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Afr. J. Biomed. Res. Vol. 23 (Special Edition, July, 2020); 81- 84

Research Article

Blood Pressure, Hypertension and Obesity in Young Adults in a Tertiary Health Institution in Southwest Nigeria

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ABSTRACT

Hypertension and obesity are significant causes of morbidity and the numbers are growing in Nigeria and the world at large. Indeed, hypertension has been cited as one of the leading causes of death worldwide and obesity has been identified as a strong risk factor in the development of hypertension. The relationship between obesity and hypertension had been studied largely among older population. This study aims at determining the relationship between obesity and hypertension in young adults at University College Hospital (UCH). This is an analytical cross-sectional study conducted at UCH. Participants aged 18 to 30 years were recruited using a non-probability sampling technique. Data were collected using questionnaire after informed consent. Additionally, weight, height, waist and hip circumference and blood pressure (BP) of participants were taken. A total of 60 males and 51 females participated in the study. Mean age of 22.8 ± 2.3 years and 23.1 ± 2.1 years for male and female respectively. The mean systolic and diastolic blood pressures were 120.2± 16.9, 79.5± 11.7 and 113.8 ± 7.6, 72.7 ± 5.7 for male and female respectively, while the mean waist circumference (WC) was 75.3± 7.0 and 72.5± 8.2 for male and female respectively. The prevalence of hypertension was 5.4% in the population, whereas the prevalence of obesity was 3.6%, 4.5% and 11.7% based on body mass index (BMI), waist hip ratio (WHR) and waist circumference (WC) respectively. From this study the prevalence of hypertension is 5.4% and there are more obese female than male using waist circumference as the index of obesity.

Keywords: *obesity, hypertension, young adults, University College hospital*

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Received: September, 2019; Accepted: March, 2020; Published: July 2020

Abstracted by:

Bioline International, African Journals online (AJOL), Index Copernicus, African Index Medicus (WHO), Excerpta medica (EMBASE), CAB Abstracts, SCOPUS, Global Health Abstracts, Asian Science Index, Index Veterinarius

INTRODUCTION

Hypertension and obesity are significant causes of morbidity and the numbers are growing in Nigeria and the world at large. Indeed hypertension has been cited as one of the leading causes of death worldwide and obesity had been identified as a strong risk factor in the development of hypertension (Macgregor 2005). In addition hypertension and obesity may act synergistically or independently to cause cardiovascular disease and mortality (legler *et al* 2014). Obesity is socially and culturally acceptable in Nigeria and therefore not usually recognized as medical problem until the medical complications of the condition begin to surface (Iloh *et al* 2010).

The prevalence of obesity, including childhood obesity, is increasing worldwide. Weight gain is associated with increases in arterial pressure, and it has been estimated that 60-70% of hypertension in adults is attributed to adiposity (Kotchen 2010). The prevalence of hypertension in young adults (age 18 – 40) was found to be 15% in Ugandans (James *et al* 2015). A local study in Ile-Ife, Nigeria, found the prevalence to be 4.4% among young adults (Asafa *et al* 2015). Centrally located body fat, associated with insulin resistance and dyslipidaemia, is a more potent determinant of blood pressure elevation than peripheral body fat (Kotchen 2010). Obesity related hypertension may be a distinct hypertensive phenotype with distinct genetic determinant. Mechanism of obesity related hypertension include insulin resistance, sodium retention, increased sympathetic nervous system activity, activation of renin- angiotensin-aldosterone and altered vascular function (Kotchen 2010). In overweight individuals, weight loss may result in a reduction of blood pressure. Higher body weight is associated with an increased prevalence of vascular risk factors (Vernooij *et al* 2010).

Childhood obesity has become a major global health concern in recent decades (Zwiauer 2000). The prevalence of obesity among children appears to be rising rapidly in developing countries, which could be attributed to lifestyle changes (Kelishadi *et al* 2003). Recent data have demonstrated a dramatic increase of overweight children and adolescents during the past 2 decades. Over nutrition and

insufficient physical activity associated with obesity have been estimated to account for at least 300,000 deaths and $99 billion cost per year in the United States. These risk factors have been proven to accelerate progression of atherosclerotic lesions in the coronary arteries of young people (Saki *et al* 2013). Obese children are at an increased risk of morbidity and mortality particularly from cardiovascular disease later in life (Freedman *et al* 1999). Hypertension and cardiovascular disease are also the major causes of morbidity and mortality in the general population.

Obesity and hypertension have been described in the literature largely among the older population. However, a lot of evidence has accumulated to show that the two conditions may have started from early childhood and even pre-natal (Levine 2006). The two conditions are on the rise among young adults due to life style changes (Iloh *et al* 2010) and it is important to study the relationship between these conditions in young adults.

The relationship between obesity and hypertension had been studied largely among the older population and has not been well explored among young adults in Nigeria. This study aims to determine the relationship between obesity and hypertension in young adults in University College Hospital. The findings may allow for early intervention that may prevent the development of cardiovascular disease later in life.

MATERIALS AND METHODS

Study design: This is an analytical cross-sectional study set out to determine the relationship between hypertension and obesity in young adults among medical students in Alexander Brown Hall, (ABH), University College Hospital (UCH).

Study population and location: The study population consists of all consenting students between age 18 and 30 years residing in ABH. Medical students are largely a group of young people from average to above-average socio-economic backgrounds. They work hard, exercise or cook little, hence they eat unhealthy diets which put them at risk of obesity.

The study was conducted at Alexander Brown Hall, a hall for medical students situated at UCH, Ibadan.

Sample size and sampling method: The estimated sample size was 110 using a prevalence of 7% (Basiratnia *et al* 2013), 95% level of confidence and allowable margin of error 5%**.** A non-probability sampling technique was used to select all consenting participants. Volunteered participant was selected. Before selection, a notice was passed describing the intention of the study in order to sensitize the subjects. Eligibility was based on being resident in ABH and in the age range of 18 to 30 years. Non consenting subjects and those with conditions that imposed extreme weight and size changes, e.g. oedema, were not eligible.

Data collection, instrument and quality control

The questionnaire was pre-tested among a selected group of students and necessary corrections were made before administration. After an informed consent, the questionnaire was given noting demographic data, family and social history. Questions relating to diet pattern were asked. Measurements were carried out by the investigator under standardized conditions and using standard equipment.

The waist circumference (WC) was measured at the level of the umbilicus and the hip circumference at the level of the greater trochanter using a tape rule to the nearest 0.5cmHeight was measured using a meter rule (Secca) to the nearest 0.5cm with vertex as the reference point, weight was measured using a weighing scale (Secca) to the nearest 0.5kg. Body mass index (BMI) was defined as (weight in kg)/ (height in m)^2. The waist hip ratio (WHR) an indicator of central obesity was expressed to the nearest 0.5 (Anyanwu *et al* 2011). The blood pressure was measured with the patient relaxed and the arm at heart level using a sphygmomanometer (Accoson) and stethoscope (Lithmanns) to the nearest 2mmHg. Three blood pressure measurements were taken per subject: both arms and then on the arm with the higher blood pressure with an interval of two minutes between each measurement.

Obesity was defined as BMI over 30kg/m^{2}or waist circumference above 80cm for female and 90cm for male (Rahman *et al* 2010) or a waist hip ratio over 0.9 for male and 0.82 for female. Hypertension was defined as blood pressure ≥ 140/90 mm Hg.

Cases were identified for referral to the appropriate clinics.

Data analysis: The data was analyzed using SPSS version 19 software. Chi-square test was used to test for association, and statistical significance was set at $p < 0.05$.

Ethical consideration: Ethical approval was obtained from UI/UCH ethics committee

RESULTS

General characteristics: A total of 60 males and 51 females participated in the study. The mean age of the males was 22.8 ± 2.3 years, and 23.1 ± 2.1 years for the females. The mean BMI was 22.7 ± 2.8 for males and 22.7 ± 3.6 for females, while the mean WHR was 0.83 ± 0.041 for males and 0.77 ± 0.044 for females (Table 1).

Table 1.
Characteristics of the participants

	Male (mean + SD)	Female (mean + SD)
Age (yrs)	22.8 ± 2.3	23.1 ±2.1
BMI	22.7± 2.8	22.7± 3.6
WHR	0.83± 0.041	0.77± 0.044
WC (cm)	75.3± 7.0	72.5± 8.2
Blood pressure (mmHg)		
Systolic	120.2± 16.9	113.8± 7.6
Diastolic	79.5± 11.7	72.7 ±5.7

BMI = body mass index; WC= waist circumference; WHR = waist/hip ratio

Prevalence of obesity and hypertension

The prevalence of hypertension was 5.4% in the participants, being 10% in males and 0% in females, while the prevalence of obesity was 3.6%, 4.5% and 11.7% based on BMI, WHR and WC respectively. A significant difference was found on gender-based obesity using

waist circumference as the index of obesity with 10 females being obese as opposed to 3 males (Table 2). There is a significant association between gender and hypertension with 6 males being hypertensive as opposed to zero female. However, no significant association was found between hypertension and age, family history, alcohol, smoking, BMI, WHR and WC (Table 3).

Table.2
Comparison between various indices of obesity by gender.

	Male (%)	Female (%)	Total (%)	P
BMI				
Obese	2 (1.8%)	2 (1.8%)	4 (3.6%)	1.00
Not obese	58 (52.3%)	49 (44.1%)	107 (96.4%	
WHR				
Obese	3 (2.7%)	2 (1.8%)	5 (4.5%)	1.00
Not obese	57 (51.4%)	49 (44.1%)	106 (95.5%	
WC				
Obese	3 (2.7%)	10 (9.0%)	13 (11.7%)	0.035
Not obese	57 (51.4%)	51 (45.9%)	98 (88.3%)	

DISCUSSION

Hypertension is one of the leading causes of death worldwide and obesity has been identified as a strong risk factor for hypertension. Both can act independently and synergistically to cause cardiovascular disease.

From this study the prevalence of hypertension was 5.4%. This implies that one in every twenty young adults had hypertension. This is similar to a 4.4% prevalence from Ile-Ife Nigeria (Asafa *et al* 2015) and lower than 15% prevalence from Uganda, possibly due to ethnic difference and larger sample size of the latter (James *et al* 2015).

In addition, there is significant gender difference in hypertension with a higher prevalence in males than in females. Similar reports from Ile-Ife Nigeria also showed higher prevalence among males than in female. This was in contrast with a study done in Northwest Ethiopia which reported higher prevalence of hypertension in female than male (Ankilew *et al* 2105). This is often referred to as gender dichotomy. This can be explained by the higher indices of obesity, elevated level of insulin in women and stress level at later age.

Furthermore a significant difference was found on gender based obesity using waist circumference as the index of obesity with more obese females than males This is similar to a study done in Malaysia with 66.4% obese female and 23.8% obese male based on waist circumference (Ahmed *et al* 2016). This study is limited based on the sample size and sampling technique. The study participants were medical student whose socio-demographic characteristics may not be similar to the general public.

It is concluded from this study that the prevalence of hypertension is higher in male than in female and there are more obese males than females using waist circumference as the index of obesity. A study involving a larger sample size and participant from various sphere of life is required before the result can be applied to the general public.

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Table.3.
Association between hypertension and risk factors.

		Hypertensive (prevalence)	Not hypertensive (prevalence)	Total (prevalence)	P value (2 sided)
Age	< 25 years	5 (4.5%)	92 (83.6%)	97 (88.2%)	0.539
	≥ 25 years	1 (0.90%)	12 (10.9%)	13 (11.8%)	
Family history	Yes	5 (4.5%)	51 (45.9%)	56 (50.5%)	0.206
	No	1 (0.90%)	54(48.6%)	55 (49.5%)	
Alcohol	Yes	3 (2.7%)	18(16.2%)	21 (18.9%)	0.080
	No	3 (2.7%)	87 (78.4)	90 (81.1%)	
Cigarette	Yes	1 (0.90%)	1 (0.90%)	2 (1.8%)	0.106
	No	5 (4.5%)	104 (93.7%)	109 (98.2%)	
Gender	Male	6 (5.4%)	54 (48.6%)	60 (54.1%)	0.030
	Female	0 (0%)	51(45.9%)	51 (45.9%0	
BMI	Obese	0 (0%)	4 (3.6%)	4 (3.6%)	1.000
	Not obese	6 (5.4%)	101(91.0%)	107 (96.4%)	
WHR	Obese	1 (0.90%)	4(3.6%)	5 (4.5%)	0.247
	Not obese	5 (4.5%)	101(91.0%)	106 (95.5%)	
WC	Obese	1 (0.90%)	12(10.8%)	13 (11.7%)	0.535
	Not obese	5 (4.5%)	93(83.8%)	98 (88.3%)	

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