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Comparison between selected anthropometric indices of patients with cancer and age matched apparently healthy individual

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Abstract. The purpose of this study was to compare selected anthropometric indices between patients with cancer and age matched apparently healthy individual. Subjects were recently diagnosed prostate and breast cancer patients receiving treatment at the Surgical Outpatient Department of Obafemi Awolowo University Teaching Hospitals Complex (OAUTHC), Ile-Ife, Nigeria and their age matched apparently healthy individuals from the same vicinity. The weight, height, waist circumference (WC), hip circumference (HC) and wrist circumference were measured for the 2 groups. Body mass index (BMI), waist to hip ratio (WHR) and frame size (FRS) were calculated. Descriptive and inferential statistics were used to organize the result. The result revealed that there was a significant increase in WC ($t = 2.95$, $p<0.001$), WHR ($t = 4.80$, $p<0.001$), FRS ($t = -4.53$, $p<0.001$) and BMI $t = 2.21$, $p<0.05$ of subjects with prostate cancer than the control group. There was a significant increase in WC ($t = 2.52$, $p<0.05$) and HC ($t = 2.30$, $p<0.05$) of subjects with breast cancer when compared with that of the control group. It can be concluded from the study that increase in any of BMI, WHR, WC, hip circumference and frame size might be a predisposing factor for prostate cancer while increase in waist circumference or hip circumference may predispose an individual to breast cancer.
Key words: *prostate cancer, breast cancer, waist circumference, hip circumference, frames size*.

Introduction

Cancer is the second common cause of death in developed countries and among the leading causes of death in developing countries (1). Cancers as a group account for approximately 13% of all deaths each year with the most common been: lung cancer (1.4 million deaths), stomach cancer (740,000 deaths), liver cancer (700,000 deaths), colorectal cancer (610,000 deaths), and breast cancer (460,000 deaths). This makes invasive cancer the leading cause of death in the developed world and over half of cases occur in the developing world which make the case to be the second leading cause of death in the developing world (2). Fatimah, (1) reported that in indigenous Africans, 650,000 people of estimated 965million are diagnosed of cancer annually and lifetime risk of dying from cancer in African women is 2 times higher than in developed countries. The earliest study from Nigeria was from the Ibadan Cancer Registry (ICR)-1960-69. There was higher rates of cancer in females with age standardized rates (ASR) of 105.1 and 78 per 100,000 females and males respectively (1). In Zaria, 1976-78 data reported 1575 cases with 52% of cases in males and 48% in males; a latter study however showed more cancers in females than males (1). Other data (2001-2005) from Ibadan showed increasing incidence and the ASR for all cancers as 81.6 per 100,000 for males and 115.1 per 100,000 for females with 65.9% and 34.1% in females and males respectively. From Kano, of 1001 cancers recorded for period 1995-2004, male cancers accounted for 50.3% and 49.7% in females. Report from University of Benin Teaching Hospital showed 2258 cases over a 20year period with female cancers predominating (64%) while that from Calabar showed a total of 588 cancers between 2004-2006 with 50.9% and 49.1% respectively for males and females (1). The six most common cancers in Nigeria in descending order of frequency are breast, cervix, prostate, colorectal liver cancer and Non-Hodgkin lymphoma (NHL) (1). Cancers are primarily an environmental disease with 90–95% of cases attributed to environmental factors and 5–10% due to genetics (3). Environmental, as used by cancer researchers, means any cause that is not inherited genetically, not merely pollution (4).

Common environmental factors that contribute to cancer death include tobacco (25–30%), diet and obesity (30–35%), infections (15–20%), radiation (both ionizing and non-ionizing, up to 10%), stress, lack of physical activity, and environmental pollutants (3). These can directly damage genes or combine with existing genetic faults within cells to cause the disease (5). About five to ten percent of cancers are entirely hereditary however, majority of cancer cases are due to controllable lifestyle which make cancer to be considered a largely preventable disease (6). Greater than 30% of cancer deaths could be prevented by avoiding risk factors including: tobacco, overweight/obesity, an insufficient diet, physical inactivity, alcohol, sexually transmitted infections, and air pollution (7).

Anthropometry provides the single most portable, universally applicable, inexpensive and non-invasive technique for assessing the size, proportions and composition of the human body. It reflects both health and nutritional status and predicts performance, health and survival. As such, it is a valuable, but currently underused, tool for guiding public health policy and clinical decisions (8). Epidemiological evidence implicating anthropometric risk factors in breast cancer etiology is accumulating and for premenopausal women, breast cancer risk increases with increasing height, but decreases with higher weight or body mass index, and no association with increased central adiposity exists (9). Although frequently studied, there is disagreement on the applicability, reliability and trends of weight, height, waist circumference (WC) and relevant indices to incidence of cancer. Waist Circumference is generally accepted as a key marker in cerebrovascular accident (CVD) and cervical cancer risk assessment whereas more evidence of the usefulness of WC-prostate cancer and WC-breast cancer correlations is needed (10). The study is designed to investigate the difference between some anthropometric indices of patients with breast and prostate cancer and apparently healthy individuals especially in our environment.

Material and Method

The participants in the study were patients with prostate and breast cancer and age matched apparently healthy individuals. The cancer patients were recruited from the surgical outpatient clinic of the Obafemi Awolowo University Teaching Hospital (OAUTHC), Ile-Ife, Nigeria.

Inclusion criteria. Subjects in the study have either of prostrate or breast cancer diagnose by a physician and age matched apparently healthy individuals within the same vicinity.

Exclusion criteria. Patients bedridden with cancer were excluded from the study, Subjects with resolved case of breast or prostate and other forms of cancer were also excluded from the study.

Instruments: Instruments used are: Hanson bathroom weighing scale which was used to get the weight of the participating subject. Height-meter, which was used to measure the height of the participating subjects and butterfly tape measure which was also used to measure the waist circumference, hip circumference and wrist circumference of the subject

Sampling technique: A purposive sampling technique was used to select 23 newly diagnosed patients with breast cancer and 24 patients with prostate cancer. For every breast cancer patients 3 apparently healthy individuals were chosen but one of them was randomly selected to participate in the study. For every prostate cancer patients 3 apparently healthy individual male were selected and one was randomly chosen to participate in the study. Twenty three apparently healthy females, age matched and 24 health male age matched were chosen for both breast and prostate cancer patients respectively. There were 47 cancer patients and 47 apparently healthy individuals.

Procedure. Ethical approval was obtained (IPHOAU/12/172) from Health Research Ethics Committee, Institute of Public Health, Obafemi Awolowo University, Ile Ife. The subjects with diagnosed cancer were recruited from the surgical outpatient clinic of Obafemi Awolowo University Teaching Hospital (OAUTHC), Ile-Ife, Osun State and age matched apparently healthy individuals were also recruited from within the same geographical location.

Anthropometric data were measured for both the patents and apparently healthy individuals using the procedures according to Marfell-Jones et al. (11).

Weight was done with the use of a bathroom weighing scale. Three measurement were taken and the average was used for the measurement

Height was done with height-meter, subjects stood upright backing the height-meter, while the reading was taking. Three readings were measured and average was used for the measurement.

Waist circumference was measured at the narrowest part of torso. Hip circumference was measured at the greater protrusion of gluteal maximum posteriorly and pubic symphysis anteriorly while wrist circumference was measured immediately after the radial stylod process distally. Three measurements were taken for each, the average were used for the data.

Data Analysis. Data was analyzed using SPSS version 16. Descriptive and inferential statistics of independent -t-test were used to assess the difference between the anthropometrics parameters of cancer patient and apparently healthy individuals. An alpha level of 0.05 was set as level of significance.

Results

Presented in table I is the comparison between the anthropometric parameters of subjects with prostate cancer and the apparently individuals

It was observed that there were significant differences in their waist circumference ($t = 2.95$, $p<0.001$), waist to hip ratio ($t = 4.80$, $p<0.001$), frame size ($t = -4.53$,$p<0.001$) and body mass index ($t = 2.21$, $p<0.05$) between subject with prostate cancer and apparently healthy individuals

The results showed that there were significant difference in their waist circumference ($t = 2.52$, $p<0.05$) and hip circumference ($t = 2.30$, $p<0.05$) of patients with breast cancer and apparently individuals.

Table I. Result of independent –t-test comparing mean value of selected anthropometric indices between subjects with prostate cancer and control

Variables	**Prostate=24**	**Control=24**		
	Mean ± SD	Mean ± SD	t-cal	p-value
Age (yrs)	73.70 ± 6.71	70.71 ± 5.71	-0.87	0.67
Weight (kg)	64.71 ± 15.92	67.29 ± 9.16	-0.77	0.45
Height (m)	6.78 ± 16.24	1.79 ± 0.54	-0.74	0.47
Waist cir (cm)	87.30 ± 10.29	73.36 ± 4.23	2.95	0.01
Hip circumference (cm)	90.40 ± 5.40	89.00 ± 2.45	0.52	0.61
Wrist circumference (cm)	16.57 ± 0.62	16.75 ± 0.82	-0.50	0.63
Waist hip ratio	0.97 ± 0.06	0.82 ± 0.03	4.80	0.00
Fame size	9.83 ± 0.42	10.75 ± 0.29	-4.53	0.00
BMI (kg/m^2)	24.53 ± 2.93	20.99 ± 2.26	2.21	0.04

*Key: BMI =Body Mass Index. Cir = Circumference. * Sig at p < 0.05*

Table II. Result of independent t-test comparing mean value of selected anthropometric indices between subjects with breast cancer and control

Variables	**Breast=23**	**Control=23**	**t-cal**	**p-value**
	Mean ± SD	Mean ± SD		
Age (yrs)	47.89 ± 9.44	47.89 ± 9.44	-0.53	0.86
Weight (kg)	66.11 ± 8.55	64.61 ± 18.13	-0.32	0.75
Height (m)	1.60 ± 0.05	1.60 ± 0.06	-0.24	0.81
Waist circumference(cm)	99.33 ± 6.17	70.89 ± 18.40	2.52	0.02*
Hip circumference (cm)	98.83 ± 5.72	87.44 ± 14.87	2.30	0.03*
Wrist circumference (cm)	15.29 ± 0.42	15.29 ± 0.78	0.00	1.00
Waist hip ratio	0.89 ± 0.04	0.93 ± 0.07	1.77	0.09
Fame size	10.48 ± 0.49	11.42 ± 4.57	0.86	0.40
BMI (kg/m^2)	25.83 ± 3.51	25.23 ± 6.07	-0.37	0.72

*Key : BMI =Body Mass Index. Cir = Circumference. * Sig at p < 0.05*

Presented in table III is the result of independent t test comparing mean value of selected anthropometric indices between subjects with patients with breast and prostate cancer and apparently healthy individuals.

The results showed that there were significant increase in their waist circumference ($t = 3.36$, $p<0.05$), hip circumference ($t = 2.18$, $p<0.05$) and waist to hip ratio ($t = 3.73$, $p<0.001$) of patients that have either of breast cancer or prostate cancer and healthy individuals.

Table III. Result of independent comparing mean value of selected anthropometric indices between subjects with cancer and control

Variables	Cancer=28	Control=24	t-cal	p-value
	Mean ± SD	Mean ± SD		
Weight (kg)	64.71 ± 15.92	66.44 ± 8.54	-0.60	0.55
Height (m)	3.44 ± 9.71	1.65 ± 0.10	0.91	0.37
Waist circumference (cm)	89.61 ± 15.86	77.66 ± 6.24	3.36	0.00**
Hip circumference (cm)	94.93 ± 12.68	88.88 ± 4.97	2.18	0.03*
Wrist circumference (cm)	15.75 ± 0.94	15.67 ± 0.82	0.37	0.71
Waist to hip ratio	0.94 ± 0.71	0.87 ± 0.05	3.73	0.00
Fame size	10.85 ± 3.72	10.56 ± 0.45	0.41	0.69
BMI (kg/m^2)	24.98 ± 5.12	24.48 ± 3.87	0.18	0.86

Keys: *kg=kilogram, m=meters. Cir = Circumference * Sig at p < 0.05 ** sig at p < 0.001*

Discussion and conclusion

The study was designed to assess the difference between selected anthropometric indices of prostate and breast cancer patients and apparently healthy individuals.

The result of the study shows that the mean body mass index of subjects with prostate cancer fell within the normal range but was significantly higher than the apparently healthy control group. This is in line with the work of Glovannuvcci et al.,(12) which reported that the risk of prostate cancer in men with a higher BMI (> or =30 kg/m^2) was lower than that in men with a lower BMI (23-24.9 kg/m2) but only if they were younger (<60 years old) or had a family history of prostate cancer. Our study found that the mean waist to hip ratio of patients with prostate cancer was higher than normal and was found to be significantly higher than the control group. This supported the work of Hsing et al., (13) and Huanq et al, (14) in which it was founded that high levels of waist to hip ratio were related to an excess risk of developing prostate cancer. Hsing et al (13) reported that high levels of WHR were related to an excess risk, with men in the highest quartile (WHR > 0.92) having an almost 3-fold risk compared with men in the lowest quartile (WHR < 0.86).

It is further revealed from the result that there was a significant difference between the waist circumference of subjects with prostate cancer and the control group. CCV, (15) documented that the larger the waist circumference the higher the risk of many types of cancer including prostate and breast cancer. The finding of our study also supported the work of Cosimo et al., (16) which showed a significant difference between the waist circumference of individuals with prostate cancer and the control with higher waist circumference being associated with increase in the risk of prostate cancer. Similarly, Cancer Council (17) in one of her studies reported that the waist circumference around 100 cm for men and 85cm for women significantly increases the risk of some cancers in which prostate (for men) and breast (for women) are inclusive. Although the waist circumference found in our study was less than 100 cm for men but more than 85cm for women. The differences in ethnicity and cultural adaptation may be accountable for the difference in the value.

The finding from our study revealed that though the mean BMI was within the normal range but the mean for prostate cancer was significantly higher than that of normal individual. This was in contrary with the study of Edward et al., (18) in which they reported that the risk of prostate cancer in men with a higher BMI (≥30 kg/m^2) was lower than that in men with a lower BMI (23–24.9 kg/m^2), Pischon et al (19) also reported that even in a very lean population (average BMI = 21.9), abdominal adiposity may be associated with an increased risk of clinical prostate cancer, pointing to a role of hormones in prostate cancer etiology. More so, Andrew et al (20) in their study affirmed that obesity was associated with the presence of prostatic intraepithelial neoplasia in initial benign specimens and with higher prostate cancer risk during follow-up. The presence of prostatic intraepithelial neoplasia in a benign biopsy indicates a higher risk for future diagnosis of prostate cancer (21).

According to results of this study, the frame size of subjects with prostate cancer patients was significantly larger than that of the control group. This supported the work of Andrew et al (20) where they found association between body size and prostate cancer incidence in their study reflects associations between body size and larger prostate size

With respect to breast cancer, our study found that waist circumference of subjects with breast cancer was significantly larger than that of the control group. In addition the mean waist circumference found in our study was higher than that recommended by Cancer Council (17) . This supported the work of Huang et al., (14) in which waist circumference was found to be significantly associated with postmenopausal breast cancer risk. Similarly, Elisa et al., (22) also reported that high waist circumference increases the risk of breast cancer in premenopausal women. Okoba et al (23) in their study concluded that WHR is a significant predictor of breast cancer risk in Nigerian women however our study did not find a significant difference in waist to hip ratio of patients with cancer and healthy control. The small sample size observed in our study may be a limitation for our findings. The hip circumference was find significantly larger than that of control which supported the work of Elisa et al., (22) where it was reported that the higher the hip circumference, the higher the risk of breast cancer. Weight increase and obesity, subsequent to the menopause, have been identified as the most important risk and negative prognostic factors for breast cancer in postmenopausal women . Macciò and Madeddu (24). Several studies pointed out that obese women exhibit at diagnosis an increase in lymph-nodes involvement and a higher propensity to distant metastases (25,26). Evidence for a role of estrogen associated to obesity in postmenopausal breast cancer is that circulating levels of estrogens are strongly and linearly related to adiposity (27). Endogenous estrogens biosynthesis after menopause is catalyzed almost exclusively by the aromatase enzyme in the adipose tissue. Beside the increased adipose mass, also fat distribution has been correlated with breast cancer risk and outcome: increased breast cancer risk and mortality have been associated with upper body obesity as defined by the waist-to-hip ratio, or suprailiac-to-thigh ratio (28). More so a central role is played by the adipose tissue that sustains and surrounds the breast glandular tissue and includes a mix of mature adipocytes, undifferentiated fibroblasts, and macrophages. Changes in fibroblasts distribution may regulate the local synthesis of estrogen, thus influencing the breast tumor development (28).

It could be concluded from the study that increase in BMI, WHR, WC, hip circumference and frame size may be a predisposing factors for prostate cancer while increase in waist circumference and hip circumference may be predisposing factors for breast cancer patients

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