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Socio-demographic indices and frequency of consumption of vegetables and red meat in Nigerian women with breast cancer

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ABSTRACT

Aim: Breast cancer is a chronic disease with diverse risk factors. Studies on the involvement of socio-demography and diet in breast cancer etiology are inconclusive. The contribution of socio-demography and selected diets to breast carcinogenesis was thus determined in this study.

Methods: A comparative cross-sectional design was used among 169 non-pregnant women. This comprised 85 drug-naive women with breast cancer and 84 apparently healthy women without breast cancer (controls). The cases and controls were matched for age and menstrual status. Semi-structured questionnaire was used to obtain information on socio-demography, diet, and reproductive history. Data were analyzed using Chi-square and binary logistic regression. *p*-values less than 0.05 were considered as statistically significant.

Results: Daily consumers of red meat were more likely to have breast cancer compared with weekly consumers [odds ratio (OR) = 27.728, 95% confidence interval (CI), 8.874–86.638]. Daily and weekly consumers of vegetables were less likely to have breast cancer compared with occasional consumers (OR = 0.263, 95% CI, 0.081–0.859; OR = 0.268, 95% CI, 0.081–0.885, respectively). Moreover, weekly consumers of dairy products were less likely to have breast cancer compared with non-consumers (OR = 0.080, 95% CI, 0.020–0.324).

Conclusion: Red meat consumption was a predictor of breast cancer. However, regular consumption of vegetables, fruits, and dairy products protects against breast cancer.

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KEYWORDS

Socio-demography; breast cancer; trading; diet; vegetable intake

Introduction

Breast cancer is the commonest malignancy in women, worldwide [1,2]. Non-modifiable risk factors such as the family history of breast cancer, parity, lactation, and menstrual history have been extensively studied [3,4]. However, studies on the influence of modifiable risk factors such as diet, lifestyle, socio-demographic and socioeconomic status on breast cancer risk are inconclusive [5–8].

Dietary factors account for approximately 30% and 20% of cancers in industrialized and developing countries, respectively [9]. Intake of fruit and vegetable has been reported to reduce breast cancer risk; however, with inconclusive evidence [10]. The consumption of red meat has been associated with increased risk of breast cancer in some studies, while the association of dairy product intake with breast cancer risk has not been established [11,12]. Some studies observed that processed carbohydrates increase breast cancer risk. They have a high glycemic load; hence, predispose to obesity which increases endogenous estrogen level [9,13].

Socioeconomic status measured by occupation and educational status has been associated with breast cancer incidence and survival [14]. Women of high socioeconomic position appear to have a higher risk of developing breast cancer as a result of exposure to reproductive factors and hormone

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replacement therapy [15]. However, an inverse relationship was reported between high educational status and clinicopathological characteristics of breast cancer [16]. Studies on the relationship between marital status and the risk of breast cancer are controversial. There are reports that being married at the time of diagnosis of breast cancer improves survival. This is attributed to increased social, emotional, and economic support married women enjoyed from their spouses [17].

There are currently conflicting reports on the association of contraceptive use and breast cancer risk. It has been reported that oral contraceptive use increased breast cancer risk. Estrogen and/or progesterone contained in oral contraceptive pills could induce the proliferation of breast cancer cells [18].

Studies on the association of socio-demographic factors, diet, and breast cancer risk are currently inconclusive. This study was designed to determine the contribution of socio-demography and selected diets to breast carcinogenesis.

Materials and Methods

Study design and participants

This study was a comparative cross-sectional design that comprised 169 non-pregnant women aged 28–80 years. Eighty-five (85) were newly diagnosed women with breast cancer who were yet to commence treatment (cases). They were recruited from the Surgical Oncology Clinic, Department of Surgery, University College Hospital, Ibadan, Nigeria. Eighty-four (84) apparently healthy non-pregnant women without breast cancer were recruited as control.

The cases were age-matched individually, i.e., for every case, a control of the same age was recruited. Study participants were also matched on menstrual status, i.e., 30 cases in the follicular phase were matched with 30 controls, 24 cases in the luteal phase were matched with 23 controls, and 31 cases in the postmenopausal phase were matched with 31 controls. Women who reported being on hormonal drugs, who had other types of cancer were excluded from the study.

Ethical considerations

The study protocol was approved by the University of Ibadan and University College Hospital Joint Ethical Review Committee (UI/EC/10/0193). Informed consent was obtained from the participants after the details of the study were explained to them before recruitment into the study.

Study instrument

Semi-structured pre-test questionnaire was administered to each participant to obtain information on socio-demography, diet, and reproductive history.

Statistical analysis

Data were analyzed using the Statistical Package for Social Sciences (SPSS 18.0) SPP, Inc., Richmond, CA. Chi-square and Fischer's exact tests were used to test the association between categorical independent variables and the outcome variable of interest. Binary logistic regression analysis was used to determine the predictors of breast carcinogenesis and $p < 0.05$ was considered as statistically significant.

Results

Table 1 shows socio-demographic indices, family history of breast cancer, and history of contraceptive use in women with and without breast cancer. There was an association between occupation, ethnic group, and breast cancer ($p < 0.05$). There was no difference in age, marital status, educational status, family history of breast cancer, contraceptive use, type of contraceptive, and breast cancer ($p > 0.05$).

Table 2 shows diet history in women with and without breast cancer. There was an association between consumption of vegetables, fruit, red meat, dairy product, and breast cancer ($p < 0.05$). There was no association between beans/beans product, refined carbohydrate, and breast cancer

Table 3 shows the odds ratio (OR) of predicting factors of breast cancer in women with breast cancer. Patients of Yoruba ethnicity were less likely to have breast cancer compared with women of other ethnicities (OR = 0.117, $p = 0.001$). Daily and weekly consumers of vegetable were less likely to have breast cancer compared with cases who consume vegetable occasionally (OR = 0.263, $p = 0.027$; OR = 0.268, $p = 0.031$, respectively). Daily consumers of red meat were more likely to have breast cancer compared with those who consume red meat occasionally (OR = 27.728, $p = 0.000$). Weekly consumers of the dairy product were less likely to have breast cancer compared with non-consumers (OR = 0.080, $p = 0.000$)

Discussion

Breast cancer is a multi-factorial disease [19]. The impact of lifestyle, environmental factors, and diet on breast carcinogenesis has not been completely established [7,20].

Table 1. Socio-demographic indices and some reproductive factors in women with and without breast cancer.

Variable	Cases (n = 85)%	Controls (n = 84)%	χ^2	p
Age (years)	48.3 ± 1.3	48.5 ± (1.3)	t = −0.07	0.941
Marital status			1.497	0.221
Married	63 (53.4%)	55 (46.6%)		
Single	22 (43.1%)	29 (56.9%)		
Educational status			3.640	0.303
None	16 (45.7%)	19 (54.3%)		
Primary	21 (61.8%)	13 (38.2%)		
Secondary	24 (54.5%)	20 (45.5%)		
Tertiary	24 (42.9%)	32 (57.1%)		
Occupation			8.101	0.017*
Trading	59 (59.0%)	41 (41.0%)		
Civil servants	13 (33.3%)	26 (66.7%)		
Others (Housewife, farmers, clergy)	13 (43.3%)	17 (56.7%)		
Ethnic group			9.637	0.002*
Yoruba	61 (44.5%)	76 (55.5%)		
Others	24 (75.0%)	8 (25.0%)		
Family history of breast cancer			0.137 **Fishers = 1.000**	0.711
Yes	4 (57.1%)	3 (42.9%)		
No	81 (50.0%)	81 (50.0%)		
Contraceptive use			1.201	0.273
Yes	31 (56.4%)	24(43.6%)		
No	54 (47.4%)	60(52.6%)		
Contraceptive type			1.920	0.166
Hormonal	20 (64.5%) [a]	11 (35.5%) [b]		
Non-hormonal	11 (45.8%) [a]	13 (54.2%) [b]		

n = number of participants, χ^2 = Chi-Squared test, p = probability value, * = significant at $p < 0.05$, t = Student's t-test, Cases = Women with breast cancer. Controls = Apparently healthy women without breast cancer.
[a]n = 31, [b]n = 24.

There was an association between occupation and breast cancer in this study ($p < 0.05$). Traders accounted for 59.2% of our study population. Ndikom and Ofi [21] had a similar observation in their study in Nigerian women with cervical cancer. The association of trading with breast carcinogenesis has been attributed to a sedentary lifestyle coupled with long working hours (>55 hours/week) [22,23]. Sedentary lifestyle leads to high energy intake resulting in overweight/obesity which has been implicated in breast carcinogenesis [24,25]. It is known that overweight and obesity increase levels of inflammatory factors such as tumor necrosis factor-α, interleukin-6, and leptin which are known risk predictors of cancer [26,27].

Geographic variation in breast cancer incidence within a country can be influenced by population risk factor differences [28]. In this study, there was an association between ethnicity and breast cancer. The Yoruba ethnic group was less likely to have breast cancer when compared with other ethnic groups ($p < 0.05$). It is possible that the geographical location of the study participants' enrollment could be the reason for this observation.

The emerging report indicates that diet plays a significant role in breast carcinogenesis [29]. In this study, regular red meat consumption predicted breast cancer ($p < 0.05$). Similar observation was reported by Guo et al. [30]. Red meat contains fat with a high proportion of saturated fatty acids which has been implicated in breast carcinogenesis [31]. The consumption of red meat enhances the metabolic activation of heterocyclic amines (HCAs) which involves cytochrome P-450-mediated N-hy-

Table 2. Diet History in women with and without breast cancer.

Variable	Cases (*n* = 85)%	Controls (*n* = 84)%	χ^2	*p*
Beans/Beans product intake			0.528	0.768
Daily	10 (43.5%)	13 (56.5%)		
Weekly	20 (52.6%)	18 (47.4%)		
Non-consumers	55 (50.9%)	53 (49.1%)		
Vegetable intake			6.933	0.031*
Daily	23 (50.0%)	23 (50.0%)		
Weekly	43 (60.6%)	28 (39.4%)		
Occasionally	19 (36.5%)	33 (63.5%)		
Fruit intake			7.687	0.021*
Daily	17 (45.9%)	20 (54.1%)		
Weekly	32 (41.6%)	45 (58.4%)		
Occasionally	36 (65.5%)	19 (34.5%)		
Red meat intake			54.471	<0.001*
Daily	70 (76.1%)	22 (23.9%)		
Weekly	4 (13.3%)	26 (86.7%)		
Occasionally	11 (23.4%)	36 (76.6%)		
Dairy product intake			10.669	0.005*
Daily	2 (50.0%)	2 (50.0%)		
Weekly	7 (23.3%)	23 (76.7%)		
Non-consumers	76 (56.3%)	59 (43.7%)		
Refined carbohydrate intake			0.080 **Fishers = 0.868**	0.778
Yes	58 (49.6%)	59 (50.4%)		
No	27 (51.9%)	25 (48.1%)		

n = number of participants, χ^2 = Chi-Squared test, *p* = Probability value, * significant at $p < 0.05$,
Cases = Women with breast cancer. Controls = Apparently healthy women without breast cancer.

droxylation in the liver. HCA metabolites are transported to the breast where N-acetyl transferase activity makes HCAs most reactive. DNA adduct formation that emerged from the binding of these highly reactive metabolites is capable of inducing genetic mutations which results in mammary gland carcinogenesis [32]. The contribution of heme content of red meat to increased oxidative stress further supports the association of red meat with breast carcinogenesis [31,33].

Reports on the intake of dairy products and breast cancer risk are equivocal [34]. In this study, regular consumption of dairy products was observed to be protective against breast cancer ($p < 0.05$). Dairy products are good sources of calcium, vitamin D, butyrate, lactoferrin, and conjugated linoleic acid, which reduce the risk of breast cancer [35–37]. Moreover, *lactobacillus acidophilus*, a probiotic present in yogurt may modulate the immune response against breast cancer [38]. Insulin-like growth factor-1 content, a pro-carcinogenic factor, is significantly reduced in processed dairy products by heat treatment or fermentation [39].

The possible reduction of breast cancer risk by fruit and vegetables has been studied for over 30 years; however, no protective effects have been firmly established [40]. In this study, regular consumption of fruit and vegetable was associated with reduced breast cancer risk ($p < 0.05$). Observations in this study are in tandem with some studies that reported an inverse association between fruit and vegetable intake and the risk of breast cancer [41]. Fruits and vegetables contain phytochemicals such as carotenoids, phytosterols, flavonoids, and fiber which protect against carcinogenesis. These phytochemicals reduce oxidative stress by inducing DNA repair enzymes [42]. Moreover, fruits and vegetables contain protease inhibitors that are effective in the prevention of DNA damage and decrease mutation rate [10].

Studies on the association of oral contraceptive pills and breast cancer are controversial [18]. In this

Table 3. Predictors of breast cancer in Nigerian women with breast cancer.

Variable	OR	95% CI	*p*
Ethnicity			
Yoruba	0.117	0.034–0.411	0.001*
Others (ref)	1.000		
Occupation			
Trading	2.163	0.593–7.891	0.243
Civil servants	0.778	0.176–3.432	0.740
Others (ref)	1.000		
Vegetable intake			
Daily	0.263	0.081–0.859	0.027*
Weekly	0.268	0.081–0.885	0.031*
Occasionally (ref)	1.000		
Fruit intake			
Daily	0.379	0.110–1.301	0.123
Weekly	2.656	0.869–8.113	0.086
Occasionally (ref)	1.000		
Red meat intake			
Daily	27.728	8.874–86.638	0.000*
Weekly	1.196	0.264–5.407	0.817
Occasionally (ref)	1.000		
Dairy product intake			
Daily	0.233	0.015–3.507	0.292
Weekly	0.080	0.020–0.324	0.000*
Non-consumers (ref)	1.000		

OR = Odds ratio, CI = Confidence interval at 95%, *p* = probability.
*significant at $p < 0.05$.

study, there was no association between contraceptive use and breast cancer risk. This observation is consistent with other studies that did not find an association [43,44]. This could be attributed to the prevalence of triple-negative breast cancer subtype which lacks estrogen receptor, progesterone receptor, and human epithelial receptor 2, which is prevalent in African women [45].

Conclusion

It could be concluded from this study that daily consumption of red meat is a risk factor of breast cancer, while regular consumption of fruits and vegetables reduces the risk of breast cancer. Therefore, regular intake of fruit and vegetable, as well as healthy choice of meat, is recommended.

Conflict of interest

The authors declare that no conflict of interest exists.

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