

Prevalence of Hypertension and Association with Increased Body Mass in a Semi-Urban Settlement in Nigeria

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Abstract

Introduction: Hypertension is a major cardiovascular disease and is responsible for fatal cardiovascular outcomes such as stroke, myocardial infarction, heart failure and renal failure. In Nigeria, the prevalence of hypertension and its associated complications is increasing at an alarming rate. Whereas excess weight is associated with increased rate of death from cardiovascular diseases, data on association between excess weight and hypertension in Nigerian population are sparse. In the present study we investigated the association between excess body weight and hypertension in a Nigerian semi-urban settlement.

Methods: A cross-sectional survey was carried out at the Kumapayi settlement located in the suburb of Ibadan in southwestern Nigeria. A total of 293 subjects, comprising 40% males, aged 18 years and above who consented to the study following a period of publicity and invitations to all residents of the settlement were enrolled into the study. Demographic, anthropometry and blood pressure measurements were carried out on all the subjects by trained health personnel.

Results: Mean subject age was 47.3 ± 15.2 years with 28.9% overweight (BMI 25-29 kg/m²) and 21.6% obese (BMI ≥ 30 kg/m²). The prevalence of overweight and obesity increased with age peaking at age 40-64 years and then falling. The prevalence of hypertension (BP $\geq 140/90$ mmHg) was 43.3%. There was significant association between increased BMI and both systolic ($P < 0.001$) and diastolic ($P < 0.002$) pressure.

Conclusion: This study confirmed the association between overweight/ obesity and hypertension. Lifestyles changes targeted at weight reduction may help to stem the increasing trend of cardiovascular diseases in the community.

Keyword: Hypertension; Obesity; Rural; Epidemiology

Introduction

Hypertension is a major cardiovascular disease (CVD) and is responsible for fatal cardiovascular outcomes such as stroke, myocardial infarction, heart failure and renal failure [1,2]. Hypertension is highly prevalent among blacks for reasons not yet very clear [3-5]. In Nigeria, the prevalence of hypertension and its associated complications are increasing at an alarming rate [6]. The prevalence depends on the location of the study and the cut-off point for definition of hypertension. Lower prevalence was found in studies that used BP 160/95 mmHg compared with BP 140/90 mmHg as definition of hypertension [7,8]. In Meta-analysis by Ekwunife et al. [9], the prevalence ranged between 12.4% and 34.8% while study at the community in the Eastern part of Nigeria by Ejim et al. [10] showed that 46.4% of the study population had hypertension. The prevalence is higher in males compared to females.

The aetiology of hypertension is complex and it is becoming clearer that the rise in prevalence of hypertension in Nigeria cannot be completely explained by racial or genetic programming. It is of note that while studies on genetic determinants of hypertension are at various stages of conclusion worldwide including Nigeria [11-15], the role of environmental factors such as physical inactivity, obesity, and smoking cannot be ignored.

Concomitant with the increasing prevalence of hypertension is the jump in prevalence of obesity [16,17]. Indeed association between increased body mass and hypertension and diabetes is well established in the literature [18]. Obesity is one of the most important risk factors for hypertension and cardiovascular disease [19]. The global obesity pandemic has been attributed to increasing sedentary lifestyle and unhealthy eating habit, especially in the western developed countries

[16]. Several physiologic mechanisms including activation of the renin-angiotensin-aldosterone and sympathetic nervous system, endothelial dysfunction and renal function abnormalities have been adduced for the association between obesity and hypertension [20].

Nigeria, like several other developing countries is currently experiencing an epidemiological shift from communicable to non-communicable diseases [21]. Increasing urbanization and exposure to western lifestyles in Nigerian cities and suburbs have been implicated for the epidemiological shift [22]. In addition there are culturally conducive practices to overweight and obesity in different parts of Nigeria. However there are scanty population data on Nigerians about evidence of association between obesity and the disturbing rise in hypertension with its concomitant cardiovascular morbidity and mortality. These gaps in knowledge and the need for epidemiology data on patterns of hypertension and association with increased body mass in Nigeria underscore the motivation for the present study in a suburban community of southwestern Nigeria. The aim of this study is therefore to assess the pattern of hypertension and determine its association with obesity in semi-urban settlement at Ibadan, Nigeria.

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Methods

We conducted a cross sectional study on adult females and males at least 18 years old and who were permanent residents at Kumapayi village in Egbeda local government area (ELGA), South-Western Nigeria. Kumapayi village is a semi-urban settlement located about 20 kilometers from the centre of Ibadan Metropolis. The village's total population was 2,728 and comprised of peasant farmers, petty traders, and junior government workers posted to schools and health posts in the community. The participants were randomly selected from various households after an initial brief through the community and religion leaders who were permanent residents of the settlement.

All measurements were carried out by two physicians and a nurse between 8:00 am and 10:00 am at designated community health center. Systemic blood pressure was measured using a standard Omron (HEM711DLX) blood pressure apparatus on the left arm after 5-minute rest using a cuff of appropriate size with the subject in the sitting position. Three independent blood pressure measurements were obtained with a minimum interval of one minute and the last two of three BP was used as the first may have had stress effects that settled once the subject was re-assured and became used to the procedure. Hypertension was defined as systolic blood pressure ≥ 140 mmHg and/or diastolic blood pressure ≥ 90 mmHg or being on pharmacological treatment. Based on the guidelines in the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC VII) [23], subjects were further classified as normal, prehypertension, stage I hypertension or stage II hypertension. Blood samples were collected under aseptic procedures from a finger puncture. Blood cholesterol level was assessed using a digital mission cholesterol meter (ACON LABORATORIES INC.USA).

Anthropometric measurements including height and weight were obtained by the nurse. Height was measured without shoes to the nearest centimeter using a ruler attached to the wall, while weight was measured to the nearest 0.1 kg on an electronic scale with the subject wearing light outdoor clothing without shoes or eye glasses. Body mass index (BMI) was calculated as weight in kilograms divided by the square of height in meters (kg/m^2). Using the WHO criteria [24], persons with BMI of 25.0-29.9 were defined as overweight, and persons with BMI ≥ 30 were defined as obese. Ethical approval was obtained from the institutional ethical review board and informed consent was obtained from each participant.

Statistical analysis

Data was captured on excel spread sheet and then analyzed using SPSS version 17. Continuous variables were expressed as means \pm standard deviation and categorical variables as frequencies. Chi-squared test was used to assess statistical independence and analysis of variance was performed to test differences in mean blood pressure in BMI classes. Stepwise (backward) multiple regression analyses were done to evaluate the independent relations of blood pressure parameters. The level of statistical significance was taken as $p < 0.05$.

Results

A total of 293 adults consisting of 119 (40.6%) males and 174 (59.4%) females, with mean age of 47.3 ± 15.2 years and mean BMI of 45.7 ± 5.4 kg/m^2 were studied (Table 1). Compared to males, the mean BMI and total cholesterol were higher in females. Higher proportion of females were obese ($p=0.018$, Figure 1). The prevalence of prehypertension, Stage I hypertension and Stage II hypertension were 36.7%, 19.9%

and 23.4%, respectively. However, the blood pressure parameters and within hypertension classification were comparable across the gender (Table 1).

As shown in Table 2, half of the subjects were either overweight or obese with peak in obesity among subjects 40-64 years old. The relationship between systolic and diastolic blood pressure with BMI categories is presented in Table 2. There was a noticeable and statistically significant association between higher systolic or diastolic blood pressure with higher BMI status. Similarly, we observed moderately statistically significant association ($p=0.038$) between BMI and hypertension classifications (Table 2) among the subjects. Also there was significant linear relationship between weight and blood pressure as shown in Figure 2.

Discussion

In this study we report that 36.7% and 43.3% of the study population were pre-hypertensives and hypertensives, respectively. Obese and overweight subjects constituted 28.9% and 21.6%, respectively, of the total population. Among the hypertensives, 19.9% were Stage I, and 23.4% Stage II. Over weight and obesity increased with age peaking at age 40-64 years and then showing decline thereafter. The prevalence of hypertension defined as blood pressure equal to or greater than 140/90 mmHg, was noted in 43.3% of our subjects. This is higher than the prevalence of less than 10% earlier reported in Ghana and Nigeria community. In a previous nationwide study [1] carried out over 15 years ago in Nigeria, the prevalence of hypertension was 7% in the rural population and 20% in the urban settlement; these Figures may not represent the current prevalence of hypertension in a country which has been undergoing rapid urbanization with accompanying increasing overweight [17]. The low prevalence reported in previous studies might have resulted from high cut-off point of 160/95 mmHg used in the Nigeria survey. However the rising trend of hypertension in rural communities has been well documented. Findings by Escalona et al. [19] and Amoah et al. [2] from different communities in Ghana noted prevalence of 26.8% and 28%, respectively. The findings in current study are similar to those reported for Enugu, the Eastern part of Nigeria where Ejim et al. [10] reported the prevalence of 46.4% and 30% for hypertension and obesity respectively. In contrast, Oladapo et al. [25] found 20.8% in their rural population being hypertensive. This difference in prevalence reported in the study and that reported in the present study may be due to the higher proportion of obesity in our subjects, and the fact that participants in Ejim's study were elderly. Of concern is additional high prevalence of prehypertension of 36.7% which is similar to 39.2% found in Oladapo's study. Prehypertension is an indicator of a future cardiovascular burden. Review of prospective studies by Huang et al. [26] have shown that after controlling for multiple cardiovascular risk factors, prehypertension is significantly associated with CVD mortality and the risk for stroke mortality is higher than coronary heart disease mortality [27]. Early adoption of life style modification such as weight reduction, increased physical activities and increased consumption of fruits and vegetables, with a reduction in sodium intake could stem the tide of cardiovascular morbidity and mortality in the community

The rising trend of adiposity is a global health concern. Obesity is an independent risk factor for cardiovascular morbidity and mortality [28,29]. Similar to the finding in Ejim et al., 28.9% and 21.6% of our study population were obese and overweight respectively. Oladapo et al. [25] had earlier reported a prevalence of obesity of about 4% from a rural community in the same local government area where

	Men (n=119)	Women (n=174)	Total (n=293)	p-value
Age(years)	49.92 ± 14.9	48.20 ± 14.8	47.69 ± 14.8	0.485
Height(m)	1.67 ± 0.1	1.56 ± 0.1	1.6 ± 0.1	0.0001
Weight(kg)	68.56 ± 12.8	64.81 ± 15.7	66.34 ± 14.7	0.032
Body mass index(kg/m ²)	24.56 ± 4.6	26.64 ± 5.8	25.80 ± 5.4	0.001
Systolic blood pressure(mmHg)	136.97 ± 25.1	136.80 ± 31.3	136.46 ± 28.9	0.812
Diastolic Blood Pressure(mmHg)	83.67 ± 14.4	83.32 ± 15.8	83.46 ± 15.2	0.851
Pulse Pressure	47.76 ± 14.6	49.93 ± 20.1	49.08 ± 18.1	0.387
Mean Arterial Pressure	96.89 ± 13.2	96.21 ± 20.9	96.47 ± 18.2	0.806
Total Cholesterol(mg/dl)	159.42 ± 47.3	178.48 ± 49.7	169.94 ± 49.4	0.037
Hypertension group				0.257
Normal (%)	15.4	23.1	19.9	
Prehypertension (%)	40.2	34.3	36.7	
Stage I hypertension (%)	23.1	17.8	19.9	
Stage II hypertension (%)	21.4	24.9	23.4	

Table 1: General characteristics of subjects

	Normal BMI	Overweight	Obese	P-value
Systolic BP (mmHg)	131.6 ± 25.1	136.5 ± 29.2	148.4 ± 34.1	0.001
Diastolic BP (mmHg)	80.5 ± 13.9	85.1 ± 15.8	88.4 ± 15.7	0.002
Age group				0.001
Young (<40yrs)	50 (17.2)	19 (6.5)	11 (3.8)	
Middle-aged (40-64 yrs)	65 (22.3)	56 (19.2)	46 (15.8)	
Elderly (>65yrs)	29 (10.0)	9 (3.1)	6 (2.1)	
Hypertension class				0.038
Normal	31 (11.2)	18 (6.5)	5 (1.8)	
Pre-hypertension	56 (20.3)	23 (8.3)	23 (8.3)	
Stage 1 hypertension	29 (10.5)	14 (5.1)	13 (4.7)	
Stage 2 hypertension	22 (8.0)	23 (8.3)	19 (6.9)	

Table 2: Relations of Body Mass Index groupings

our study was carried out. The higher prevalence of obesity in our population could be due to relatively higher exposure to westernized urban lifestyle compared to the core rural setting in Oladapo's study. Although our study did not assess the level of physical activities and dietary intake, the impact of urbanization on development of obesity and metabolic syndrome has been well reported in literature [30]. The prevalence of 23% reported for obesity by Jackson et al. [31] in rural US was much higher than Oladapo's finding, again underscoring the role of environment in the development of increased body mass. This is similar to what was reported by Varghese et al. [32].

The current study showed a linear relationship between increase weight and blood pressure levels. Data from rural communities of India and parts of Indonesia [33-36] have shown increasing rate of obese hypertensive which is similar to the findings in our current study which signifies an epidemic shift to non-communicable diseases among developing countries. This is evidently resulting from changing lifestyles and dietary habits especially among the middle and high social class persons. Among other non-pharmacological management of obese Hypertensives, Andrews et al. [37] showed that weight reduction was more effective. Obesity remains a major cardiovascular risk factor for high blood pressure that must be addressed holistically in the prevention and management of hypertension associated morbidity and mortality.

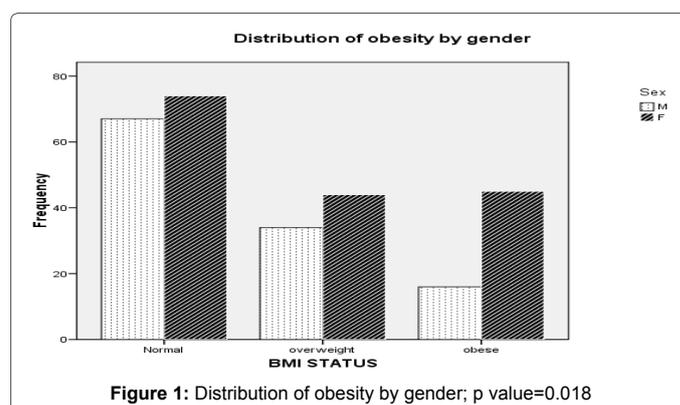
Limitations to the Study

Confirmation of elevated blood pressure on another occasion is ideal to diagnose clinical hypertension rather than just taking average of 2 or 3 readings at single visit as done in the current study. However, recording average of 2 or 3 blood pressure measurements at a point in

time has been reported in epidemiological studies [36]. Furthermore, assessment of general adiposity was done in our study. It would have been interesting to explore association of visceral adiposity with hypertension. Lastly, although our study population could be said to be representative of the community, the same may not be true for the entire country in view of differences in body composition and cultural practices in a multi-ethnic country like Nigeria and most importantly since data on lifestyle factors were not collected which could have been helpful in interpreting the findings of an epidemiological survey.

Conclusion

Our study confirmed increased prevalence of hypertension and association between overweight/obesity and hypertension in a Yoruba community of Nigeria. Lifestyle changes targeted at weight reduction



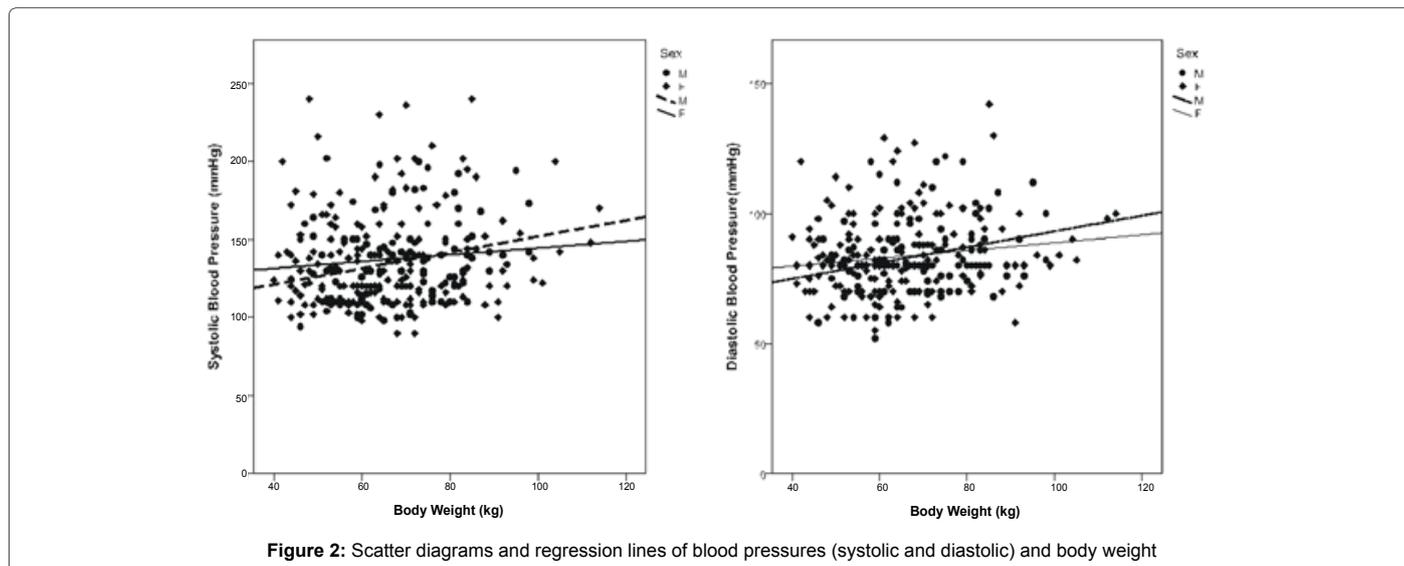


Figure 2: Scatter diagrams and regression lines of blood pressures (systolic and diastolic) and body weight

will help to stem the increasing trend of cardiovascular diseases in this population. This may give credence to the advocacy by the World Heart Federation to reduce cardiovascular related death by 25% in 2025. Longitudinal data may provide stronger evidence and better allow for categorization of the association between obesity and hypertension in this population.

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