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LIPID PROFILE IN HYPERTENSIVE PATIENTS RECEIVING TREATMENT IN FEDERAL MEDICAL CENTRE OWERRI, NIGERIA.

[1]OBEAGU EMMANUEL I., [2]EZIUKWU KELECHI., [3]OGBODO OBIAGELI R., [1]ODO MATHEW C. AND [4]UDOCHUKWU A. IBEZIM-UCHEGBU

[1]HEALTH SERVICES DEPT. MICHAEL OKPARA UNIVERSITY OF AGRICULTURE UMUDIKE, ABIA STATE , NIGERIA.

[2]EVAN ENWEREM UNIVERSITY, IMO STATE, NIGERIA.

[3]DEPT. OF NURSING SCIENCES, EBONYI STATE UNIVERSITY, ABAKALIKI.

[4]MEDICAL CLINIC, NATIONAL ROOT CROP RESEARCH INSTITUTE, UMUDIKE.

ABSTRACT

A total of 100 hypertensive patients from the Federal Medical Center, Owerri, (FMC), were investigated to determine the relationship between total cholesterol (TC), HDL-cholesterol, LDL cholesterol and three anthropometric parameters: waist circumference (WC) waist-hip ratio (WHR) and body mass index (BMI). 50 apparently healthy students of Evan Enwerem University were recruited as control subjects. In hypertensive subjects, the mean ($\pm$ standard deviation) obtained for the various parameters were TC, 6.05 ($\pm$0.77) mmol/L, HDL cholesterol, 1.03 (+0.44) mmol/L, LDL cholesterol 3.40 (+0.72) mmol/L, WC 95.77 ($\pm$17.20) cm, WHR 0.95 (+0.16) and BMI 32.3 (+6.62) kg/m^2. There was a statistical significant difference ($p<0.05$) between the means of WC, BMI, TC and LDL cholesterol of hypertensive and control subjects. The correlation of the three anthropometric parameters (BMI, WC and WHR) with TC and LDL cholesterol was significantly ($p<0.05$) positive. While a significant negative correlation was observed between HDL cholesterol and the three anthropometric parameters (BMI, WC and WHR). Also, a positive correlation was observed between age and TC and LDL cholesterol of hypertensive patients. It can then be concluded that an increase in the anthropometric parameters (BMI, WC and WHR) is accompanied by an increase in TC and LDL cholesterol.

Keywords: Lipid profile, LDL, HDL, Hypertension, BMI, WC and WHR

INTRODUCTION

Hypertension is defined as either a sustained systolic blood pressure of greater than 140 mm Hg or a sustained diastolic blood pressure of greater than 90mmHg (Epstein and Froblich, 2001). This rise is as a result of an increase in cardiac output and in peripheral vascular resistance (Laragh, 2001).

About 12 million people die yearly worldwide from hypertension. 15% of adults in their late 20s to 40s are hypertensive; about 50% of 55-64 years old and 60% of those in their late 60s to 70s are hypertensive. (Culter *et al.,* 2002). Over 300 markers have been unearthed by scientists to help reduce the high incidence of hypertension and these include correlation between infection, diet, age, lifestyle and weight to the increased incidence of hypertension (British Hypertension Society, 2000).

Hypertension may be essential or secondary. In essential hypertension the cause of hypertension is unknown and it constitutes about 90-95% of recorded cases. Secondary hypertension constitutes about 5-10% of recorded cases. Its causes are: renal, neurogenic, endocrine, of the aorta and toxaemia of pregnancy. (Gomez and Moneva, 2000).

A family history of hypertension increases the likelihood that an individual will develop hypertension (Vidi, 2000). Other risk factors for hypertension are obesity, diabetes, stressful lifestyle, physical inactivity, alcoholism, smoking and hypercholesterolemia.

Some hypertensive individuals are asymptomatic, while chronic hypertension may cause complications (Chobaman and Hill, 2000). These complications include: congestive heart failure, arteriosclerosis, chest pain (angina pectoris) myocardial infarction, renal diseases, hypertensive retinopathy, hypertensive encephalopathy and cerebral thrombosis.

Early diagnosis and proper treatment of hypertension is the key in reduction of the high mortality rate of hypertension. Hypertension can be managed or treated by avoiding its numerous risk factors and by drug therapy.

One of the treatment measures for hypertensive patients, especially the obese patients is weight reduction through regular exercise and eating of low-fat meals (Narklewicz, 2006). This is because obesity is a risk factor for hypertension.

Obesity means an excessive accumulation of fat in the body. Men with more than 25% body fat and women with more than 30% body fat are said to be obese. Obesity is usually evaluated by the use of anthropometric parameters (Malarias and Seidell, 1998). Among these parameters are weights, waist circumference, sub-scapular and triceps skin fold measures and indices such as body mass index (BMI) and waist-hip ratio (WHR). Although, waist circumference (WC) is a highly sensitive measure of obesity, WHR is preferred because it gives an accurate indication of the predominant fat storage in the abdominal region relative to that in the gluteal region (Bennett and Dhaliwal, 2003). As a diagnostic tool for obesity, the BMI assesses whether sedentary individuals are underweight, of normal weight, overweight or obese (Mc Gee, 2005).

Elevated total cholesterol and LDL (Low Density Lipoprotein) cholesterol level and reduced HDL (High Density Lipoprotein) cholesterol level, are another risk factors for hypertension (Sacks, 2001).

Cholesterol is the predominant steroid in animal tissues. It circulates in plasma as an essential component of lipoprotein carriers of various densities, which are complexes, composed of cholesterol and 3 other lipids. They are derived from endogenous synthesis or from exogenous supply from foods like egg yolk, red meat, seafoods, whole-fat diary products. After absorption from the intestine, it is transported in various forms such as HDL and LDL cholesterol.

Factors like diet, obesity, alcohol; smoking, gender, age etc affects the level of cholesterol in plasma. The effect of age on cholesterol level is manifested when there is higher HDL cholesterol level in menstruating women than in post menopausal women, due to the synthesis of HDL cholesterol is enhanced by estrogen. (Godwin *et al*, 1999). Effect of age and gender is seen when there is progress rise in total cholesterol levels from the 20th to 60th year of life, more in men than in women during the reproductive years, due to a reduced concentration of LDL receptors in the liver and is called hypercholesterolemia.

Hypercholesterolemia is a modifiable risk factor for atherosclerosis, which is a condition in which deposits of cholesterol containing plaques are formed within the intima of arteries of vital organs, especially those of the heart. Blood flow through these arteries may be occluded by these plaques, which may rupture and trigger blood clot formation within the arteries. When this happens, heart attack or stroke may result due to insufficiency of arterial blood supply to the organs involved (National Cholesterol Education Program, 1993).

Therefore, to eliminate the risk of cardiovascular disease like stroke and heart attack, hypercholesterolemia should be diagnosed early and treated. Hypertension is a worldwide disease affecting people of low, medium and high income groups. However, it is more prevalent in blacks.

Over 4.3 million Nigerians above the age of 15 years are classified as being hypertensive with blood pressure greater than 140/90mmHg (Akinkugbe, 2008) and making it the commonest non-communicable disease in Nigeria today. Hypercholesterolemia and obesity are risk factors for hypertension.

This work relates the cholesterol level of hypertensive patients to their body mass index, waist-hip ratio and waist circumference. The result obtained will determine if hypercholesterolemia and obesity are actually risk factors for hypertensive patients undergoing treatment in Federal Medical Center Owerri. This will help the physicians in the treatment and counseling of their patients.

AIMS AND OBJECTIVE

1.To measure the concentration of total cholesterol, LDL cholesterol, HDL cholesterol in hypertensive patients undergoing treatment

2.To determine the correlation between the concentrations of cholesterol (i.e. total cholesterol, LDL cholesterol and HDL cholesterol) with anthropometric parameters (e.g. waist circumference, waist-hip ratio and body mass index) in these hypertensive patients.

MATERIALS AND METHODS

SUBJECTS AND SAMPLE COLLECTION

This study was carried on a total number of 150 subjects, which comprised of 100 test subjects and 50 control subjects. Of the 100 test subjects 55 were male and 45 were female, while 25 were male and 25 female in the control subject. The test subjects were hypertensive patients undergoing treatment at Federal Medical Centre Owerri, while the control subjects were apparently healthy students of Evan Enwerem University Owerri, Imo State.

Ethical approval was sought and obtained from the management of Federal Medical Center Owerri. The subjects were briefed and their consents obtained. They were asked to fast for 9-12 hours i.e. they should not eat any food or drink any beverages in the time leading up to the test, only water was allowed. 5mls of venous blood was aseptically drawn from each subject by venepunture into sterile plain bottles.

This blood was allowed to clot and following clothing and retraction, was centrifuged for 5 minutes at 3000rpm for maximum extraction of the clear sera. The clear sera were immediately separated from the packed cells to avoid haemolysis that may cause false results. The analysis was done on the same day and where it is not possible the sera were stored in the fridge until the next day.

RESULTS

Table 1: Mean (Standard deviation) value of anthropometrics and demographic data of studied subjects.

PARAMETERS	HYPERTENSIVE PATIENTS	CONTROL SUBJECTS	P-VALUE
Age (year)	55.83±10.46	23.55±2.33	<0.001
WC (cm)	95.77 ±17.20	86.45± 7.02	0.013
WHR	0.95± 0.16	0.95± 0.22	0.496
BMI (kg/m^2)	32.3 ± 6.62	24.3 ± 4.07	<0.001

Cut- off values for risk of obesity are

BMI >25kg/m^2

WC> 102cm (males), 88cm (females)

WHR> 0.9 (males), 0.8 (females)

P≤ 0.05 is significant

P≥ 0.05 is not significant

The value in table 1 shows that the mean of BMI (32.2kg/m^2) obtained for hypertensive patients exceeded the BMI-set standard for obesity (above 30 kg/m^2). This same table shows that mean value of the BMI of control subjects (24.3kg/m^2) falls within the BMI range for optimal weight (18.5-24.9 kg/m^2).

PARAMETERS **(**mmol/L)	**HYPERTENSIVE PATIENTS**	**CONTROL SUBJECTS**	**P-VALUE**
TC	6.05 ±0.77	4.25±0.62	<0.001
HDL-C	1.03 ±0.44	1.12 ±0.40	0.267
LDL-C	3.40 ± 0.72	2.33 ± 0.98	<0.001

Table 2: Mean (standard deviation) value of serum cholesterol fraction of studied subjects.

Cut- off values for risk are:

TC> 5.2 mmol/L

HDL- C<0.9 mmol/L

LDL-C> 3.32 mmol?L

P≤ 0.05 is significant

P≥ 0.05 is not significant

Table 2 reveals that the mean value of total cholesterol (6.05 mmol/L) and LDL cholesterol (3.40 mmol/L) obtained for hypertensive patients were above the cut-off values for hypercholesterolemia, which are 5.2 mmol/L and 3.32 mmol/L respectively. While the control subject had a lower and safer mean value of total cholesterol (4.25mmol/L) and LDL cholesterol (2.33 mmol/L).

These two tables show that the values of BMI, waist circumference (WC), total cholesterol (TC), and LDL cholesterol differed significantly ($p < 0.05$) between the hypertensive and control subjects. While the values of HDL cholesterol and waist-hip ratio (WHR) did not differ significantly ($p > 0.05$) between the hypertensive and control subjects.

The values from these two tables when combined, shows that both hypercholesterolemia and obesity were present in the hypertensive patients studied but absent in the control subjects.

Table 3: Results of Correlation Analysis between Serum Cholesterol Fractions and Anthropometrics Parameters of the Hypertensive Patients

ANTHROPOMETRIC PARAMETERS	ANTHROPOMETRIC LIPID PARAMETER	CORRELATION COEFFICIENT	VALUE
AGE	AGE vs TC	0.0655	0.0235
	Age vs HDL-C	-0.0031	0.9871
	Age vs LDL-C	0.0527	0.0463
BMI	BMI vs TC	0.3954	0.031
	BMI vs HDL-C	-0.5866	0.0007
	BMI vs LDL-C	0.4307	0.018
WC	WC vs TC	0.3903	0.033
	WC vs HDL-C	-0.2346	0.0121
	WC vs LDL-C	0.4336	0.0171
WHR	WHR vs TC	0.3630	0.047

	WHR vs HDL-C	-0.2046	0.0278
	WHR vs LDL-C	0.3692	0.045

$P > 0.05$ is not significant

$P < 0.05$ is significant

Values from table 3 show that there was significant positive correlation of age of the hypertensive patients with there total cholesterol (TC) and LDL cholesterol. It also shows that a positive significant correlation existed between the BMI of hypertensive patients with their total cholesterol and LDL cholesterol.

Furthermore, waist circumference (WC) and waist-hip ratio (WHR) of the hypertensive has a positive significant correlation with their total cholesterol and LDL cholesterol.

The three anthropometric parameters BMI, WC and WHR correlated negatively with HDL-cholesterol of the hypertensive patients.

DISCUSSION

An evaluation of the relationship between cholesterol levels and anthropometric parameters is an assessment of hypercholesterolemia and obesity as pre-disposing factors for hypertension.

The results from this study show that obesity was present in most of the hypertensive patients used in the study. This finding is same with the findings of Sanchez-Castelli *et al*., (2005) who reported high prevalence of obesity in hypertensive patients. This occurs as a result of abnormally high proportion of body fat in proportion to lean body mass (Carol and Curtain, 2006).

The results also show the presence of hypercholesterolemia in the hypertensive patients studied. This is consistent with the findings of Aguilar *et al*., (2001) who reported high prevalence of hypercholesterolemia in hypertensive patients. This is as a result of high level of total cholesterol and LDL cholesterol in the blood due to reduced concentration of LDL receptors on the liver (NCEP, 1993).

Tables 1 and 2 show that there was no significant difference in mean HDL cholesterol level and WHR, among the hypertensive and control subjects. This may be attributed to similarities in their levels of physical activity, leading to similar lipid changes and body weight (Connelly *et al* .,1999). However, these tables also show that there were significant differences in the mean Total cholesterol, LDL cholesterol, waist circumference (WC) and body mass index (BMI). The result of this study are different from that of Jawed and Nadeen *et al* ., (2003) who found no differences in mean total cholesterol and

LDL cholesterol but found differences in mean HDL cholesterol among normal weight and obese people. The differences in both results may be due to the fact that this present study used hypertensive and control subjects, while the other study used over weight and optimal weight non-hypertensive subjects.

In this study, the correlation analysis between the three anthropometric parameters (BMI, WC and WHR) and the cholesterol fractions (TC, HDL-C, LDL-C showed that BMI correlated positively with total cholesterol and LDL cholesterol of hypertensive patients. This occurred because overweight or obese enhances a rise in cholesterol level. The findings of this present study was consistent with the findings of berg and Destefano, (1995), who reported a positive correlation of BMI with both total cholesterol and LDL cholesterol of hypertensive patients. Waist circumference (WC) and waist-hip ratio (WHR) of the hypertensive patients correlated positively with total cholesterol and LDL cholesterol. This occurred because increase in intraabdominal fat causes increase in body weight and cholesterol level. In agreement with this finding, reader *et al*., (1997) also reported a positive correlation. The three anthropometric parameters correlated negatively with HDL cholesterol. This occurred because obesity increases the level of LDL cholesterol but reduces the level of HDL cholesterol. This present study was in agreement with the study carried out by Danesh and Hirshfield (2004), who reported a negative correlation between the three anthropometric parameters and HDL cholesterol. This present study also revealed a positive correlation of age with total cholesterol and LDL cholesterol. Aguilar *et al* (2001) recorded a similar finding, this finding is explained by a rise in total cholesterol and LDL cholesterol from the second till the sixth decade of life more in men than in pre-menopausal women (Mayne, 2005).

The co-existence of hypercholesterolemia and obesity in hypertensive patients can be attributed to the fact that both of them are predisposing factors for hypertension.

CONCLUSION

The study proves the fact that increases in body mass index (BMI) is accompanied by an increase in waist circumference and waist-hip ratio and total cholesterol and LDL cholesterol level. Since overweight or obesity and hypercholesterolemia is present in the hypertensive patients studied, it can then be concluded that, obesity or overweight and hypercholesterolemia are predisposing factors for hypertension.

Moreso, it is seen that increase in age is accompanied by an increase in total cholesterol and LDL cholesterol. This proves the fact that, as one grows older, their likelihood of developing hypercholesterolemia increase.

RECOMMENDATION

A constant lipid profile check should be adopted by every individual, especially the hypertensive patients. We recommend that people should reduce the intake of fatty food, as they grow older.

Hypercholesterolemia and obesity in hypertensive patients should be properly treated on time.

Every hypertensive patients should embark on regular physical activity or exercise. This will help to reduce fat deposits in the body. Overweight or obese hypertensive patients should embark on weight-loss programme, by regular physical activity and exercise and eating foods low in fat and calories.

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