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Original Article

Evaluation of blood pressure and indices of obesity in a typical rural community in eastern Nigeria

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Abstract

Aim: With increasing urbanization of lifestyle, cardiovascular morbidity and mortality have been on the increase in Africans. Studies on cardiovascular risk factors in rural communities in South East Nigeria are scarce. This study focused on hypertension and obesity in adult Nigerians dwelling in a rural setting in Eastern Nigeria.

Materials and Methods: A total of 218 participants from the rural community were recruited into the study. A questionnaire was used to assess prior knowledge of their weight and blood pressure status as well as drug history for those found to have hypertension. Each participant's blood pressure was measured and any value ≥140/90 mmHg was regarded as high blood pressure (HBP). Their heights and weights were measured and their body mass indices (BMI) calculated using the standard formula of BMI = Weight in Kg/Height in m^2; BMI ≥30 Kg/m^2 was referred to as global obesity. Their waist circumferences (WC) were also measured and any value ≥102 cm for males and ≥88 cm for females was regarded as abdominal obesity.

Results: The general prevalence of HBP in the rural community was 44.5%. The prevalence of HBP increased as age increased and awareness about HBP was low (15.2%). Females were more aware than the males. The prevalence of HBP was higher in males (49.3%) compared with their female counterparts (42.3%), whereas the females had a higher prevalence of all forms of obesity (abdominal: 36.2%, global: 14.8%) compared with the males (abdominal: 14.5%, global: 10.1%). Higher BMI was associated with higher systolic and diastolic BP values. Hypertensive participants had higher BMI and WC than those who had normal BP.

Conclusion: The prevalence of both hypertension and obesity seems to be increasing in rural communities in Nigeria and thus, the available prevalence documented in previous studies for rural communities may no longer represent the current trend. Awareness of the participants about these major cardiovascular risk factors is still very low. Higher BMI was associated with higher values of both systolic and diastolic BP.

Keywords: Body mass index, Hypertension, Rural community, Waist circumference

Résumé

But: Avec l'augmentation de l'urbanisation du mode de vie, la mortalité et la morbidité cardiovasculaire ont été à la hausse africains. Études sur les facteurs de risque cardiovasculaires dans les collectivités rurales dans South East Nigeria sont rares. Cette étude axée sur l'hypertension artérielle et de l'obésité chez les adultes nigérians de logement en milieu rural dans l'est du Nigeria.

Matériaux et procédés: Un total de 218 participants provenant de la communauté rurale ont été recrutés dans l'étude. A questionnaire a été utilisé pour évaluer la connaissance préalable de leur statut de poids et de la pression artérielle ainsi que l'histoire de drogue pour ceux qui ont de l'hypertension. La pression artérielle de chaque participant a été mesurée et toute valeur ≥140/90 mmHg est considéré comme l'hypertension artérielle (RAP). On a mesuré leurs hauteurs et poids et leur corps de masse indices (IMC) calculées à l'aide de la formule standard d'IMC = poids en Kg/hauteur de m2; IMC ≥30 Kg/m2 a été dénommée obésité globale de. Leur taille circonférence (WC) ont aussi été

mesurées et toute valeur ≥102 cm pour les mâles et ≥88 cm pour les femmes a été considérées comme l'obésité abdominale.

Résultats: La prévalence générale du rap dans la communauté rurale a été 44,5%. La prévalence de rap augmenté comme âge a augmenté et connaître le rap était faible (15,2%). Les femelles sont plus conscientes que les mâles. La prévalence de RAP était plus élevé chez les hommes (49,3%) par rapport à leurs homologues de sexe féminins (42,3%), alors que les femelles ont une plus forte prévalence de toutes les formes de l'obésité (abdominale: 36,2%, global: 14,8%) par rapport aux mâles (abdominale: 14,5%, Global: 10,1%). IMC supérieur a été associée à des valeurs plus élevées de BP systoliques et diastoliques. Participants hypertendus avaient IMC et plus élevés que ceux qui avaient BP normale.

Conclusion: La prévalence de l'hypertension et l'obésité semble augmenter dans les collectivités rurales au Nigeria et donc, la prévalence disponible documentée dans les études antérieures pour les communautés rurales peut représenter un n'est plus la tendance actuelle. Sensibilisation des participants sur les principaux facteurs de risque cardiovasculaires est encore très faible. Plus élevé BMI a été associée à des valeurs plus élevées de BP systolique et diastolique.

Mots clés: Indice de masse corporelle, l'Hypertension, communauté rurale, tour de taille

Introduction

Hypertension was thought to be rare in Africans, but several studies over the years in the African population have shown that hypertension is not uncommon in Africans and that blood pressure rises with advancing age in the African people.[1-10]

The prevalence of hypertension in Nigeria determined by the Akinkugbeled Non-Communicable Disease (NCD) Survey and still being referred to[1] included both rural and urban communities in different parts of the country, but that report may no longer represent the current situation. That survey was conducted well over a decade ago and also defined high blood pressure (HBP) as BP ≥ 160/95 mmHg (the then cut off for HBP), undermining the need to study hypertension in different parts of the nation using the current World Health Organization definition of HBP (BP ≥ 140/90 mmHg).

In recent times, hypertension has been studied fairly reasonably in Nigeria; several of which were either hospital based or done in urban settings.[1-3,5,6,9-14] Majority of the recent studies involving rural communities were conducted in the North or South West, with only very few in the South East.[1,4,7,15-18]

Several studies have, over the years, demonstrated a consistent positive association between hypertension and obesity; another independent cardiovascular risk factor rapidly emerging in Africans.

Obesity has not been well documented in Africans and Nigerians in particular. The NCD survey[1] conducted in Nigeria over a decade ago defined obesity prevalence in Nigerians but that finding may, possibly, no longer reflect the current prevalence, considering the fact that the gap between the life style and habit in rural and urban communities in Nigeria is closing up rapidly. Majority of the recent obesity studies done in Nigeria, either in an urban or rural setting or in a medical facility were either in South-West or South-South Nigeria,[7,8,11,13,14,18-23] with only a few in the South-East,[16] hence the need for more studies in the South-East.

Therefore, this research was carried out to study HBP and obesity in adult Nigerians dwelling in a rural setting in Eastern Nigeria.

Materials and Methods

This study was a cross sectional community-based prevalence study carried out in a typical rural community in Enugu State, Eastern Nigeria. The Ethical committee of Nnamdi Azikiwe University Teaching Hospital gave approval for the study. Written permission was obtained from both the traditional ruler of the town and the local government authority before the study was carried out. Informed consent was obtained from each participant before recruiting him or her into the study. The NCD survey[1] conducted in Nigeria found hypertension prevalence to be roughly 11.2%, varying from 9.8 to 14.6% in rural and urban populations, respectively. Thus, using the standard formula, 9.8% was used to calculate the sample size for this rural study to be 136. However, a total of 218 subjects were recruited into the study. All consenting apparently healthy subjects 18 years and above residing in the community were recruited into the study. All those with history of current use of steroids, clinical evidence of fluid retention, and all pregnant females were excluded from the study. Six medical officers were recruited and trained to help in this study. General physical examination was carried out on each participant. Each participant then

had his/her waist circumference (WC) measured with a non-stretchable tape. WC ≥ 102 cm for males and ≥88 cm for females was regarded as abdominal obesity. Height without foot wear or head tie/cap was measured with a stadiometer made locally using wood and non-stretchable tape. Their weights without foot wear were also measured using Hanson's weighing scale. All values were taken to the nearest one decimal place. Body mass index (BMI) (Quetelet's index) was calculated by dividing the weight (w) in Kilogram by the square of subject's height (H^2) in meters. The results were graded as follows: BMI ≤ 25 Kg/m^2 - normal; BMI, 25 to 29.9 Kg/m^2 - overweight; and BMI ≥ 30 Kg/m^2 - obese.

Each participant got seated while a questionnaire incorporating relevant bio and other data such as prior knowledge of blood pressure status, weight, and treatment history for those who were previously aware that they had hypertension was administered. Each participant having been seated for at least 10 minutes to answer the questionnaire then had his/her BP measured three times at 5 minutes interval with an Accoson Sphygmomanometer using the standard procedure. The average of the last two was taken as the subject's BP. Hypertension was defined as blood pressure ≥ 140/90 mmHg.

Data analysis

The SPSS (11.5) statistical software was used for data entry and statistical analysis. The mean values, standard deviations, and student's t test were done and Chi square was used to compare percentages between different groups appropriately. *P* value < 0.05 was regarded as significant.

Results

As shown in Table 1, the male subjects in this study were significantly older than their female counterparts ($P = 0.001$). Subjects with BMI ≥ 25 Kg/m^2 were significantly younger than those with BMI < 25 Kg/m^2 ($P = 0.002$). The subjects who had hypertension were also significantly older than those who had normal blood pressure ($P = 0.005$). Systolic blood pressure was slightly higher in males than in females, whereas the females had a slightly higher diastolic BP than the males. This difference in both systolic and diastolic BP was, however, not significant (systolic; $P = 0.499$, diastolic; $P = 0.868$). The subjects who were ≥55 years had a significantly higher systolic BP than those <55 years ($P = 0.004$). There was no significant difference in diastolic BP between these two age groups (79.9 ± 14.2 *vs* 78.0 ± 14.2 mmHg; $P = 0.349$). The subjects whose BMI were ≥25 Kg/m^2 had a significantly higher systolic BP and diastolic BP compared with those with normal BMI (systolic;

Table 1: Mean parameters of participants in the study

Participants	Males N = 69	Females N = 149	*P* value	≥55 N = 131	<55 N = 87	*P* value	BMI ≥25 n = 91	BMI <25 N = 127	*P* value	HBP n = 97	Non-HBP N = 121	*P* value
Mean age (years)	61.2 ± 13.1	53.4 ± 17.0	0.001	66.6 ± 8.0	39.7 ± 11.4	0.000	51.91 ± 14.7	58.7 ± 16.8	0.002	59.3 ± 12.6	53.0 ± 18.3	0.005
Mean systolic BP (mmHg)	140 ± 28.7	137.6 ± 26.8	0.499	143.1 ± 28.1	132.0 ± 25.4	0.004	145.0 ± 29.9	133.8 ± 24.5	0.003	162.5 ± 22.7	119.3 ± 10.2	0.000
Mean diastolic BP (mmHg)	78.9 ± 15.6	79.3 ± 13.8	0.868	79.9 ± 14.2	78.0 ± 14.2	0.349	84.0 ± 15.6	75.7 ± 12.3	0.000	89.5 ± 13.9	71.1 ± 8.3	0.000
Mean WC (cm)	85.9 ± 12.4	85.8 ± 11.4	0.971	86.5 ± 11.6	84.8 ± 11.7	0.312	94.6 ± 10.8	79.5 ± 7.4	0.000	88.5 ± 12.0	83.6 ± 11.0	0.002
Mean BMI (Kg/M2)	23.7 ± 4.1	25.5 ± 4.7	0.006	24.3 ± 4.2	26.0 ± 5.0	0.006	29.3 ± 3.7	21.9 ± 1.9	0.000	25.8 ± 4.8	24.3 ± 4.4	0.019

WC = waist circumference; BMI = Body mass index; HBP = High blood pressure

$P = 0.003$, diastolic; $P = 0.000$).

All obesity parameters were higher in hypertensive subjects compared with nonhypertensive subjects. The differences in WC (88.5 ± 12.0cm *vs* 83.6 ± 11.0 cm) and BMI (25.8 ± 4.8 *vs* 24.3 ± 4.4Kg/m^2) were significant ($P = 0.002$, $P = 0.019$, respectively. Those with BMI ≥ 25 Kg/m^2 had a significantly higher WC (94.6 ± 10.8 cm) compared to those with normal BMI (79.5 ± 7.4); $P = 0.000$. BMI was significantly higher in those <55 years (26.0 ± 5.0 Kg/m^2) than in those ≥55 years (24.3 ± 4.2 Kg/m^2). There is, however, no difference in WC between the two age groups (≤55 years, 86.5 ± 11.6 cm; >55 years, 84.8 ± 11.7 cm; $P = 0.312$). The females had a significantly higher BMI than the males ($P = 0.006$). Between the males and females, there was no difference in WC ($P = 0.971$).

As shown in Table 2, 44.5% of the subjects had hypertension while 29.4% had abdominal obesity. High BMI (BMI ≥ 25 Kg/m^2) was found in 44.1% of the study population. However, 13.3% of the subjects were overtly obese using BMI ≥ 30 Kg/m^2 (global obesity).

Table 3 shows that hypertension prevalence was higher in males than in females in the general population (49.3 *vs* 42.3%) as well as within both age groups (≥; males: 40.0%, females: 34.7%). Subjects ≥55 years old were significantly more hypertensive than those <55 years (50.4 *vs* 35.6%; $P = 0.022$). Generally, females had higher prevalence of both abdominal obesity (36.2 *vs* 14.5%; $P = 0.001$) and global obesity (14.8 *vs* 10.1%; $P = 0.239$). The same trend was respectively found for females and males within the age groups for abdominal obesity (≥55 years, 40.3 *vs* 14.8%: $P = 0.001$;<55 years, 31.9 *vs* 13.3%: $P = 0.126$) and global obesity (≥ 55 years, 10.4 *vs* 9.3%, $P = 0.539$; <55 years, 19.4 *vs* 13.3%, $P = 0.446$). Although the subjects ≥55 years old had a slightly higher prevalence of abdominal obesity (29.8%) than those <55 years (28.7%), this difference was not statistically significant ($P = 0.497$). On the other hand, the younger subjects had higher prevalence of global obesity (18.4%) than the older subjects (9.95), $P = 0.056$.

Table 4 (A) shows that 12.4% of the entire population had a prior knowledge of their BP (males, 11.6%; females, 12.8%) and 7.3% had prior knowledge of their weight (males, 11.6%; females, 5.4%) before the study. Among the subjects found to have HBP, about 25% knew before the study hat they had been hypertensive (males, 23.5%; females, 25.8%), whereas 27.9% of the subjects who responded to the question on whether they would like to be fat said that they wished to be fat (males, 33.3%; females, 25.7%). Only 10.3% of the entire hypertensive subjects were on treatment but among those of them who knew that they had been hypertensive,

Table 2: General prevalence of hypertension and obesity in the community

	Number of participants	Percentage
Hypertension	97	44.5
High BMI (overweight and obese inclusive)	91	44.1
Global obesity (BMI ≥ 25 Kg/m2)	29	13.3
Abdominal obesity (WC ≥ 88 cm for females, ≥102 cm for males)	64	29.4

BMI = Body mass index; WC = Waist circumference

Table 3: Prevalence of Hypertension and Obesity in relation to age and sex

Participants	<55 N=87 (39.9%)		≥ 55 N= 131 (60.1%)		All Males N=69	All Females N=149	All <55 N=87	All ≥ 55 N=131
	Males N=15	Females N=72	Males N=54	Females N=77				
HBP N=97 (44.5%)	6 (40.0%)	25 (34.7%)	28 (51.9%)	38 (49.4%)	34 (49.3%)	63 (42.3%)	31 (35.6%)	66 (50.4%)
P value	0.456		0.459		0.206		0.022	
High BMI N=91 (41.7%)	4 (26.7%)	44 (61.1%)	15 (27.8%)	28 (36.4%)	19 (27.5%)	72 (48.3%)	48 (55.2%)	43 (32.8%)
P value	0.015		0.201		0.003		0.001	
Abdominal obese N=64(29.4%)	2 (13.3%)	23 (31.9%)	8 (14.8%)	31 (40.3%)	10 (14.5%)	54 (36.2%)	25 (28.7%)	39 (29.8%)
P value	0.126		0.001		0.001		0.497	
Global obese N= 29 (13.3%)	2 (13.3%)	14 (19.4%)	5 (9.3%)	8 (10.4%)	7 (10.1%)	22 (14.8%)	16 (18.4%)	13 (9.9%)
P value	0.446		0.539		0.239		0.056	

Hypertension (HBP) = BP≥140/90 mmHg, High BMI = overweight and obese inclusive; Global Obesity = BMI≥ 30Kg/M^2, Abdominal Obesity = WC (≥88cm (Females), ≥102cm (Males))

Table 4: Knowledge and attitude ofparticipants about their blood pressure and weight.

(A) Participants' knowledge about their blood pressure and weight

	Entire community			Hypertensive participants		
	Males	Females	All subjects	Males	Females	All subjects
Prior BP knowledge	8 (11.6%) N = 69	19 (12.8%) N = 149	27 (12.4%) N = 218	8 (23.5%) N = 34	17 (27.0%) N = 64	25 (25.8%) N = 97
Prior knowledge of weight	8 (11.6%) N = 69	8 (5.4%) N = 149	16 (7.3%) N = 218			
Wish to be fat	10 (33.3%) N = 30	19 (25.7%) N = 74	29 (27.9%) N = 104			

(B) Participants on Anti- hypertensive medication

	Those on treatment
All hypertensive participants N = 97	10 (10.3%)
Those aware of their HBP N = 25	10 (40.0%)

only 40.0%, were on treatment [Table 4B].

Discussion

The prevalence of hypertension in this study was 44.5%. This finding is higher than the prevalence finding in recent studies done in other communities in Nigeria[1,4,6,7,10,11,13,16] and in some other countries[24,25] but similar to the finding in a study conducted in women attending an annual general meeting organized by women in their villages (popularly called August Meeting) in South-East, Nigeria,[26] and in a recent study in rural South Africans.[8] Although this present study involved both men and women residing in the village studied, the August meeting study involved only women, some of whom came from urban communities to attend the meeting, this emerging new trend documented in this rural community studied in this research may well be associated with the rapid westernization of the lifestyle and the dietary habits of Nigerians living in both urban and rural communities.

Like other studies done within Nigeria and in other countries which had consistently shown the prevalence of hypertension to be more in males than in females, the prevalence of hypertension in this community was more among males (49.3%) than females (42.3%). The difference in prevalence between the males and females was, however, not significant. This may not be surprising because the female subjects in this study were more of postmenopausal women (mean age: 53.4 years) and after menopause, the difference in prevalence of HBP between males and females become narrower.

In agreement with all the other previous studies, the prevalence of hypertension increased with age in the community, with those 55 years of age and above being significantly more hypertensive (50.4%) than those less than 55 years of age (35.6%) ($P = 0.022$).

The finding of significantly higher systolic BP in the those 55 years and above (143.1 ± 28.1 mmHg) than in their younger counterparts (132.0 ± 25.4 mmHg) in this study is in agreement with other previous studies.[9,10,25]

In this rural community, only 25.8% were aware that they had hypertension before this study, of which only 40% of them (i.e., 10.3% of the total participants with HBP) were taking medication. Other recent studies in Nigeria had equally shown that knowledge/awareness and practice about HBP were poor.[12,26] Awareness was higher in females (27.0%) than in males (23.5%). Awareness level has been shown to be as high as 70% in the United States of America[24] and about 53.3% in Delhi, India,[25] with females also having more awareness than the males. It may, therefore, not be surprising that only 40% of those who had a prior knowledge of their HBP in this study were on regular medication, similar to the finding in the Indian study[25] in which only 43.4% were taking treatment and only 8.5% had controlled BP. It is known that patient education is a very important aspect of HBP management and yet, a study in Nigeria found that up to 40% of physicians within a hospital setting do not educate their hypertensive patients properly on the need for regular treatment and follow-up.[27]

Thus, patient education should be taken more seriously in managing people with HBP if the course of HBP in blacks would improve rather than worsen, because even in developed nations, where health insurance policy is stable and practiced, just about 50 to 60% of people with HBP are said to be on treatment and just about 35% achieve control.[24]

In this study, the overall prevalence of global obesity was 13.3% while abdominal obesity was 29.4%. However, 44.1% were either overweight or overtly obese. These findings are lower than that documented in recent studies done in an urban

community in Northern Nigeria[13] and also in a rural and an urban community as well as a medical facility in South-South Nigeria[20,22] but similar to that in paid workers in another urban city in the South-West.[6] The prevalence finding in this study is, however, higher than findings in other rural and urban communities elsewhere in Nigeria and in other African nations.[7,8,11,13,16,17,19,22] Comparing the two obesity indices, abdominal obesity was more common in the community than global obesity. This trend has also been documented in other studies in Nigeria and elsewhere.[7,8,13,17,19,20,22,28-32]

In relation to gender, the prevalence of both obesity indices were higher in females compared with the males (global obesity: 14.8 *vs* 10.1%; $P = 0.239$, abdominal obesity: 36.2 *vs* 14.5%; $P = 0.001$). This finding is consistent with the previous studies in Nigeria[7,8,11,13,14,16,18-22] and elsewhere[28-32] in observing a higher prevalence of obesity in females than in males. Although the higher prevalence of global obesity in females than in males in this study was not statistically significant ($P = 0.239$), significantly more females (48.3%) had higher than normal BMI (i.e., BMI ≥ 25 Kg/m^2) compared with their male counterparts (27.5%); $P = 0.003$. In relation to age, the subjects <55 years had a significantly higher BMI (26.0 ± 5.0 Kg/m^2) compared with those ≥55 years (24.3 ± 4.2 Kg/m^2); $P = 0.006$. However, there was no significant difference in WC between these two age groups (84.8 ± 11.7 *vs* 86.5 ± 11.6 Kg/m^2), $P = 0.312$.

Thus, this study, like other recent studies in different communities in different states of Nigeria, shows that there may be a consistent increase in the prevalence of obesity in Nigeria over the years. Therefore, it suggests that the life style of the citizens seems to be changing from the previously usual active and relatively energy-consuming farming and manual labor (which the rural community was noted for) to a more sedentary energy-reserving one. Again, our usual African traditional diet, which was more of natural and nonprocessed food, is fast being replaced with artificial and processed food even in the so-called rural communities, thus the emerging tendency to obesity.

Only 7.3% of subjects in this study knew their weights before this study. Though majority had no previous knowledge of their weight, most of them (79.1%) did not wish to be fat for various reasons, whereas about 27.9% would wish to be fat. In the United States, about 38% of overweight and 8% of obese adults had a wrong perception of their weights,[33] and the wrong perception was higher with ethnic non-Hispanic blacks. Thus, in the African setting like Nigeria where a plump appearance is still favored in many tribes and fatness still seen as a measure of affluence, the least that can be done is to educate the populace on the adverse implications of excessive weight gain and how to maintain ideal weight. With this background, obesity and its adverse implications may be reduced to its barest minimum.

Conclusion

The need for more aggressive health reform, incorporating health education about hypertension and obesity at the primary health care level as part of the strategies to reduce coronary heart disease and other noncommunicable diseases in our communities is highlighted.

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