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Full Length Research Paper

Fruit and Vegetable Consumption Patterns and the Serum Ascorbate of Patients with Breast Cancer in a Nigerian Teaching Hospital

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ABSTRACT

Ascorbic acid in fruits and vegetables serves as a powerful antioxidant and microbial property which protects cells from cancer causing agents. Breast cancer is the most prevalent cancer in women worldwide, and is the second leading cause of cancer death among women. This study evaluated the fruits and vegetables consumption pattern and serum ascorbate level of patients with breast cancer attending the University College Hospital Ibadan, Nigeria. Fruit and vegetable consumption pattern of thirty (30) newly diagnosed patients with breast cancer was assessed using a food frequency questionnaire and their serum ascorbate level was determined using a UV spectrophotometer. Majority (90.0%) of the subjects were above 35 years of age and about a third (36.7%) had neither formal nor primary school education, half (50.0%) of the subjects were not employed and a high percentage (73.4%) had three or more children. None reported to have a family history of breast cancer and none had ever smoked cigarette but 6.7% reported to have taken alcohol before. Majority of the patients did not take fruits and vegetable frequently. Only oranges (73.3%), Tomatoes (100.0%), chilli pepper (100.0%), *C. annuum* (90.1%) and Ugwu (63.3%) were more regularly taken. Majority (80.0%) of the patients had subnormal while only 20.0% had normal ascorbate levels. This study has shown that breast cancer occurs more in the older adult than in the younger adults among the studied population. Intake of fruits and vegetables among the patients was generally low. The patients also presented low serum ascorbate level. Nutrition education programmes to enlighten the public as well as patients with cancer on the importance of taking fruits and vegetables regularly, as part of their diet, need to be intensified by nutritionist-dietitian.

Keywords: Fruits and vegetable intake, Patients with breast cancer, Serum ascorbate.

INTRODUCTION

Cancer is a class of disease or disorders characterized by abnormal, uncontrollable proliferation (division) of cells (Pitot, 1996). These cells have the ability to invade other

tissues, either by direct growth into adjacent tissues through invasion or implantation into distant sites by metastasis (a stage in which cancer cells are transported through the blood stream or lymphatic system to other tissues). Breast cancer could be treatable or not treatable

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but generally leads to death (America Cancer Society, 2000).

Cancer has become one of the major health problems second only to heart disease and accounts for about 20% of the total death in the developed country, with an upward trend in each year (Rennie and Rusting, 1996). The International Agency for Research on Cancer (IARC) in 2004 estimated, over 10 million new cases of cancer and 7 million deaths from cancer globally (WHO, 1997).

Cancer affects people of all ages with risk increasing with increase in age. Agha et al., (2005) indicate that cancer especially leukemia was an upward trend, occurring both in young children and adolescents. Breast cancer is the most prevalent cancer in women worldwide, and is the second leading cause of cancer deaths in women, following cancer of the lungs. (IARC, 2004). Cancer of the breast is a major health problem worldwide and common in both high resource and low resource settings, responsible for over one million of the estimated 10 million neoplasm diagnosed worldwide in both sexes (Ferley et al., 2000). In the year 2000 an estimated 375, 000 deaths was reported and cancer of the breast ranks third highest among occurring cancers (Ferley et al., 2000).

Cancers are associated with environmental factors such as tobacco, smoke, radiation, alcohol intake, dietary pattern and the attack of certain viruses. However there is at least a 10 fold variation in breast cancer incidence rates worldwide (Parkin et al., 1997), largely as a consequence of a range of socio-economic differences, and also several reproductive, hormonal, and nutritional factors.

Fruits and vegetables of all types form valuable part of our diets; they have the potential of influencing health beyond ordinary nutritional value (WHO, 2005). According to FAO (2003) and WHO (2005), ascorbic acid in fruits and vegetable serve as a powerful antioxidant which protects cells from cancer-causing agents. Much of the fruits and vegetable potency is believed to come from substances known as an "array of pharmaceutically active phytochemical" with high anti-oxidant and microbial property (FAO, 2003). In 1997, an international review panel (World Cancer Research Fund America Institute for Cancer Research, 1997) showed convincing evidence that high intake of fruits and vegetable decreases the risk of cancers of mouth, pharynx, breast, lung, stomach and colon. Many fruits and vegetables are high in protective substances, such as fiber, antioxidants, vitamins, minerals and other potential anti carcinogenic compounds including dithiolthiones, isothiocyanates, indole-3 carbinol, flavonoids and lignans.

Ascorbic acid, a water soluble anti-oxidant is known to protect against lipid per oxidation thereby protecting against degenerative disease, coronary heart disease, cataract formation and cancer (Frei et al, 1990). Ascorbic acid plays an important role in numerous biological systems through the synthesis of hormones, neurotransmitters, collagen, carnitine and other substances, the detoxification of exogenous compounds cytochrome p-450 1-3 and a free radical scavenger.

In a Lowan Women's Health study showed that women taking at least 500mg vitamin C daily had a relative low risk of developing breast cancer, compared with those not supplemented with vitamin C. Similarly Landa et al (1994), in a Spanish study showed that vitamin C intake among patients with breast cancer, was significantly lower than the intake of a matched group of control Block (1991). Indicated that vitamin C intake had the most consistent and significant inverse association with breast cancer risk. This study was therefore designed to evaluate the fruit and vegetable consumption pattern and the serum ascorbate level of patients that were newly diagnosed with breast cancer who were attending the Radiotherapy Department of the University College Hospital Ibadan, Southwestern Nigeria.

MATERIALS AND METHODS

This descriptive and cross-sectional study was carried out at the Radiotherapy Department, University College Hospital, (UCH) Ibadan, Southwestern Nigeria. University College Hospital is a tertiary hospital, Centre of clinical excellence and a strong hold of scientific research in the medical sciences where patients with different illness are usually referred from every part of Nigeria for better medical treatment. The laboratory analysis was carried out at the Department of Human Nutrition, University of Ibadan.

Inclusion and Exclusion Criteria

A total number of 30 patients with early stage of breast cancer who were newly diagnosed with breast cancer and were not yet on chemotherapy or radiotherapy and gave their informed consent to participate in the study were included in the study.

Patient who had started treatment (radiotherapy or chemotherapy) and those who were unwilling to participate in the study were excluded from the study.

Data collection

A validated, semi-structured, interviewer administered questionnaire consisting of socio demographic and

socio-economic characteristics, the medical history and lifestyle was administered to the patients. Also, food frequency questionnaire was used to collect information on the patients' frequency of consumption of fruits and vegetables.

Serum ascorbate determination

Blood sample of 5mls was collected from the patients for their serum ascorbate analysis. The blood samples were centrifuged at 3000 revolutions per minutes for 15 minutes. Serum samples were analyzed for serum ascorbate using UV Spectrophotometer (Jenway, 6305) following the modified Baker and Frank (1968) method of analysis; serum ascorbate levels were classified as normal (0.4-1.5mg/100ml), subnormal (<0.4mg/100ml) and supranormal (>1.5mg/100ml) (Baker and Frank, 1968). Serum ascorbate in milligrams (mg) was calculated by dividing the Optical Density of sample X 2 by Optical Density of standard. Wavelength was set at 540 nm.

Data Analysis

Data were analyzed using the Statistical Package for Social Sciences (SPSS) version 16.0 to generate the frequency, percentages and mean with their standard deviation (SD).

RESULTS

Table 1 shows the characteristic of the patients. A high percentage (90.0%) of the patients were above 35 years of age with a mean age of 43.1±7.3 years, most (93.3%) of them were married; only a few (3.3% each) were either single or widowed. Majority (80.0%) were Christians while a few (20.0%) were Muslims. As many as (70.0%) of the patients were Yoruba while only 13.3% and 16.7% were Ibos and Hausas respectively.

About a third (36.7%) had either no formal or primary education while 63.4% had secondary, post-secondary or tertiary education. Half of the patients were either employed or petty traders and the other half were civil servants, retired civil servants or business women. About a third (31.3%) were on the monthly income that was less than N30, 000, while more than half (62.5%) of the patients were on monthly income greater than N40, 000. About two-third (63.4%) of the respondents had three children or more.

Table 2 presents the medical history and lifestyle of the patients. A little above half (56.7%) of the patients were diagnosed with breast cancer in less than one year. None of the subjects reported any family history of breast cancer.

Table 1:
Characteristics of the participants

Variable	Frequency	Percentage
Age (mean=43.1±7.3 years)		
<35	3	10.0
36-40	7	23.3
41-50	11	37.0
51-60	2	6.6
Ethnicity		
Yoruba	21	70.0
Ibo	4	13.3
Hausa	5	16.7
Marital status		
Single	1	3.3
Married	28	93.3
Widowed	1	3.3
Religion		
Christianity	24	80.0
Islam	6	20.0
Educational status		
No formal education	3	10.0
Primary	8	26.7
Secondary	6	20.0
Post-secondary	2	6.7
Tertiary	11	36.7
Occupation		
Unemployed	3	10.0
Petty trader	12	40.0
Civil servant	8	26.7
Business woman	5	16.7
Retired civil servant	2	6.7
Monthly household income		
<20,000	4	12.5
20,000- 30,000	6	18.8
30,001-40,000	2	6.3
>40,000	18	62.5
No of children		
None	7	23.3
1-2	4	13.3
3-4	8	26.7
5-6	9	30.0
>6	2	6.7

Only a few (6.7%) reported that they had other illness such as diabetes and hypertension in addition to the breast cancer. Many (66.6%) had dietary advice before

the study and the dietary advice was given by the nurses (85.0%) and only 5.0% were counselled by the dietician.

Majority (70.0%) of the patients claimed not to be taking a lot of fried foods. All the patients claimed they had never smoked cigarette and only a few (6.7%) had ever taken alcohol; also majority (73.3%) had regular vitamins and minerals supplements.

Table 2:
Medical history and lifestyle of the participants

Variable	Frequency	Percentage
Duration diagnosis		
<1 year	17	56.7
>1 year	13	43.3
Family history of breast cancer		
Yes	0	0.0
No	30	100.0
Presence of other illness (diabetes, hypertension)		
Yes	2	6.7
No	28	93.3
Took drug regularly		
Yes	30	100.0
No	0	0
Obtained dietary advice		
Yes	20	66.3
No	10	33.3
Person giving advice		
Doctor	3	10.0
Dietician	2	5.0
Nurse	25	85.0
Took a lot of fried foods?		
Yes	9	30.0
No	21	70.0
Ever smoked cigarette		
Yes	0	0.0
No	30	100.0
Ever taken alcohol		
Yes	2	6.7
No	28	93.3
Taken vitamin/mineral supplement(s)		
Yes	22	73.3
No	8	26.7

Table 3 shows the frequency of consumption of fruits and vegetables by the patients. Generally majority of the patients did not consume fruits and vegetable regularly. However, oranges (73.3%), tomatoes (100.0%), chilli pepper (100.0%), *Capsicum annum* (90.1%) and Ugwu (63.3%) were the fruit and vegetables consumed frequently by most of the patients.

Classification of serum ascorbate level of the patients is presented in Fig. 1. Only 20.0% of the patients had normal ascorbate level while majority (80.0%) had subnormal ascorbate level.

TABLE 3:
Fruits and Vegetables consumption pattern of the patients

Fruits and vegetables	Frequency of Consumption	
	>3x/wk(%)	<3x/wk(%)
Fruits		
Orange	21(73.3)	7(23.3)
Guava	30(100.0)	
Tangerine	9(30.0)	21(70.0)
Apple	14(46.7)	16(43.3)
Banana	15(50.0)	15(50.0)
African cherry	1(3.3)	29(96.7)
African pear	2(6.7)	28(93.3)
Watermelon	5(16.6)	25(83.4)
Pineapple	13(43.3)	17(56.7)
Grape	1(3.3)	29(96.7)
Pawpaw	12(40.0)	18(60.0)
Vegetables		
Ugwu dark green	19(63.3)	11(36.7)
Amaranthus green	9(30.0)	21(70.0)
Waterleaf	5(16.6)	25(83.4)
Bitterleaf	5(16.6)	25(83.4)
Okro	5(16.6)	5(83.4)
<i>Cochorus olitorius</i>	7(23.3)	23(76.7)
<i>Umberto quattrocchi</i>	30(100)	
<i>S. aethiopicum</i>	4(13.3)	26(86.7)
<i>Irvingia gabonensis</i>	15(50.0)	15(50.0)
Tomato	30(100.0)	-
Chili pepper	30(100.0)	-
<i>Capsicum annum</i>	27(90.1)	3(9.9)
Garden egg	5(16.6)	25(83.4)
Cabbage	2(6.6)	28(93.4)
Lettuce	1(3.3)	29(96.7)

DISCUSSION

Breast cancer is a public health problem, the cause of which have been associated with certain risk factors such as age, race, family history of breast cancer, null parity and some lifestyle factors such as tobacco smoking, alcohol intake, diet and physical inactivity (American Cancer Society, 2006).

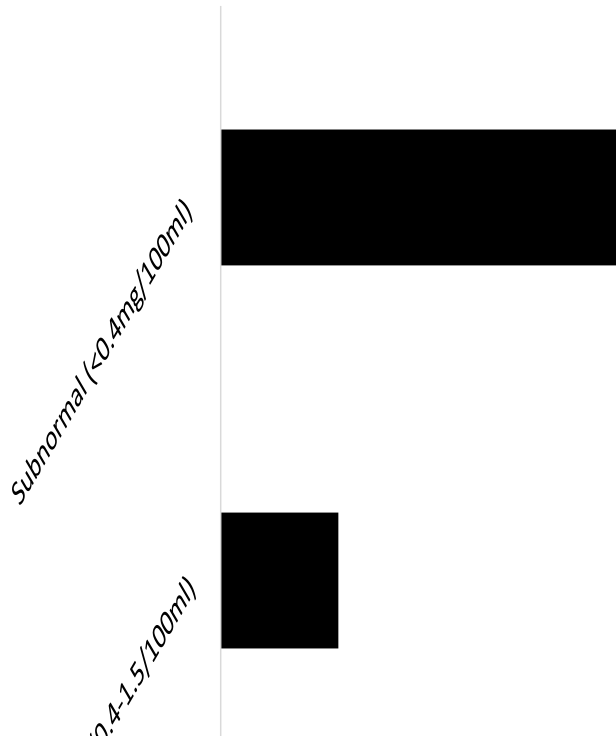


Fig. 1
Serum ascorbate level of the patients

Almost all the patients in this study were above 35 years, with a mean age of 43.1 ± 7.3 years. This indicates that breast cancer occurs more in older adults than in younger adults. This observation agrees with the report of Osteen (2001) that breast cancer was common with older women of 40 years or above and the incidence increases with increase in age. Majority of the patients in this study were from Yoruba ethnic group of Nigeria and this could be as a result of the location of the study (South-western part of Nigeria), where Yoruba ethnic group are predominant. This also indicates that the dietary habit of the population is likely to be homogeneous.

In this study, a higher percentage of the women had secondary, post-secondary or tertiary education. Also a higher percentage of them were earning more than thirty thousand naira (₦30,000) per month indicating that their socioeconomic status was fairly good.

The American Cancer Society (2005) indicates nulliparity as a risk indicator of breast cancer, however, in this study most of the women had three or more children. Loman et al., (2001) report also indicates that a family history of breast cancer, especially of first degree relatives is an increased risk for developing breast cancer. All the patients in this study did not report any family history of breast cancer. The reason for this

could be associated with the culture of non-disclosure of family disease in Nigeria

Fentimah (2002) reported association between cigarette smoking and /or alcohol intake with increased risk for breast cancer. None of the patients in this study reported to have ever smoked cigarette while only a few reported to have ever drunk alcohol. Hamajima et al., (2002) reported a stronger link of cigarette smoking and a lower link of alcohol consumption and breast cancer risk.

High fat consumption was reported as a risk factor for breast cancer (American Cancer Society, 2006). Only about a third of the patients in this study, generally took a lot of fried foods. The intake of vitamins and minerals supplements was common among the subjects, although David et al., (1993) reported that vitamins and mineral supplements even on a long term intake did not have an inverse relationship with incidence or growth of cancer cells.

A protective effect of consuming fruits and vegetables regularly in the diet was supported by some studies (Gandni et al., 2000; Riboli and Norat, 2003). However, a high percentage of the patients with breast cancer who participated in the study were not taking fruits and vegetables regularly. The main fruits that were frequently consumed by most of the patients were oranges, while the commonly consumed vegetables are Ugwu, tomatoes, chilli pepper and *Capsicum annum* (bell shaped pepper). According to Grant (2005), fruits and vegetables contain combination of numerous plausible nutritive and non-nutritive compounds that exert chemo preventive effects through stimulation of cell differentiation, cessation of cell division, anti-oxidant potential, and induction of metabolic detoxification and enhancement of immune function that protect against development and proliferation of cancer cells. Although, reports on the effects of fruits and vegetable intake on the risk of breast cancer has been inconsistent, the Working Group on the Evaluation of Cancer Preventive Strategies (2005) reported that relative risk of breast cancer was 14% lower for each additional 100g/day intake of vegetable and 100g/day intake of fruits.

Adequate intake of fruits and vegetables is reported to improve ascorbic acid intake of individuals. Zora et al, (2006) observed an increase in ascorbate level of subjects with their increase of fruits and vegetable intake. Also, a combined analysis of Italian breast cancer studies by La Vecchia et al, (2001) and that of Olsen et al (2005) indicated that vegetable intake reduced breast cancer cell by 20-25%.

A large no of patients of this study rarely or only took fruits occasionally and only a very low percentage of

them claimed to be taking fruits frequently (>3x/day). In adopting the classification of serum ascorbic acid into normal (acceptable), subnormal (deficient), and supranormal (abnormal) by Baker and Frank (1968), a high percentage (80.0%) of the patients with breast cancer in this study had subnormal ascorbate level. Their low level of serum ascorbate level could be explained by their low intake of fruits and vegetables. Furthermore, the presence of the cancerous cells in the patients may also contribute to the low serum ascorbate level. The immune surveillance system is important both in inhibiting cancerous growth, and also in the prevention of the spread. Ascorbate intake and supplementation are critical to increase the number and effectiveness of lymphocytes and phagocytosis, which are critical for immune function (Miller et al, 2004; Cameron and Pauling, 1979).

In conclusion, this study has revealed that breast cancer is more prevalent in adult female patients than in young female groups within the study population. None of the patients was cigarette smoker and only a few had ever taken alcohol. The intake of total fruits and vegetables were not regular and the serum ascorbate level of majority of the patients was low. Due to differences in dietary practices, it is recommended that similar studies should be conducted among diverse ethnic populations in Nigeria. Also, nutrition education should be given to the public to enlighten individuals that fruits and vegetables are integral part of their diet that should be taken daily, as a preventive measure for disease development

REFERENCES

Agha M, Dimonte B, Green berg M, Green berg C, Barn R, MC Langhlin JR (2005). "Incidence Trends and Projections for Childhood Cancer in Ontario". *Int J. Cancer* 162: 943-952

American Cancer Society (2000): The American Cancer Society: All American Cancer Society: All About Breast Cancer. Overview. [www. Cancer.org](http://www.Cancer.org).

American Cancer Society (2005): American Cancer Society. Cancer Prevention and Early Detection Facts and Figures Atlanta GA American Cancer Society.

American Cancer Society (2006): Prevention of Breast Cancer. Sept. Vol. 13. 1485-1494.

Baker H. and Oscar Frank (1968). In: *China Vitaminology (Methods and Interpretation)*. Interscience Publishers. Pp. 153-160.

Block G (1991): Vitamin C and Cancer Prevention: the Epidemiological Evidence. *Am J Clin Nutr* 53:270s-280s.

Cameron E, Pauling L. (1979): Ascorbic Acid and the cancer: a review *cancer Rcs*; 39: pp 663-681.

David J. Hunter, Joann E. Manson, Graham A., Charles H. Hennekens, Frank E. Willett (1993). A Prospective

Study of the Intake of Vitamin C,E and A and the Risk of Breast Cancer. *The New England Journal of Medicine*. Vol. 4. Jul 22, 329: 234-240.

Fentimah E. (2002): Fixed and modifiable risk factors for breast cancer. *Int J clin pract* 42: 309-316

Ferlay J, Bray F, Pisani P, Parkin DM (2000): Cancer incidence, mortality and prevalence worldwide. IARC cancer Base No 5 [1.0] Lyon, France:.

Frei B, Stocker R, England L. Ames BN (1990): Ascorbate: the most effective antioxidant in human plasma. *Adv exp med Biol* 264: 155-163

Grant, W.B (2005). Re: Fruit and Vegetable Intake and Risk of Major Chronic Disease *J. Natl. Cancer Inst.* 97: 608-608

Gandini S, Merzenich H, Robertson C, Boyle P (2000): Meta-analysis of studies on breast cancer risk and diet: the role of fruits and vegetable consumption and the intake of associated micronutrients. *Eur J Cancer* 36: 636-646

Hamajima N, Hirose K, Tijima K (2002): Alcohol tobacco and breast cancer-collaborative reanalysis of individual data from 53 epidemiological studies including 58, 515 women with breast cancer and 95, 067 women without the diseases. *Br J cancer* 273(24): 2985-2989

IARC-International Agency for Research on Cancer (2004): IARC monographs on the evaluation of carcinogenic risks to human tobacco smoke and involuntary smoking. Lyon. IARC press.

IARC Working Group on the Evaluation of Cancer Preventive Strategies (2005): fruits and vegetables. Vol 8 Lyon, France: International Agency for research on Cancer. IARC Handbooks of Cancer prevention.

La Vecchia, Alteri Altieri A., Tavani A.. (2001): Vegetables, Fruit, Antioxidants and Cancer. A Review of Italian Studies. *Eur. J. Nutr.* Dec. 40: 261-267.

Landa M.C., Frago N., Tress A. (1994): Diet and the Risk of Breast Cancer in Spain. *Eur J. Cancer Prev.* 3. 313-320.

Loman N., Johnson O., Kristoffersson U., Olsson H., Borg A. (2001). Family History of Breast and Ovarian Cancers and BRCA1 and BRCA2 Mutations in a population-Based Series of Early Onset Breast Cancer. *J. Nut. I Cancer Inst.* Aug 15, 93. (16:1215-1223).

Miller AB, Ailtenburg HP, Bueno-de-Mesquita B (2004): Fruits and vegetable and lung cancer: findings from the European Prospective Investigation into Cancer and Nutrition. *Int J Cancer* 108:269-276

Olsen, A., Stripp, C., Christense, J., Thomsen, B.L., Overvad, K., Tjønneland, A. (2005). Re: Fruit and Vegetable Intake and Risk of Major Chronic Disease. *J. Natl. Cancer Inst.* 97: 1307-1308

Osteen RT, Lenhard RE Gansler T., (2001): Breast cancer in, clinical Oncology: Atlanta, American Cancer society 2:251-268

Parkin DM, Whelan SL, farlay J, Raymond L, young L; (1997): Cancer incidence in five continents Lyon: IARC Press,, viii

Pitot H.C. (1996). Fundamentals of Oncology. 3rd ed. New York.

Rennie J, Rusting R (1996): Making head way against cancer, *sci Am* 275 (3): 56.

Riboli E , Norat T. (2003): Epidemiologic evidence of the protective effect of fruits and vegetables on cancer risk. *Am J Clin Nutr.* 78(Suppl 3): 559S-569S

WHO (1997): World Health Organization: Diet, Nutrition and the prevention of Chronic disease, Technical Report series No. 797 Geneva

World cancer research/IARC (1997). World Cancer Research Fund Panel Food Nutrition and Prevention of

Cancer. A Global Perspective, (Potter JD Chair). Washington D.C American Institute for Cancer Research. Pp. 45-53.

Zora Djuric, Jianwei Ren, M. D., Olga Mekhovich, Raghu Venkatramoorthy, Lance K. Heilbrum (2006). Effects to High Fruit-Vegetable and Low-Fat Intervention on Plasma Micronutrient Levels *Journal of the American College of Nutrition* Vol. 25 (3).Pp. 178-187.