ORIGINAL ARTICLE

The magnitude of abdominal adiposity and atherogenic dyslipidemia among geriatric Nigerians with arterial hypertension in a rural hospital in South-eastern Nigeria

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Abstract

Background: As the case detection rate of arterial hypertension increases daily in rural Nigeria, screening for its associated abdominal obesity and dyslipidemia is an important healthcare challenge. Of great concern in rural Nigeria is that most geriatric hypertensives with abdominal obesity and dyslipidemia are not routinely diagnosed and therefore do not receive appropriate management.

Objective: This study was aimed at describing the magnitude (prevalence and pattern) of abdominal adiposity using waist circumference (WC) index and dyslipidemia among geriatric Nigerians with arterial hypertension in a rural hospital in South-eastern Nigeria.

Materials and Methods: A descriptive hospital-based study was carried out from June 2008 to June 2011 on 122 consecutive geriatric patients with systemic hypertension who met the selection criteria at St. Vincent De Paul Hospital, Amurie-Omanze, a rural Mission General Hospital in Imo state. Abdominal obesity was defined as WC ≥102 cm and ≥88 cm for men and women, respectively. Dyslipidemia was defined using the third report of National Cholesterol Education Panel in adult (ATP III). The data collected included basic demographic variables, blood pressure, waist circumference, fasting lipid profile, and blood sugar.

Results: The prevalence of abdominal obesity was 50.8% and was the most common pattern of abdominal adiposity. Fifty-four (44.3%) out of 122 patients had at least one dyslipidemia with the most frequent being low high-density lipoprotein cholesterol (HDL-C, 38.5%). There was statistically significant difference between male and female gender based on abdominal adiposity (X^2 = 5.406, *P* value = 0.04) while their mean lipid differentials were not statistically significant.

Conclusion: This study has shown that abdominal adiposity and dyslipidemia exist among geriatric hypertensives in the study area with abdominal obesity being the most common abdominal adiposity and low HDL-C being the most frequent lipid abnormality. This study therefore urges the necessity to consider abdominal obesity and dyslipidemia in geriatric hypertensives in rural Nigeria alongside the complex of other cardiovascular risk factors.

Key words: Abdominal adiposity, dyslipidemia, geriatrics, hospital, hypertension, Nigeria, rural

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Introduction

Hypertension is a common geriatric health problem from non-communicable diseases and magnifies the risk of cardiovascular disease morbidity and mortality.[1] As the prevalence of hypertension increases in rural Nigeria,[2] screening for its associated abdominal adiposity and lipid changes remains relevant, particularly in elderly hypertensive patients, since blood pressure, abdominal adiposity, and lipid profile change with advancing age. The relationship between blood pressure and adiposity[3,4] and dyslipidemia[5] has previously been described. The clinical and public health implications of obesity and its cardio-metabolic co-morbidities have also been documented in adult Nigerians in rural,[6] semi-urban,[7] and urban[8] areas of the country.

Research on ageing is currently on the front-burner in the field of human science. The growing population of elderly people and their attendant health challenges probably motivates this trend. Hypertension, abdominal adiposity, dyslipidemia, and biologic factor of ageing relate to each other pathophysiologically and prognostically. The cardio-metabolic risk factors can co-exist in ageing patients, thus impacting negatively on their longevity, wellness, and aliveness. However, hypertension may antedate the development of abdominal obesity and dyslipidemia and vice versa, and the three conditions constitute component-defining factors or criteria for dysmetabolic syndrome.[9] These are associated with risk of death among the elderly population.[10,11]

Ageing can lead to increase sedentary living, excessive food consumption, reduced cholesterol metabolism, and thus increased accumulation of body lipids.[1] While hypertensive patients are prone to dyslipidemia, abdominally obese patients also appear to be prone to dyslipidemia.[8,12] Studies have shown that abdominal obesity, as defined by abnormal waist circumference (WC), increase the likelihood of an individual developing cardiovascular diseases and that there are marked differences in the hormonal and metabolic responses between central and peripheral fat distribution.[13,14] The abdominal adipocytes are metabolically active and have high lipolytic activities and release a large amount of free fatty acids.[13,14]

Obesity is defined using WC criterion as an excess of adipose tissues resulting in WC ≥102 cm (40 inches) and ≥88 cm (35 inches) for men and women, respectively.[15] Similarly, abdominal overweight refers to the WC between 94 and 101 cm and 80 and 87 cm for men and women, respectively.[15] The health consequences of obesity depend on the amount of body fat, its distribution, and the presence of other cardiovascular risk factors.[16] The metabolic changes in obese individuals are most often seen in abdominal obesity and have consistently been related to increased risk of coronary heart disease in men[17] and women.[18] Many methods of estimating abdominal obesity have been developed and include imaging techniques such as computed tomography scan and magnetic resonance imaging. Although the imaging methods are the gold standard for assessing abdominal adiposity, they are expensive for large-scale epidemiological studies. Criteria for defining healthy weight, overweight, and obesity have been based on anthropometric measures. One of such anthropometric indices of abdominal adiposity, especially for the elderly who tend to have a shift of fat from peripheral to central sites, is the WC, which is a measure of central adiposity. The WC, therefore, provides a simple method of describing pattern of abdominal adiposity even if the body mass index is about right.

Dyslipidemia refers to the presence of abnormal lipids in the body.[19] Several combinations of abnormal lipid profile have been reported in apparently healthy adult population in Asaba[20] and Maiduguri;[21] elderly population in Benin, Edo State, Nigeria,[22] and type 2 diabetic patients in Lagos.[23] However, various patterns and prevalence rates of abnormal lipidology have been reported in hypertensives in Jos[24] and Abuja,[25] Nigeria. The isolated and combined lipid abnormalities such as raised total cholesterol, low high-density lipoprotein cholesterol (HDL-C), and high low-density cholesterol (LDL-C) have also been described to characterize hypertensive dyslipidemia,[5,12,26] and each of these abnormalities are independently atherogenic.

Although not all geriatric hypertensives develop abdominal obesity and dyslipidemia, their chances of developing them are higher. The management of hypertension in geriatric patients has variable endpoints, indicating the involvement of factors other than hypertension in the outcome and abdominal obesity and dyslipidemia constitute components of such factors. The addition of abdominal obesity and dyslipidemic factors in elderly hypertensives needs further attention, especially in secondary health facilities in rural Nigeria. It is, therefore, pertinent to detect early the addition of abdominal obesity and dyslipidemia on geriatric hypertension, as early intervention may alter cardiovascular endpoints. Screening for abdominal obesity and lipid abnormalities in elderly hypertensives needs to be at diagnosis, as the development and damage by abdominal obesity and dyslipidemia start even before the diagnosis is made. The authors, therefore, sought to study the magnitude (prevalence and pattern) of abdominal adiposity and dyslipidemia in geriatric Nigerians with arterial hypertension in a rural hospital in South-eastern Nigeria.

Materials and Methods

This was a clinic-based descriptive study carried out on 122 geriatric patients with arterial hypertension from June 2008 to June 2011 who presented at St. Vincent De

Paul Hospital, Amurie-Omanze, a rural Mission General Hospital in Isu Local Government Area of Imo State, South-eastern Nigeria. The hospital renders 24-hour service daily, including public holidays, to the community and its environs.

The geriatric hypertensive patients who gave informed verbal consent and met the selection criteria (age ≥65 years, treated hypertensives) were consecutively screened for abdominal obesity and dyslipidemia. Critically ill patients, patients with demonstrable ascites and intra-abdominal masses determined by history and physical examination, diabetic hypertensives, and patients with secondary hypertension were excluded from the study.

Sample size estimation was determined using the formula[27] for estimating minimum sample size for descriptive studies when studying proportions with entire population size <10,000 using estimated population size of 100 geriatric patients based on the previous annual geriatric patients hospital attendance records. The authors assumed that 50% of the geriatric hypertensives would have abdominal obesity and dyslipidemia, at 95% confidence level and 5% margin of error. This gave a sample estimate of 80 patients. However, selected sample size of 122 geriatric hypertensive patients was used based on the duration of the study.

The WC was measured using flexible non-stretchable tape. The subject stood erect with arms at the side and feet together. The researcher faced the subject. The iliac crest and lower rib cage were first identified by palpation. The WC was taken as the midpoint between the lower border of lower rib cage and iliac crest in a horizontal plane parallel to the floor.[10] After overnight fast of 12–16 hours, fasting venous blood sample was drawn from the patient after adequate disinfection of the skin over the venepuncture site and was separated to obtain the plasma. Chemical analysis for the fasting lipid profile estimations was done at Hi-Tech laboratory, Owerri. The fasting lipid profile: total cholesterol, triglycerides, and HDL-C, were determined by enzymatic method according to the manufacturer's guide. The value of LDL-C was calculated by using Friedwald's formula.

Abdominal overweight was defined as WC from 94 cm to 101 cm for men and 80 cm to 87 cm for women, while abdominal obesity was defined as WC ≥102 cm and ≥88 cm for men and women, respectively.[15] Dyslipidemia was defined according to the Third Report of the Expert Panel on Detection, Evaluation, and Treatment of high blood cholesterol in adults (ATP III)[19] as follows: Total serum cholesterol ≥200 mg/dL (5.17 mmol/L) and/or triglyceride ≥150 mg/dL (1.7 mmol/L) and/or LDL-C ≥100 mg/dL (2.58 mmol/L) and/or HDL-C <40 mg/dL (<1.03 mmol/L). Blood pressure readings were based on the JNC VII classification and guidelines.[28] Hypertension was defined as systolic and/or diastolic blood pressure ≥140/90 mmHg or documented use of antihypertensive medications in a previously diagnosed person with hypertension. Diagnosis of diabetes mellitus was based on venous plasma glucose of ≥126 mg/dL after an overnight fast, which was confirmed by a repeat test on second clinic visit.[6] The diabetic hypertensives were excluded from the study. The basic demographic variables of age, sex, marital status, education, and occupation were also documented.

The researchers defined geriatric patients as those age 65 years and above.[29] Atherogenic profile refers to abnormal lipid fractions that can predispose and promote atheroma formation and include total cholesterol, triglyceride, LDL-C and HDL-C.

Statistics

The results generated were analyzed using software Statistical Package for Social Sciences (SPSS) version 13.0, Inc. (Chicago, IL, USA) for the calculation of mean, frequencies, and percentages. Results were presented as frequencies and percentages for categorical variables and mean ± standard deviation for continuous data. Independent *t*-test was used to compare means of two groups while Chi-square served to compare proportions. The statistical significance was at $P<0.05$.

Results

The age of the geriatric hypertensive patients ranged from 65 years to 91 years with mean age of 69 ± 2.10 years. There were 51 (41.8%) males and 71 (58.2%) females with male to female ratio of 1:1.4. Majority of the geriatric hypertensives were widow and widower (72.9%), had primary education (43.4%), and were peasant farmers (46.7%) [Table 1].

The most common abdominal adiposity was abdominal obesity (50.8%) [Table 2] while the most frequent lipid abnormality was low HDL-C (38.5%) [Table 3].

Table 4 shows the sex distribution of the study population based on abdominal adiposity. The difference between the two sexes was statistically significant ($x^2 = 5.406$, *P* value = 0.04).

Table 5 shows the mean lipid profiles of the patients based on sex. The differences in the mean total cholesterol, triglyceride, LDL-C, and HDL-C between both sexes were not statistically significant.

Discussion

The prevalence rate of abdominal obesity of 50.8% in this study is greater than 31.7% reported among adult patients in rural hospital in Okrika, Rivers State, Nigeria.[8] The

Table 1: Basic demographic characteristics of the study population

Parameter	Number (%)
Age (years)	
65–74	88 (72.1)
75–84	24 (19.7)
≥85	10 (8.2)
Total	122 (100.0)
Sex	
Male	51 (41.8)
Female	71 (58.2)
Total	122 (100.0)
Marital status	
Married	33 (27.1)
Widowed	89 (72.9)
Total	122 (100.0)
Education	
No formal education	28 (23.0)
Primary	53 (43.4)
Post-primary	41 (33.6)
Total	122 (100.0)
Occupation	
Retired	33 (27.0)
Farming	57 (46.7)
Trading	24 (19.7)
Clergy	8 (6.6)
Total	122 (100.0)

Table 2: Distribution of patients based on abdominal adiposity

Parameter	Number (%)
Normal	17 (13.9)
Overweight	43 (35.3)
Obese	62 (50.8)
Total	122 (100.0)

Table 3: Distribution of the patients based on lipid profile

Parameter (mg/dL)	Number (%)
Lipid profile	
Normal	68 (55.7)
At least one abnormality	54 (44.3)
Total	122 (100.0)
Total cholesterol	
<200	101 (82.8)
≥200	21 (17.2)
Total	122 (100.0)
Triglyceride	
<150	104 (85.2)
≥150	18 (14.80
Total	122 (100.0)
Low-density lipoprotein cholesterol	
<100	93 (76.2)
≥100	29 (23.8)
Total	122 (100.0)
High-density lipoprotein cholesterol	
<40	47 (38.5)
≥40	75 (61.5)
Total	122 (100.0)

Table 4: Sex distribution of abdominal adiposity

Parameter	Sex	
	Male No (%)	Female No (%)
Abdominal adiposity		
Normal	13 (25.5)	4 (5.6)
Overweight	17 (33.3)	26 (36.6)
Obese	21 (41.2)	41 (57.8)
Total	51 (100.0)	71 (100.0)

X^2=5.406, df = 2; *P* value = 0.04

marginally average prevalence rate of obesity in this study could be a reflection of the method of its measurement and diagnostic criterion. WC, which is a measure of central (abdominal) obesity, identifies a greater proportion of individuals with obesity compared with body mass index (BMI), which is a measure of generalized obesity,[8] and has been shown to be most pathogenetically important in the etiology of metabolic disorders.[9] This higher prevalence of abdominal obesity among the study population could be a reflection of their epidemiological characteristics. More importantly, the elderly population has a shift of fat from peripheral to central sites with progressive distribution of fat store more in the visceral region. Apart from the metabolic homeostasis associated with ageing, physical activity patterns also have an important influence on the physiological regulation of total energy expenditure. With increasing age, personal, instrumental, and domestic activities of daily living decrease. Of great concern in the study area is the reduction of domestic and other diverse home and community-related activities due to changes in the family dynamics, structure, and function resulting from the presence of children, grandchildren, great-grandchildren, and extended family relatives who assist their elderly parents and grand-parents in household and community chores and subsistence farming. More worrisome is the role of modern means of transportation and communication in the study area such as the use of vehicular transport system and mobile cellular phones. These facilities probably have freed the study subjects from the tasks involving long-distance trekking, which involve a lot of effort and energy expenditure. In addition, talking with their children, relatives, and friends on the mobile phone has also contributed to reduced physical activity such as walking and cycling among the study population. Efforts should therefore be made to prevent abdominal obesity in geriatric hypertensives through primary prevention strategies such as health education, health promotion, and risk reduction. This will help to improve their quality and duration of life and reduce health costs associated with management of their hypertensive conditions and concurrent abdominal obesity.

Table 5: Mean lipid profile based on sex (mean±SD) in mmol/L

Lipid profile	Male	Female	t-value	*P*-value	Remarks
TC	4.91±0.95	5.19±0.79	0.81	0.090	NS
TG	1.28±0.27	1.30±0.44	0.92	0.182	NS
LDL-C	2.59±0.11	2.61±0.46	0.64	0.090	NS
HDL-C	1.01±0.34	1.11±0.53	0.88	0.070	NS

Abbreviations: TC = Total cholesterol, TG = Triglyceride, LDL-C = Low density lipoprotein cholesterol, HDL-C = High density lipoprotein cholesterol, NS = Not significant

The pattern of abdominal adiposity in this study with the abdominal obesity being the most common pattern could be explained by the observation that those with abdominal obesity were less likely aware of its medical implications and consequences. In addition, patients with abdominal overweight are at risk of progressing to abdominal obesity and its concurrent health hazards. This study has, therefore, buttressed the documentation of the growing evidence of the association between ageing, hypertension, and abdominal obesity. Although fats act as storage organ for excess calories, its abdominal distribution is, however, associated with increased risk of cardiovascular diseases and premature death[10] and impacts negatively on quality of life of geriatric hypertensives.[30] Age is therefore an immutable risk factor that may complicate the management of abdominal obesity in geriatric arterial hypertension. Preventive strategies against weight gain and abdominal obesity should therefore be considered for geriatric hypertensives in rural Nigeria who are living in a resource-constrained environment. These preventable strategies include primary interventions such as lifestyle modification such as healthy dietary and social habit practices and physical, instrumental, and domestic activities of daily living.

The prevalence of dyslipidemia of 44.3% in this study is higher than 27.6% reported in urban elderly population in Benin, Edo State, Nigeria.[22] This comparatively high prevalence in this study could be attributed to the underlying hypertensive condition of the study subjects in addition to the ageing process. Hypertension has been shown to be associated with abnormal lipid profiles.[5,12,26] This may be related to insulin resistance, which has characterized hypertensive dyslipidemia.[9] Ageing can also lead to physical inactivity and excessive food intake, which are associated with reduced cholesterol metabolism and thus increased accumulation of body lipids. Ageing, hypertension, and dyslipidemia have untoward effects on arterial wall, thus magnifying the atherogenic potential and burden on elderly hypertensives.[1] The strategies to reduce the risk and burden of geriatric cardiovascular diseases in rural Nigeria should, therefore, focus on control of hypertension and dyslipidemia which are modifiable. Management of dyslipidemia in elderly hypertensive in rural Nigeria is, therefore, generally necessary and ethically imperative.

This study has shown the pattern of dyslipidemia among the study population. Although the pattern of dyslipidemia varies with the population studied and definition of dyslipidemia. However, the findings of this study have buttressed the documentation that several combinations of abnormal lipid parameters exist among hypertensive patients.[5,12,24,26] The results of this research are also in consonance with the reports that dyslipidemia is becoming an important medical problem among hypertensive patients and are associated with hypertension in a clustering of medical condition or metabolic risk factors referred to as dysmetabolic syndrome.[9] With increasing age, there is progressive decline in fiber intake with an increase intake of carbohydrate and caloric dense foods[1,31] and is also associated with reduction in muscle and bone mass with relative increase in fat mass. A decrease in muscle mass may result in simultaneous decrease in lipid metabolism. Furthermore, there is progressive redistribution of the fat stores more to the intra-abdominal (visceral) region. This accumulated visceral fat is highly lipolytic and has been shown to be a major clinical parameter contributing to geriatric dyslipidemia. Although not all geriatric hypertensive patients develop dyslipidemia, their chances of developing dyslipidemia are high. This may be promoted and enhanced by other constitutional and non-constitutional risk factors of hypertension.[28] While age is a non-modifiable risk factor of hypertension, dyslipidemia is a modifiable risk factor. Epidemiological data have demonstrated that each of the abnormal lipid fractions is independently atherogenic and hypertension associated with dyslipidemia increases the risk of atherosclerotic plaques in coronary arteries and other arterial beds.[28] Early detection of dyslipidemia in elderly hypertensive patients and subsequent effective treatment will beneficially alter the course of the disease and thus improve hypertensive patient management outcome. The screenings for abnormal lipid profile in geriatric hypertensives therefore holds the key to prevention of its associated complication and will enable clinicians to ensure that their geriatric hypertensive patients with atherogenic dyslipidemia receive the life-saving benefits of lipid-lowering therapy in addition to lifestyle modifications.

This study has shown that the commonest lipid abnormality was low HDL-C. This finding could be a reflection of the burden of this specific lipid fraction among the study population, as dyslipidemia is a documented risk factor of numerous chronic metabolic medical conditions

such as hypertension. The low HDL-C among the study population may be attributed to the interacting age factor and behavioral risk factors such as diet and decreased physical activity among the elderly patients. The ageing process is largely characterized by change in dietary pattern and lower physical activities. Despite the publication of cholesterol-related guidelines and major clinical trials,[19] actual lifestyle and cholesterol management measures remains disproportionately low among geriatric Nigerians with systemic hypertension. These interventional strategies to increase HDL-C should focus on controlling hypertension, abdominal obesity, and lifestyle modifications. Identifying this concomitant low HDL-C of hypertension therefore avails greater opportunities for appropriate health information, education, promotion, and communication with the geriatric hypertensives.

This study has shown higher prevalence of abdominal obesity among the females, more than the male geriatric hypertensives. This finding is in consonance with the epidemiological generalization of higher prevalence of obesity among females when compared with their male counterparts.[32] This could be attributed to socio-cultural, hormonal, and genetic differences between the sexes. Elderly females are generally less physically active than their male folk.[33] However, apart from changes in the energy density of diets, genetic differences between the sexes may be contributory.[34] In addition, postmenopausal period is associated with decrease in the resting metabolic rate, which increases body weight.[35] Furthermore, the gender-specific cut-off levels for definition of obesity using WC could have also resulted in higher prevalence rate of abdominal obesity among female geriatric hypertensives.[36]

This study has shown variations in the lipid profiles of male and female geriatric hypertensives. These relative and marginal differences were not statistically significant. This finding is at variance with the reports in elderly population in Benin, Edo State.[22] Although the mechanism involved in the development of sex-related lipid variations have been elucidated, several factors including age, genetics, and socio-environmental factors probably influence these variations.[5,26]

Study implications

There is growing interest in the effects of abdominal obesity and atherogenic lipids on hypertension. Abdominal obesity and dyslipidemia in elderly hypertensives could add to other driving forces responsible for increasing predisposition to cardiovascular endpoints such as heart attack and stroke. Although some geriatric hypertensives may be familiar with their waist sizes, clinicians should, therefore, teach them how to determine their WC and the importance of screening for abnormal lipid profile. The earlier in the pre-morbid phase abdominal obesity and dyslipidemia are detected in geriatric hypertensives, the better the prognosis and outcome of management. Establishing a baseline for these measurements and checking them during patient visits appropriately can provide clinicians with an excellent means of educating their geriatric hypertensives on lifestyle modifications and other diverse clinical care.

Study limitations

The limitations imposed by the descriptive nature of the study are recognized by the researchers. However, this study stimulates the need for analytical and longitudinal studies in this area. This would enable a quasi cause-effect relationship to be drawn and also for a reliable and valid conclusion to be ascertained. The sample size was comparatively small, but this was more than the minimum estimated sample size for the study and was the number of patients seen within the study period. The overall expression of plasma lipid homeostasis should evaluate for plasma lipid profile, not only for their absolute values but also for their mutual ratios. However, the expert panel on cholesterol education recommends testing for total lipid profile including triglyceride, HDL-C, and LDL-C instead of measuring only total cholesterol, as total cholesterol alone misses specific lipid and blood proteins that are independently atherogenic. This study is, therefore, on atherogenic dyslipidemia, not on mutual ratios such as cardiac risk ratio, atherogenic index, and atherogenic coefficient, which are predictive of coronary heart disease. The findings of this study, therefore, gave some useful insight into the magnitude of atherogenic dyslipidemia among the study population for consultation and comparative purposes. The WC was taken at a single point in time and the authors had no information on previous measurements. In addition, the authors had no direct measures of abdominal fat or muscle composition. The researchers also anticipated measurement errors and biases for abdominal adiposity. However, their effects were reduced by using non-stretchable tape and training of the researchers. The training of the research team included standardization of measurement of waist circumference. This was to ensure accuracy and reliability and reduce inter- and intra-observer errors and ensure comparability of measurements. This study, therefore, provides useful baseline information on which subsequent interventions in the study area could be based and evaluated.

Conclusion

This study has shown that abdominal adiposity and dyslipidemia exist among geriatric hypertensives in the study area with abdominal obesity being the most common abdominal adiposity and low HDL-C being the most frequent lipid abnormality. This study, therefore, urges the necessity to consider abdominal obesity and dyslipidemia in geriatric hypertensives in rural Nigeria alongside the complex of other cardiovascular risk factors. Screening for abdominal obesity and dyslipidemia should be an essential part of clinical care framework for geriatric hypertensives

attending secondary rural health facilities in Nigeria. This will invariably improve the quality of care received by geriatric hypertensives. Efforts should be focused on non-pharmacological and pharmacological intervention strategies.

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