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The Risk of Hypertension in Igbo Adults Residing in Owerri Using Waist to Hip Ratio and Body Mass Index as Markers.

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ABSTRACT

This study investigated the national health status of adults in Owerri Municipal L.G.A. Imo State, Nigeria, as indicated by their body mass index (BMI) and waist to hip ratio (WHR). 100 subjects comprising 50 male and 50 female adults were recruited for the study. Using standard procedures, their systolic blood pressure, diastolic blood pressure, pulse rate, age, height, weight and waist and hip circumstances were measured and recorded for BMI and WHR determination. Data were analyzed using SPSS 17.0 for Pearson correlation and t-test. Results showed significant difference ($p<0.05$) in the mean BMI between males ($25.09\pm 5.3 kg/m^2$) and females ($27.83\pm5.49 kg/m^2$. Female subjects presented a greater degree of obesity and are at a higher risk of cardiovascular diseases especially hypertension as 0%, 34%, 40% and 26% of the females and 2%, 54%, 32% and 12% of the males were found to be underweight, normal, overweight and obese respectively. The WHR values ranges from 0.68-0.96 for males. With this the health conditions of the females were at 4%, 10%, 32%, 34% and 20% for good, better, moderate, worse and worst risk respectively. Thus using the BMI classification, 66% of female subjects were prone to developing cardiovascular disease especially hypertension while the percentage was 44% amongst male subjects. This suggests that females living in Owerri are more prone to hypertension than males. This could be due to eating habits, poor or lack of regular physical exercise and excessive alcohol consumption. The result of the present study is recommended to health workers for counseling and enlightenment and campaign on improvement of health status of people living in Owerri.

Keywords: Hypertension, waist to hip ratio, body mass index, waist circumference, Hip circumference

INTRODUCTION

It has been noted previously that as a country develops, the standard of living of the citizens increases, their nutritional status increases as well. Many citizens do not have to toil for their daily needs and instead take up white-collar jobs that are accompanied by sedentary lifestyles. This brings about high prevalence of overweight and obese persons in the society who are unable to make out time for exercise leading to exposure to cardiovascular diseases. Therefore, developed countries with large economies have a higher prevalence of overweight and obese people followed by developing countries like Nigeria [1].

Waist circumference and waist-to-hip ratio are widely used as an indicator of abdominal obesity in population studies. It is increasingly clear that waist-to-hip ratio is a better reflection of the accumulation of intra-abdominal or visceral fat depot, because of the postulated role of visceral fat depot in health risk disease. Behavioural factors associated with a high waist circumference and waist-to-hip ratio (e.g., high alcohol consumption, physical inactivity and smoking) were attributed to both relatively large waist and relatively narrow hips [2,3,4].

Waist-to-hip ratio shows a graded and highly significant association with myocardial infarction risk worldwide. According to Charles and Laurie [5], redefinition of obesity based on waist-to-hip ratio instead of Body Mass Index (BMI) increases the estimate of myocardial infarction attributed to obesity in most ethnic groups .People with higher waist circumference and waist-to-hip ratio tend to be at higher risk of cardiovascular diseases than people who carry more weight around their hips [6].

Body mass index as an individual's body weight divided by the square of his/her height. The formula produces a unit of measure Kg/m^2.

$BMI = Mass\ (kg) \div Height\ (m^2)$.

The World Health Organization regards a BMI of less than 18.5 as underweight, and may indicate malnutrition, an eating disorder, a health problem, while BMI greater than 25 is considered overweight and above 30 is considered obese.

Waist-to-hip ratio analyses the relationship between the waist and hip measurement to help you understand your body type and current health status [7]. Most people store their fat in two distinct ways, often called "apple' and "pear" shape [8]. In spite of several reports on these important subjects on most populations of the world, reports on Nigerians are however scarce with no report on the ethnic groups under investigation hence the need for the present study.

Table 1: Classification of Waist to Hip ratio

Gender	Excellent	Good	Average	At Risk
Male	<0.85	0.85 -0.89	0.90 -0.95	≥0.95
Female	<0.75	0.75 -0.79	0.80 -0.86	≥0.86

Table 2: *Classification of Blood Pressure*

Classification	Normal	Pre -hypertension	Stage1 hypertension	Stage 2 hypertension
Systolic (mmHg)	<120	120 -139	140 -159	160
Diastolic (mmHg)	<80	80 -89	90 -99	100

Rotimi carried out a survey of the prevalence of hypertension and associated risk factors including obesity among persons of West Africa heritage currently living in societies at different stages of social economic and technological development. It was seen that BMI and the prevalence of overweight and obesity increased with westernization from rural African subsistence farming communities to suburban Chicago. It was also seen that average BMI increased with age until about age 54 and then began to decline. The mean BMI for African-American men was within the overweight level and less than that of women which was calculated to be in the obese level [9].

In 1997, the relationship between BMI and Blood Pressure (BP) was investigated and explained by Kaufman at the lower ranges of relative weight in African and Caribbean populations. Age adjusted slopes of Blood Pressure, on BMI were uniformly higher in men than women. Men also displayed no evidence of age modification or no-linearity in the relationship, whereas women demonstrated both age modification and nonlinearity. A threshold at 21kg/m^2 in the relationship between BMI and BP for women but not for men was observed by Kaufman [10].

Luke carried out a study to determine the ability of BMI to predict body fat levels in three populations of West African heritage living in different environments – Nigeria, Jamaica and the United States. Percentage of body fat and BMI were highly correlated within site- and sex-specific groups and the resulting coefficient of determination (r^2) ranged from 0.61 to 0.85. [11]

Bose and Chakraborty carried out a cross-sectional study to determine anthropometric profile and nutritional status based on body mass index of adult Bathudis, a tribal population of Orissa, India and found prevalence of adult under nutrition among the Bathudis [12].

Oladipo carried out a study to determine the significant difference between the Waist-to-Hip ratio and BMI of adults in Ogoni and Ikwere ethnic groups in Nigeria. He concluded by stating that there is significant difference between both ethnic groups [13].

Bigazzi carried out a study to determine the metabolic risk factors and markers of cardiovascular and renal damage in overweight subjects in the United States. They evaluated whether overweight subjects with hypertension also manifest hemodynamic and metabolic abnormalities compared with individuals of normal weight. The study results showed that increased body weight clusters with a variety of hemodynamic and metabolic abnormalities in hypertensive subjects [14].

MATERIALS AND METHODS

This study was carried out on One hundred (100) adult Nigerians living in Owerri, Imo State- Nigeria. This comprised 50 males and 50 females. The instrument used for data collection included: bathroom scale (Harson's Bathroom scale, Model H89. Made in China), digital sphygmomanometer (PROLOGIC, PL100, made in China), tailor's Tape (made in Shanghai, China) and meter ruler (2m BMI π., made in China)

The parameters measured included weight, height, waist circumference, hip circumference, systolic pressure, diastolic pressure and pulse.Weight was measured using a bathroom scale in kg. Measurements were taken in the morning before breakfast and subjects wore thin clothes. (figure 2) [15]

Height was measured from the highest point on the head of the subject excluding the hair to the sole of the foot, they were asked to take off their shoes to avoid altering the value. The measurement was taken using a meter rule in metres. Waist and Hip circumferences

were taken using a tailors tape in centimetres. For the waist circumference; measurements were taken at the thinnest part of the trunk about an inch above the umbilicus (figure 1) and for the hip circumference; measurements were taken at the widest part pelvis[16].

Figure 1: Picture of the measurement of waist circumference

Figure 2: Picture of the weight measurement

Statistical Analysis

Data on body mass index, waist to hip ratio, blood pressure (systolic and diastolic) and pulse were subjected to statistical analysis using SPSS 17.0 version for Pearson's correlation to determine the correlation between the parameters and T-test to determine differences between the mean values of groups. The confidence interval of 95% was used.

RESULTS

The present study examines the risk of hypertension among Igbo Adults who reside in Owerri using waist-to-hip ratio and body mass index (BMI) as markers. The results are presented in table 3 to 8

Tables 3 and 4 represent the percentages of risk categories of waist-to-hip ratio (WHR) in Igbo males and females respectively.

Figure 3: Picture showing how values for blood pressure is taken

Systolic and Diastolic pressure and Pulse were taken using a digital sphygmomanometer. After the subject had rested 5 minutes, the cuff of the sphygmomanometer was placed on the left arm of the subject about half an inch above the cubital fossa. The subjects arm was placed on a surface at the level of the heart before the measurements were taken. Systolic and diastolic pressures were measured in mmHg as shown in figure 3.

The values gotten for the height and weight were calculated to get Body Mass Index using the formula: BMI= Mass (kg) ÷ Height (m2)[13].

Waist to hip ratio was determined by dividing the value for waist circumference by that of the hip circumference. Classification of WHR was based on Charles and Laurie [5].

From table 3, 14% of males were at risk of developing cardiovascular diseases while most of them (86%) had normal waist to hip ratio and this were not at risk of cardiovascular problem. The percentages in females (Table 4), however, varied from males as 86% of them were pronged to developing cardiovascular diseases most especially hypertension. A lower percentage of the females population (14%) was normal, they were more prone to cardiovascular problems.

The result in table 5 shows that there were no cases of severally underweight in male and female subjects, 2% of males were underweight while no case occurred in females, more than 50% of males had normal BMI which is fairly good but not good enough. However, in females, only 34% had normal BMI while 66% were

either overweight or obese thus putting them at the risk of cardiovascular diseases, most especially hypertension. The observation here conforms to those of Table 3.

The means and standard deviation of the various variables or parameters investigated are shown in table 6, these are those of male and females subjects investigated. Though differences were observed in Body Mass Index (BMI), diastolic blood pressure, (DBP), systolic blood pressure (SBP) and age of male and female subjects, these were only significant (Table 7) in Age, and BMI ($P<0.05$). Thus sexual dimorphism occurs only in body mass index.

Analysis of correlation was carried out using SPSS statistics 17.0 version for Pearson Correlation using 95% confidence interval ($P=0.05$).The result are shown in table 8.The results obtained showed there was no correlation in any of the parameters paired in male subjects. But significant correlations were found in female subjects between BMI and DBP, BMI and SBP and WHR and SBP. Pairing of age with body mass index and waist to-hip ratio showed no significant correlation in either male or female, thus age grouping for the present study was not relevant.

Table 3: Percentage of Risk Categories of Waist-to-hip Ration for Male Subjects (classification based on Charles and Laurie, 2005)

Categories		**WHR Values**	**Incidence**	**Percentage (%)**
High Risk	Worst	>1.00	-	0
	Worse	0.95-1.00	1	2
Moderate	Risk	0.90-0.94	6	12
Healthy	Better	0.85-0.89	22	44
Condition	Good	<0.85	21	42

Sample size = 50
Range = 0.68-0.96

Table 4: Percentage of Risk categories of waist-to-hip for females subject (classification based on Charles and Laurie, 2005.

Categories		**WHR Values**	**Incidence**	**Percentage (%)**
High Risk	Worst	>0.90	10	20
	Worse	0.85-0.90	17	34
Moderate	Risk	0.80-0.84	16	32
Healthy	Better	0.75-0.79	5	10
Condition	Good	<0.75	2	4

Sample size = 50. Range =0.68-0.95

Table 5: Percentages of risk categories of Body Mass Index (BMI) for Male and Female Subjects

Categories	**BMI (kg/m2)**	**Males**		**Females**	
		No	**Percentage**	**No**	**Percentage (%)**
Severely underweight	< 16.5	-	0	-	0
Under weight	16.5-18.4	1	2	-	0
Normal	18.5-24.9	27	54	17	34
Overweight	25-29.9	16	32	20	40
Obese class 1	30-34.9	4	8	8	16
Obese class II	35-39.9	-	0	3	6
Obese class III	>40	2	4	2	4
Total	-	50	100	50	100

Range in male =17.73 -45.24(kg/M^2) Range in female =19.73-44.10(kg/M^2)

Table 6: Result of Mean and standard Deviation of BMI, WHR, DBP, SBP, Pulse and Age of Male and Female Subject

Parameters	BMI ± SD	WHR± SD	DBP± SD	SBP±SD	Pulse±SD	Age±SD
MALES	25.09±5.39	0.85±0.054	79.32±16.02	136.66±19.93	79.10±12.13	32.70±9.14
FEMALES	27.83±5.49	0.85±0.054	80.76±14.28	137.86±21.28	79.62±12.38	36.28±13.69

Sample size for males =50
Sample size for females = 50
BMI –Body Mass Index
WHR-Waist-to-hip ration
DBP – Diastolic Blood Pressure
SBP –Systolic Blood Pressure
SD- Standard Deviation

Table 7: Table showing Results of T-test Analysis/Using SPSS 17.0 version of variables in males and females.

Parameters	t-values	p-Values (SID)	Interface
Age (years)	1.577	0.121	Significant
BMI (kg/M2)	2.658	0.011	Significance
WHR	0.051	0.960	Not significant
DBP (mmHg)	0.3515	0.753	Not significant
SBP (mmHg)	0.317	0.816	Not significant
Pulse (/Minute)	0.234	0.816	Not significant

Sample size: male = 50 female = 50

Table 8: Results of Analysis of Correlation using SPSS 17.0 for Pearson Correlation
Pearson correlation P-value (2-tail) Interface

Parameters	Male	Female	Male	Female	Male	Female
BMI versus WHR	0.021	0.218	0.885	0.128	Not significant	Not significant
BMI versus DBP	-0.041	0.342	0.776	0.015	Not significant	significant
BMI versus SBP	-0.023	0.356	0.876	0.011	Not significant	significant
BMI versus Pulse	0.063	0.061	0.662	0.676	Not significant	Not significant
WHR versus DBP	0.073	0.257	0.614	0.071	Not significant	Not significant
WHR versus SBP	0.176	0.347	0.222	0.014	Not significant	significant
WHR versus Pulse	0.037	-0.115	0.801	0.425	Not significant	Not significant
WHR versus Age	0.090	0.062	0.534	0.668	Not significant	Not significant
BMI versus Age	0.044	0.276	0.761	0.052	Not significant	Not significant

Confidence interval = 95% i.e p=0.05
Sample size for male = 50
Sample size for female = 50

DISCUSSION

The result of the anthrometric features, among adults who reside in Owerri has revealed that the most prevalent group that prone to cardiovascular problems, most especially hypertension are the females and the least prevalent group are the men.

In this study, overweight or obese was the highest in females with only few of normal weight while the male had least number of overweight or obese and had more than half of the population as normal weight. In the other hand there were no cases of severe under weight on both subjects, about a few of the men where underweight while on occurred in females.

There was slight differences observed in body mass index (BMI), diastolic blood pressure (DBP), systolic blood pressure (SBP) and age of male and female subjects, these were only significant in age and BMI ($p<0.05$). There was no significant BMI pulse differences ($p>0.05$) in both sex. Based on this study, age grouping was not relevant because paring of age with body mass index and waist to-hip ratio showed no significant correlation in both sex. It was also revealed

that no correlation in any of the parameters paired in male subjects but significant correlations were found in female subjects between BMI and DBP,BMI and SBP, WHR and SBP.

With these results, the mean BMI for both male and female agrees with those of Anibeze ,Amole and Gordon and Margaret , that female showed a higher obesity pattern than males ($p<0.05$) [17,18,19].

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