 2011 to January 2012. This study assessed a number of both established and suspected risk factors for breast cancer. Pending more research and validation, the finding of the relationship between some environmental factors and breast cancer risk could be useful to health authorities in planning interventions to reduce breast cancer incidence and mortality in Nigeria.

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