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BREAST CANCER RISK FACTORS AMONG WOMEN DWELLING IN INDUSTRIALIZED CITIES IN SOUTHERN NIGERIA

Kelechi Elizabeth Oladimeji*[1,2], Ikeoluwapo Oyeneye Ajayi[3], Joyce M. Tsoka- Gwegweni[1], Oluwole Jegede[4], Olanrewaju Oladimeji[1,2]

[1]Public Health Medicine, University of Kwa Zulu-Natal, Durban, South Africa.
[2]Center for Community Healthcare, Research and Development, Nigeria.
[3]Department of Epidemiology and Medical Statistics, Faculty of Public Health, University of Ibadan, Nigeria.
[4]Milken Institute of Public Health, George Washington University, Washington D.C, United State of America.

***Correspondence for Author: Kelechi Elizabeth Oladimeji**

Public Health Medicine, University of Kwa Zulu-Natal, Durban, South Africa.

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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, Case-control, Environmental pollutants, Dietary pattern, Nigeria.

INTRODUCTION

Breast cancer is the most common malignancy in women with one million new cases in the world each year, and accounts for up to 18% of all female cancers.[1] This disease is also the leading cause of cancer-related death amongst women worldwide.[2,3] The risk factors of this disease are numerous, and their prevalence varies between racial and ethnic groups as well as geographical regions.[4] The actual cause of breast cancer is unclear but studies in Nigeria and globally have implicated a wide variety of factors like age, gender, heredity, reproductive, diet, anthropometric characteristics, psychological factors and environmental factors as possible etiological factors.[5-10]

The high morbidity and mortality associated with the breast cancer in Nigerian women is very disturbing. This is because of late detection and diagnosis as with other developing countries.[7,9]

However, breast cancer remains one of the most preventable and manageable cancers with the improved understanding of the etiology 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.[7, 9-10]

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.

METHODS

Ethical approval for the study was obtained from the Institutional Review Board of the University of Ibadan and University College Hospital, Ibadan and Warri Central Hospital Ethical Review Committee,

Delta State Ministry of Health on June and July, 2011 respectively. Informed consent was obtained from the patients. Patient information was anonymized and de-identified prior to analysis. The named ethics committees approved the study.

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 20-80 years. 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/July 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/m2) and waist-to-hip ratio were used to determine respondent's nutritional status and abdominal fat, respectively. Physical activity was measured using World Health Organization standard 12 where exercise for at least three times per week was categorized as good while less than three times a week as poor. Frequency of exposure to automobile generator, industrial fumes and effluents was categorized qualitatively as daily, occasional and rarely. Data were analyzed 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 1 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. The relationship between family history of breast and other cancers among cases and the control group is presented in Table 2. Few (5.3%) and (3.4%) of the respondents reported a family history of breast and/or other types of cancers respectively.

The consumption pattern for some selected high calorie containing food items by cases and the control group is presented in Table 3. It was found that there was a higher proportion of controls than cases who significantly had high consumption of melon/ogbono "Irvingia gabonensis" (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.

Respondents' anthropometric indices are presented in Table 4 below. The prevalence of obesity (as measured by BMI) was 45.5% and was significantly higher among the control group than the cases (51.2% vs. 27.7%), $p<0.001$. The overall prevalence of high abdominal fat was 44.4% and was significantly higher among cases than the comparison group (78.5% vs. 48.3%), $p<0.001$.

A comparison of statistically significant anthropometric indices in table 4 was carried out between cases and controls by study site (see Table 5 below). Prevalence of obesity was significantly higher among controls than cases in Warri (34.2%) versus 28.6%) and Ibadan (72.2% versus 26.7%) respectively. High abdominal fat was significantly higher among cases than controls in Warri (77.1% versus 41.4%) and Ibadan (80.0% versus 56.7%) respectively. The lifestyle of respondents is presented in Table 6 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.

The environmental factors that the cases and the comparison group were exposed to are presented in Table 7 below. Significantly, higher proportion of the cases 61(93.8%) than controls 142(70.6%) was always exposed to fumes from exhaust of cars, motor bikes and generators. There were significantly more controls 12(6.0%) than cases 2(3.1%) who reported daily exposure to insecticides and pesticides. More cases 47(72.3%) than controls 72(35.8%) reported to have been sometimes exposed to effluents from industries. A higher proportion of controls 33(16.4%) reported to have been daily exposed to telecommunication masts.

The frequency of exposure to environmental pollutants among cases and controls in both study sites are presented in Table 8. A higher proportion of cases [(33(94.3%) and 28(93.3%)] than controls [(89(80.2%) and 53(58.9%)] in both Warri and Ibadan respectively were always exposed to fumes from cars, bikes, generators. In Ibadan, lower proportion of cases 2(6.7%) reported that they were sometimes exposed to fumes from vehicles, generators and bike

compared to controls 37(41.1%). More cases in Warri were always 3(8.6%) and sometimes 29(82.9%) exposed to effluents from industries compared to controls who were always 9(8.1%) and sometimes 55(49.5%) exposed (χ^2 = 14.00, p<0.001). Also, in Ibadan, a higher proportion of cases was sometimes 18(60.0%) exposed to effluents from industries compared to controls17 (18.9%) (χ^2 = 18.46, p<0.001).

Table 9 below presents results for the logistic regression to determine possible predictors of breast cancer. The odds of women with high waist hip ratio developing breast cancer was less than women with low waist hip ratio (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 more among women who were always exposed to fumes from motorbikes, vehicles, and generators compared to 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 to those who were never exposed while those who were always exposed showed an increased risk but was not significant (OR=5.07, 95% CI=0.95-26.93). The odds of developing breast cancer was found to be 33.33 (95% CI=<0.001-0.42) times less likely for women who were always exposed to telecommunication masts.

TABLES

Table 1: Family History of Breast and other Cancers

Varibale	Cases N=65 n(%)	Controls N=201 n(%)	Total N=266 n(%)	OR (95% CI)	p value
Family history of breast cancer					
Yes	4(6.2)	10(5.0)	14(5.3)	1.25 (0.38 – 4.14)	0.71
No	61(93.8)	191(95.8)	252(94.7)		
Family history of other types of cancer					
Yes	1(1.5)	8(4.0)	9(3.4)	0.38 (0.05 – 3.07)	0.34
No	64(98.5)	193(96.0)	257(96.6)		

* Significant at 5% level of significance

Table 2: Family History of Breast and other Cancers.

Variable	Cases N=65 n(%)	Controls N=201 n(%)	Total N=266 n(%)	OR (95%CI)	p value
Family history of breast cancer					
Yes	4(6.2)	10(5.0)	14(5.3)	1.25	0.71
No	61(93.8)	191(95.8)	252(94.7)	(0.38-4.14)	
Family history of other types of cancer					
Yes	1(1.5)	8(4.0)	9(3.4)	0.38	0.34
No	64(98.5)	193(96.0)	257(96.6)	(0.05-3.07)	

*Significant at 5% level of significance.

Table 3: Selected Calorie Containing Food Consumption Pattern

Food items	Cases N=65 n(%)	Controls N=201 n(%)	Total N=266 n(%)	OR (95% CI)	p value
Egusi (melon)/Ogbono					
Low	52(80.0)	112(68.7)	164(61.7)	3.18 (1.64 – 6.2)	< 0.0001*
High	13(20.0)	89(44.3)	102(38.3)		
Groundnut/cashew nut					
Low	55(84.6)	159(79.1)	214(80.5)	1.45 (0.68 3.09)	0.33
High	10(15.4)	42(20.9)	52(19.5)		
Palm/Vegetable oil					
Low	5(7.7)	11(5.5)	16(6.0)	1.44 (0.48-4.31)	0.51
High	60(92.3)	190(94.5)	250(94.0)		
Butter/Mayonnaise					
Low					

	44(67.7)	143(71.1)	187(70.3)	0.85 (0.47-1.55)	0.60
High	21(32.3)	58(28.9)	79(29.7)		
Fresh meat					
Low	11(16.9)	14(7.0)	25(9.4)	2.72 (1.77-6.34)	0.02*
High	54(83.1)	187(93.0)	241(90.6)		
Frozen chicken					
Low	20(30.8)	91(45.3)	111(41.7)	0.54 (0.30-0.97)	0.04*
High	45(69.2)	110(54.7)	155(58.3)		
Smoked fish					
Low	35(53.8)	124(61.7)	159(59.8)	0.72 (0.41-1.27)	0.26
High	30(46.2)	77(38.3)	107(40.2)		
Suya					
Low	59(90.8)	172(85.6)	231(86.8)	1.66 (0.66-4.19)	0.28
High	6(9.2)	29(14.4)	35(13.2)		
Canned foods					
Low	62(95.4)	158(78.6)	220(82.7)	5.62 (1.68-18.8)	0.00*
High	3(4.6)	43(21.4)	46(17.3)		
Tin tomatoes					
Low	56(27.2)	150(74.6)	206(77.4)	2.12 (0.98-4.58)	0.05
High	9(13.8)	51(25.4)	60(22.6)		

* Significant at 5% level of significance.

Table 4: Anthropometric Indices of Respondents

Variable	Cases N=65 n(%)	Controls N=201 n(%)	Total N=266 n(%)	OR (95% CI)	p value
Body Mass Index (BMI)					
Normal	20(30.8)	55(27.4)	75(28.2)	1.18 (0.64 – 2.17)	<0.0001*
Overweight	45(69.2)	146(72.6)	191(71.8)		
Waist Hip Ratio (WHR)					
High abdominal fat	51(78.5)	97(48.3)	148(55.6)	3.91 (2.03 – 7.5)	<0.0001*
Low abdominal fat	14(21.5)	104(57.1)	118(44.4)		

Table 5: Respondents anthropometric indices by study site.

Variable	Warri Cases N=111 n(%)	Controls N=35 n(%)	OR (95% CI)	p value	Ibadan Cases N=30 n(%)	Controls N=90 n(%)	OR (95% CI)	p value
BMI Normal	10(28.6)	47(42.3)	0.54	0.08	10(33.3)	8(8.9)	5.13	<0.0001*
Overweight	25(71.4)	64(57.7)	(0.24-1.24)	20(66.7)		82(91.1)	(1.79-14.65)	
WHR								
High abdominal fat	27(77.1)	46(41.4)	4.77	<0.0*	24(80.0)	51(56.7)	3.06	0.02*
Low abdominal fat	8(22.9)	65(58.6)	(1.98-1.44)	6(20.0)		39(43.3)	(1.14-8.21)	

Table 6: Respondents lifestyle based on physical activity, alcohol intake and cigarette smoking

Variable	Cases N=65 n(%)	Controls N=201 n(%)	Total N=266 n(%)	OR (95% CI)	p value
Exercise at least 3x a week					
Yes	4(6.2)	36(17.9)	40(15.0)	0.3 (0.1- 0.88)	0.02* (Fisher's)
No	61(93.8)	165(82.1)	226(85.0)		
Exercise when younger					
Yes	14(21.5)	51(25.4)	65(24.4)	0.68 (0.35-1.31)	0.36
No	51(76.9)	150(69.7)	201(71.4)		
Do you take alcohol					
Yes	18(27.7)	49(24.4)	67(25.2)	1.19 (0.63-2.23)	0.59
No	47(72.3)	152(75.6)	199(74.8)		
Ever smoked cigarettes?					
Yes	0.0	2(1.0)	2(0.8)	1 (Fisher's)	
No	65(100.0)	199(99.0)	264(99.2)		

* Significant at 5% level of significance

Table 7: Frequency of exposure to some environmental pollutants among cases and controls

Frequency of exposure to environmental pollutants	Cases N=65 n(%)	Controls N=201 n(%)	Total N=266 n(%)	OR (95% CI)	p value
Fumes from exhaust of cars, motorbikes and generators					
Daily	61(93.8)	142(70.6)	203(76.3)	6.34 (2.20-15.22)	<0.0001 (Fisher's)
Sometimes	4(6.2)	59(29.4)	63(23.7)		
Smoke from cooking with firewood					
Daily	17(26.2)	58(28.9)	75(28.2)	0.87 (0.46-1.64)	0.64
Sometimes	48(73.8)	143(71.1)	191(71.8)		
Insecticides/pesticides					
Daily	2(3.1)	12(6.0)	14(5.3)	0.07 (0.01-0.33)	<0.01*
Sometimes	63(96.9)	189(94.6)	252(94.7)		
Effluents from industries					
Daily	4(6.2)	17(8.5)	21(7.9)	0.71 (0.23-2.19)	<0.0001*
Sometimes	61(93.8)	184(91.5)	245(92.1)		
Telecommunication mast					
Daily	1(1.5)	33(16.4)	34(12.8)	0.08 (0.01-0.59)	<0.0001*
Sometimes/Rarely	64(98.5)	168(83.6)	232(87.2)		

* Significant at 5% level of significance.

Table 8: Frequency of exposure to some environmental pollutants among cases and controls by study site.

Frequency of exposure to environmental pollutants	Warri Case N=35 n(%)	Warri Control N=111 n(%)	Warri OR (95% CI)	Warri p value	Ibadan Case N=30 n(%)	Ibadan Control N=90 n(%)	Ibadan OR (95% CI)	Ibadan p value
Fumes from exhaust of cars and motorbikes, generators								
Daily	33(94.3)	89(80.2)	4.8	0.05	28(93.3)	53(58.9)	9.77	<0.0001*
Sometimes	2(5.7)	22(19.8)	(0.91-18.31)	(Fisher's)	2(6.7)	37(41.1)	(2.19-43.57)	(Fisher's)
Insecticides/pesticides								
Daily	1(2.9)	6(5.4)	0.51	0.82	1(3.3)	6(6.7)	0.48	<0.0001*
Sometimes	34(97.1)	94(94.6)	(0.06-4.43)		29(96.7)	84(93.3)	(0.06-4.18)	
Effluents from industries								
Daily	3(8.6)	9(8.1)	1.06	<0.0001*	1(3.3)	8(8.9)	0.35	<0.0001*
Sometimes	32(91.4)	102(91.8)	(0.27-4.16)		29(96.7)	82(91.1)	(0.04-2.95)	
Telecommunication mast								
Daily	0	21(18.9)	-	<0.0001*	1(3.3)	12(13.3)	0.22	0.09
Sometimes	35(100)	90(81.1)			29(96.7)	78(86.7)	(0.03-1.80)	

* Significant at 5% level of significance.

Table 9: Logistic regression to determine predictors of breast cancer.

Characteristics	AOR	95% C.I for OR	P Value
WHR			
High abdominal fat	0.24	0.10-0.60	<0.0001*
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	
Diet	1.13	0.00-317.92	0.79
None(Ref)	1		0.97
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	<0.0001
Never(Ref)	1		
How frequent are you exposed to telecommunication mast			
Always	0.03	0.00-0.42	0.01
Sometimes	0.50	0.12-2.19	0.36
Never(Ref)	1		
Have you experienced loss of a close relative?			
Yes	0.20	0.25-1.33	0.05

No(Ref)	1		
Have you experienced loss of a job?			
Yes	0.00	0.00	1.00
No(Ref)	1		
Have you experienced divorce of parents? Yes	2.67	0.10-18.08	0.31
No(Ref)	1		
How strenuous is your daily activity?			
Not stressful	1.95	0.88-4.29	0.10
Stressful(Ref)	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[5,7] 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 etiology of breast cancers,[12-14] 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.[14] 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.[14]

Several studies have looked at possible linkages between single nutrient intake as well as foods or dietary patterns and breast cancer.[15-22] 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.[11,22-23] However in the current study, at bivariate analysis, possible association of reported consumption of frozen chicken, red meat, melon/ogbono "Irvingia gabonensis" and canned food with breast cancer was demonstrated as shown in table 3. Smoked fish, fats and oils consumption did not show significant associations with breast cancer in this study but it has been documented in 2014 by a systematic review,[23] that diets which include alcoholic beverages may be associated with increased risk. The influence of anthropometric measures on breast cancer risk has been the subject of many studies.[24-27] 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 a previous study.[28] However, several studies among African Americans also found inconsistent results, with high BMI being associated with an increased risk of postmenopausal breast cancer and no association.[27,29] Further observed in this study was that high abdominal fat when adjusted for confounders showed an inverse relationship with breast cancer risk. This finding is in contrast to that of Adebamowo et al. (2003) who found a positive relationship between waist-hip ratio (WHR) and breast cancer risk among postmenopausal women.[28]

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.[30] In addition the inverse relationship found in this study between WHR and breast cancer could probably be due to the fact that most of the cases had lost weight as a result of their ill health.

It however remains uncertain the role of different types of physical activity on breast cancer risk and the potential effect modification for these associations.[31] 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.

This study suggested significant association between some environmental factors and breast cancer risk after

adjusting for confounding. In 2010, Ana et al carried out an ecologic study which assessed disparities between environmental risk factors and cancers in two Nigerian cities. Environmental data were obtained for Port Harcourt and Ibadan cities respectively. Ten- year cancer records were also obtained from the University of Port Harcourt Teaching Hospital (UPTH), Port Harcourt and the University College Hospital (UCH), Ibadan. They found environmental risk factors particularly levels of polycyclic aromatic hydrocarbons was in air though it was higher in Port Harcourt than Ibadan locality ($p < 0.05$) and further concluded that people living in industrialized communities with increased environmental risk factors are likely to have a higher probability to develop cancers but however suggested that in-depth studies are required to establish empirical links between the identified environmental risk factors and the prevalence of cancers.

The study sites Warri and Ibadan are industrialized cities thus women who must have lived there for more than five years could be exposed to carcinogens which lead to the risk of developing breast cancer. This supports the findings of this study which identified increased breast cancer risk for exposures to effluents. Epidemiological studies of environmental exposures are extremely challenging to conduct, because of difficulties in exposure assessment and for many pollutants, finding women who are unexposed. To investigate the possible role of pollutants classified as carcinogenic, or potentially carcinogenic, it is necessary to conduct large, well- designed studies with longer follow-up of existing cohorts of women exposed to high doses of environmental pollutants.

CONCLUSION

This study aimed at identifying risk factors for breast cancer among women in Warri, Delta and Ibadan, 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 of which some environmental risk factors were identified. There is a need for more research on the relationship between environmental factors and breast cancer risk. Breast cancer risk factors from findings are obviously more of modifiable factors like lifestyles, diet and environmental exposures than age and family history. In conclusion, preventive strategies could help reduce the burden of breast cancer if new studies confirm the present results. In addition, health education, awareness campaign to improve the adoption of a healthy dietary habit and lifestyle may reduce the risk and burden of breast cancer among Nigerian women and globally.

CONFLICT OF INTEREST

The authors declare no competing interest.

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AUTHOR CONTRIBUTIONS

KEO and IOA were involved in designing the study. All the authors participated in the drafting of this manuscript, reviewed and approved the final draft

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REFERENCES

1. GLOBOCAN. Cancer fact sheet. International Agency for Research on Cancer. Section of cancer information. 2008. Accessed 29th May, 2012.
2. Jemal A, Bray F, Center MM, Ferlay J, Ward E, Forman D. Global cancer statistics. CA Cancer J Clin, 2011; 61(2): 69–90.
3. Youlden DR, Cramb SM, Dunn NA, Muller JM, Pyke CM, Baade PD. The descriptive epidemiology of female breast cancer: an international comparison of screening, incidence, survival and mortality. Cancer Epidemiology, 2012; 36(3): 237–248.
4. Elkum N, Al-Tweigeri T, Ajarim D, Al-Zahrani A, Amer SMB, Aboussekhra A. Obesity is a significant risk factor for breast cancer in Arab women. BMC Cancer, 2014; 14: 788.
5. Bevier M, Sundquist K, Hemminki K. Risk of breast cancer in families of multiple affected women and men. Breast Cancer Research and Treatment, 2012; 132(2): 723-728.
6. Jemal A, Center M, DeSantis C. Global Patterns of Cancer Incidence and Mortality Rates and Trends. Cancer Epidemiology Biomarkers and Prevention, 2010; 19: 1893-1907.
7. Okobia M, Bunker C, Zmuda J, Kammerer C, Vogel V, Uche E, Anyanwu S, Ezeome E, Ferrell R, Kuller L. Case–control study of risk factors for breast cancer in Nigerian women. International Journal of Cancer, 2006; 119: 2179–2185.
8. Ronit Peled, Devora Carmil, Orly Siboni-Samocha, Ilana Sholam-Vardi. Breast cancer, psychological distress and life events among young women. BioMed Central Cancer, 2008; 8: 245.
9. Ana GREE, Mynepalli KC, Michael Asuzu C. Environmental risk factors and hospital-based

cancers in two Nigerian cities. Journal of Public Health and Epidemiology, 2010; 2(8): 216-223.
10. Lawrence NS, Walter W, Amy S, Knaul FM. Breast Cancer in Developing Countries: Opportunities for Improved Survival. Journal of Oncology, 2010; 2010: 595167-6.
11. World Cancer Research Fund, American Institute for Cancer Research. Food, nutrition, physical activity, and the prevention of cancer: a global perspective. AICR; Washington DC, 2007.
12. Malone KE, Daling JR, Doody DR, Hsu L, Bernstein L, Coates RJ, et al. Prevalence and predictors of BRCA1 and BRCA2 mutations in a population-based study of breast cancer in white and black American women ages 35 to 64 years. Cancer Research, 2006; 66(16): 8297-308
13. Offit K. BRCA mutation frequency and penetrance: New data, old debate. Journal of the National Cancer Institute, 2006; 98(23): 1675-1677.
14. Oldenburg RA, Meijers-Heijboer H, Cornelisse CJ, Devilee P. Genetic susceptibility for breast cancer: How many more genes to be found? Critical Review of Oncology/Hematology, 2007; 63: 125-149.
15. Adebamowo CA, Cho E, Sampson L, Katan MB, Spiegelman D, Willett WC, et al. Dietary flavonols and flavonol-rich foods intake and the risk of breast cancer. International Journal of Cancer, 2005; 114(4): 628-633.
16. Cho E, Spiegelmann D, Hunter DJ. Premenopausal fat intake and risk of breast cancer. Journal of the National Cancer Institute, 2003; 95: 1079–1085.
17. Engeset D, Dyachenko A, Ciampi A. Dietary patterns and risk of cancers of various sites in the Norwegian European Prospective Investigation into Cancer and Nutrition cohort: the Norwegian women and cancer study. European Journal of Cancer Prevention, 2009; 18: 69–75.
18. Mattisson I, Wirfält E, Andrén C, Gullberg B, Berlund G. Dietary fat intake: food sources and dietary correlates in the Malmö diet and cancer cohort. Public Health Nutrition, 2003; 6(6): 559–569.
19. Prentice RL, Thomson CA, Caan B. Low-fat dietary pattern and cancer incidence in the women's health initiative dietary modification randomized controlled trial. Journal of the National Cancer Institute, 2007; 99(20): 1534–1543.
20. Bosetti C, Pelucchi C, La Vecchia C. Diet and cancer in Mediterranean countries: carbohydrates and fats. Public Health Nutrition., 2009; 12(9): 1595–1600.
21. Brennan SF, Cantwell MM, Cardwell CR. Dietary patterns and breast cancer risk: a systematic review and meta-analysis. American Journal of Clinical Nutrition, 2010; 91: 1294–1302.
22. Albuquerque RC, Baltar VT, Marchioni DM. Breast cancer and dietary patterns: a systematic review. Nutr Rev., 2014; 72(1): 1-17.
23. Cade JE, Taylor EF, Burley VJ, Greenwood DC. Common dietary patterns and risk of breast cancer: analysis from the United Kingdom Women's Cohort Study. Nutr Cancer, 2010; 62(3): 300-6.
24. Lahmann PH, Hoffmann K, Allen Nl. Body size and breast cancer risk. Findings from the European Prospective Investigation into Cancer and Nutrition (EPIC). International Journal of Cancer, 2004; 111(5): 762–771.
25. Ogundiran TO, Huo D, Adenipekun A, Campbell O, Oyesegun R, Akang E, Adebamowo C, Olopade OI. Case-control study of body size and breast cancer risk in Nigerian women. American Journal of Epidemiology, 2010; 172: 682–690.
26. Palmer JR, Adams-Campbell LL, Boggs DA. A prospective study of body size and breast cancer in black women. Cancer Epidemiology Biomarkers and Prevention., 2007; 16(9): 1795–1802.
27. Zhu K, Caulfield J, Hunter S. Body mass index and breast cancer risk in African American women. Annals of Epidemiology, 2005; 15(2): 123–128.
28. Adebamowo CA, Ogundiran TO, Adenipekun AA, Oyesegun RA, Campbell B, Akang EU, Rotimi CN, Olopade OI. Waist-hip ratio and breast cancer risk in urbanized Nigerian women. Breast Cancer Research, 2003; 5: R18–R24.
29. McCullough ML, Feigelson HS, Diver WR. Risk factors for fatal breast cancer in African-American women and White women in a large US prospective cohort. American Journal of Epidemiology, 2005; 162(8): 734–742.
30. Steindorf K, Ritte R, Eomois PP, Lukanova A, Tjonneland A, Johnsen N, Overvad K, et al. Physical activity and risk of breast cancer overall and by hormone receptor status: the European prospective investigation into cancer and nutrition. International Journal of Cancer, 2013; 132(7): 1667-1678.
31. Petra HL, Christine F, Jantine S, Simonetta S, Naomi EA, Tim J, Key Kay-Tee Khaw, Sheila Bingham, et al. Physical Activity and Breast Cancer Risk: The European Prospective I.