East African Medical Journal Vol. 92 No. 4 April 2015
BLOOD PRESSURE AND OBESITY INDEX ASSESSMENT IN A TYPICAL URBAN SLUM IN ENUGU, NIGERIA
G. I. Ahaneku, MBBS, FWACP, FMCP, C. U. Osuji, FWACP and O. C. Oguejiofor, FWACP, Department of Medicine, College of Health Sciences, Nnamdi Azikiwe University, Nnewi Campus, P. M. B. 5001, Nnewi, Anambra State, Nigeria, B. C. Anisiuba, FMCP, Department of Medicine, University of Nigeria, Enugu Campus, V. O. Ikeh, FMCP, Department of Medicine, University of Nigeria, Enugu Campus, J. E. Ahaneku, PhD, FSTA(jp), Department of Chemical Pathology, Nnamdi Azikiwe University, Nnewi Campus, P. M. B. 5001, Nnewi, Anambra State, Nigeria

Request for reprints to: Dr G. I. Ahaneku, Department of Medicine, College of Health Sciences, Nnamdi Azikiwe University, P. M. B. 5001, Nnewi, Anambra State, Nigeria, E-mail: gladysahaneku@yahoo.co.uk

BLOOD PRESSURE AND OBESITY INDEX ASSESSMENT IN A TYPICAL URBAN SLUM IN ENUGU, NIGERIA

G. I. AHANEKU, C. U. OSUJI, O. C. OGUEJIOFOR, B. C. ANISIUBA, V. O. IKEH and J. E. AHANEKU

ABSTRACT

***Background*: Rapid transition from rural to urban lifestyle in Africa has been associated with increasing cardiovascular disease burden and thus, the need for continuous re-evaluation of cardiovascular risk factors in African slums which have been shown to harbor 40 to 80% of urban residents cannot be over emphasized.**

***Objectives*: To evaluate hypertension and obesity in a typical urban slum in South East, Nigeria.**

***Design*: Cross-sectional community based study.**

***Setting*: A typical urban slum in Enugu State, Eastern Nigeria.**

***Subjects*: One hundred and ninety one volunteers from the slum.**

***Results*: The mean age of the entire participants in this study was 44.1 ± 16.2 years while their mean BMI was 25.1 ± 5.2 Kg/m2. Their mean systolic BP was 128.8 mmHg ± 22.2 and 79.0mmHg ± 12.9 for mean diastolic BP. Both systolic and diastolic blood pressure (BP) increased as age group increased peaking at the age group 55- 74 years and then dropping after 75 years. Mean BMI peaked at 35- 54 years and then started dropping as age increased. In the entire community, 29.3% of the participants had hypertension (males: 42.1 %, females: 23.9%), 25.1% had isolated systolic HBP (ISH) while 22.0% had isolated diastolic HBP (IDH). In the general population, the general prevalence of HBP and ISH increased as age group increased. IDH increased as age increased peaking at 55- 74 year age group (34.1%) and then dropped thereafter (≥75; ISH=10.0%). Among the females, HBP prevalence increased across board as age increased but among the males, it increased with age and peaked at 55-74 year age group (61.1%) and then dropped (≥75; HBP= 57.1%). The prevalence of obesity in the community was 13.1% (males; 5.3%, females; 16.4%). None of those ≥75 years had obesity. Obesity prevalence was highest in those 35-54 years old (17.6%) and least in those 15- 34 years old (9.1%). Generally and within all age groups, females had higher obesity prevalence than the males. For the males, Obesity was highest in those 55-74 years (11.1%) while for the females, it was highest in those 35-54 years (23.0%). Prevalence of HBP increased with BMI getting to more than double fold in those found to be obese. 26% of the participants (20.8% of males and 31.3% of females) who were found to have hypertension had prior knowledge of it.**

***Conclusion*: Hypertension and obesity are on the increase in Nigeria and degree of ignorance about these major cardiovascular risk factors has remained very high.**

INTRODUCTION

The association between hypertension (HBP) and obesity is well known and the implication of blood pressure recording and its correlation with obesity indices with regard to cardiovascular disease cannot be over emphasised. In certain societies, obesity is regarded as a symbol of prosperity and weight considered an indirect measurement of the adequacy of nutrition especially during scarcity of food (1,2) but studies have shown that quality of life reduces with increasing BMI and other obesity indices (3). Many cultures have been shown to exhibit differences in perceived healthy lifestyle and studies in different populations showed that many individuals have wrong perception of their weights (4,5). In the United States, this weight misperception was shown to be higher in blacks compared to whites (5).

Several studies in the African have shown that HBP and obesity may not be as common as previously believed (6-17) and their strong association and consequences have continued to be proven in several studies even in Nigerians. For instance, a recent study in Northern Nigeria which analysed associated factors and relationship between prehypertension and hypertension found obesity to be an independent predictor of HBP (7) while another recent study that analysed medical admissions in a tertiary hospital in Eastern Nigeria found hypertension to be the most common cause of death in males and the second after HIV in females (8). Thus these two apparently modifiable diseases must be viewed and tackled with every seriousness.

The general prevalence of hypertension and obesity in Nigeria as determined by the Non-Communicable Disease (NCD) survey (16) over a decade ago may no longer represent the present situation because of socio-economic factors and the new cut-off point for HBP currently in use. The first Pan- African meeting on HBP held in Younde, Cameroun a few years ago (17) noted that Africa is in "epidemiological transition" due to rapid transition from rural to urban lifestyles with increasing burden of non-communicable diseases. Between 40 to 85% of urban residents in most African cities have been shown to inhabit slums which are said to be growing at twice the speed of the continent's exploding cities (18,19).

An urban slum is a deteriorated area of a city; congested and over-crowded, lacking urban services like water and sewers and usually inhabited by low-income earners (19,20). Interestingly, in most African countries including Nigeria, slum populations have been seen to include university lecturers, students, government civil servants and formal sector employees (19). Thus, a reasonable population of Nigerians lives in slums with low living standard. These "urban poor" have been shown in recent research to fare worse than their rural counterparts on most health indicators (20). Meanwhile, studies on HBP and obesity in the urban slums in Nigeria are few and more so in South East Nigeria; hence the need to assess these two risk factors to determine their current prevalence in a typical urban slum community in South East Nigeria.

MATERIALS AND METHODS

This study was a cross sectional community based prevalence study carried out in a typical urban slum in Enugu State, Eastern Nigeria. The Ethical committee of Nnamdi Azikiwe University Teaching Hospital gave ethical approval for the study. Permission was obtained from the committee of landlords in that community before the study was carried out. Informed consent was obtained from each participant before recruiting him or her into the study. The NCD survey (16) 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 formular, 14.6% was used to calculate the sample size for this study to be 183. However, a total of 191 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 height without foot wear or head tie / cap measured with a standiometer made locally using wood and non-stretchable tape. Their weights with light clothing and without foot wear were also measured using Hanson's weighing scale. All values were taken to the nearest one decimal place. BMI (Quetelet's index) was calculated by dividing the weight (w) in Kilogramme by the square of subject's height (H2) in meters. The results were graded as: BMI ≤ 25 Kg / M2 - Normal, BMI 25 – 29.9 Kg / M2 -Overweight, and BMI≥30 Kg / M2 – Obese.

Each participant got seated while a questionnaire incorporating relevant bio and other data such as prior knowledge of blood pressure status and weight was administered. Each participant having been seated for at least ten minutes to answer the questionnaire then had his / her BP measured three times at five minutes interval with an Accoson Sphygmomanometer using the standard procedure. The average of the last two was taken as the subject's BP. Hypertension (HBP) was defined as blood ≥140mmHg / 90mmHg.

Data analysis: The excel worksheet was used for data entry and graphic representation while the SPSS (11.5) statistical software was used for statistical analysis. The mean values, standard deviations and percentages were determined for each parameter. Where statistical significance were tested, values < 0.05 were regarded as significant.

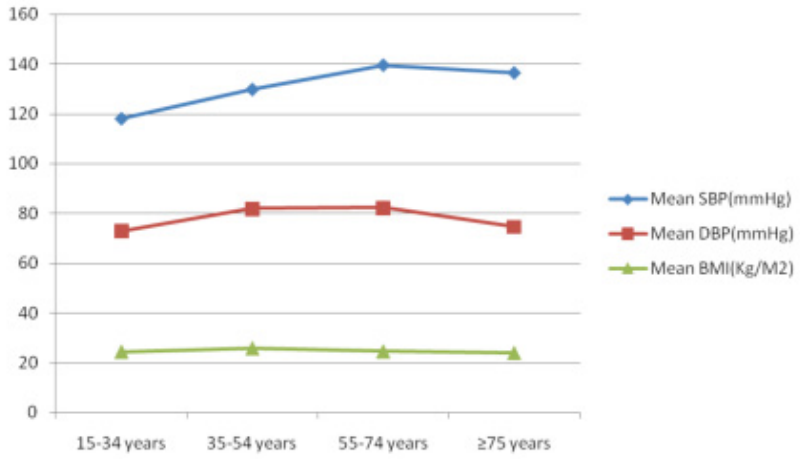
RESULTS

Table 1
Mean Parameters of participants in the community

Age (Years) (n = participants)	Mean age	Mean Systolic BP	Mean Diastolic BP	Mean BMI
15-34 n= 55	25.2± 4.6	118.0 ± 10.3	72.9 ± 8.5	24.5 ± 6.6
35-54 n= 85	43.6 ± 5.7	129.8 ± 22.7	81.9 ± 13.5	25.8 ± 4.6
55-74 n= 41	62.1 ± 5.6	139.6 ± 25.4	82.3 ± 13.7	24.6 ± 4.6
≥75 n= 10	78.0 ± 3.6	136.5 ± 28.7	74.7 ± 13.0	24.0 ± 2.6
All Participants N= 191	44.1 ±16.2	128.8 ± 22.2	79.0 ± 12.9	25.1 ± 5.2

Table 1 shows that the mean age for the entire participants in the urban slum was 44.1 ± 16.2 years while their mean BMI was 25.1 ± 5.2 Kg/m^2. Their mean systolic BP was 128.8 mmHg ± 22.2 and 79.0mmHg ± 12.9 for mean diastolic BP.

Figure 1
Graphic illustration of Mean BP and BMI within the age groups



As illustrated in the graph (Figure 1), mean systolic Bp increased with age peaking at 55- 75 years and then dropping slightly after 75 years. The mean DBP was lowest in those 15- 34 years, increased in those 35- 54 years and showed almost no change up to 74 years and then dropped in those above 75 years. Mean BMI was highest at 35- 54 years and then started dropping as age increased afterwards. There was no difference in BMI between those 15- 34 years and those above 75 years.

Table 2
Prevalence of hypertension in the community

Hypertension (BP ≥140/90 mmHg)					
Age (Years)	Males (%)	Females (%)	All Participants (%)	Isolated systolic (ISH) (%)	Isolated diastolic (IDH) (%)
15-34	0 (0) n= 0	4 (8.5) n= 47	4 (7.3) n= 55	3 (5.5)	1 (1.8)
35-54	9 (37.5) n= 24	20 (32.8) n= 61	29(34.1) n= 85	23 (27.1)	26 (30.6)
55-74	11 (61.1) n= 15	7 (30.4) n= 26	18 (43.9) n= 41	17 (41.5)	14 (34.1)
≥75	4 (57.1) n=7	1 (33.3) n= 3	5 (50.0) n= 10	5 (50.0)	1 (10.0)
Total	24 (42.1) n= 57	32 (23.9) n= 134	56 (29.3) n= 191	48 (25.1)	42 (22.0)

HBP; $P < 0.05$, ISH; $P > 0.05$, IDH; $P > 0.05$

In the entire community, 29.3% of the participants in this study had hypertension; 42.1 % of the males and 23.9% of the females. 25.1% had isolated systolic HBP (ISH) while 22.0% had isolated diastolic HBP (IDH). In the general population, the general prevalence of HBP and ISH increased as age increased. IDH increased as age increased peaking at 55- 74 year age group (34.1%) and then dropped thereafter (≥75; ISH=10.0%).

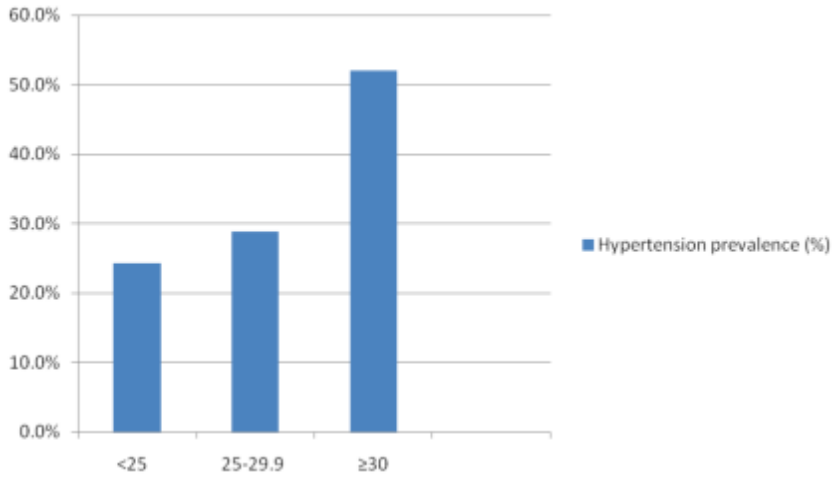
Among the females, HBP prevalence increased across board as age increased but among the males, it increased with age and peaked at the 55-74 year age group (61.1%) and then dropped in the ≥75 year group (; HBP= 57.1%).

Table 3
Prevalence of Obesity in the community

	Obesity (BMI≥ 30Kg / M2)		
Age (Years)	Males (%)	Females (%)	All subjects (%)
15-34	0 (0) n=0	5 (10.6) n=47	5 (9.1) n= 55
35-54	1 (4.2) n= 24	14 (23.0) =61	15 (17.6) n= 85
55-74	2 (11.1) n=15	3 (13.0) n=26	5 (12.2) n= 41
≥75	0 (0) n=7	0 (0) N=3	0 (0) n= 10
Total	3 (5.3) n=57	22 (16.4) n=134	25 (13.1) N= 191

The prevalence of obesity in the community was 13.1%; 5.3% for males and 16.4% for females. None of those ≥75 years (both males and females) was found to be obese. Obesity prevalence was highest in those 35-54 years old (17.6%) and least in those 15- 34 years old (9.1%). Across all the age groups, females had higher obesity prevalence than the males (P<0.05) and the difference in prevalence between the males and females got narrower as the age group increased. (15-34 years; 10.6% vs. 0%, 35-54 years; 23.0% vs. 4.2%, 55-74 years; 13.0 vs.11.1%). For the males, Obesity was highest in those 55-74 years (11.1%) while for the females, it was highest in those 35-54 years (23.0%).

Figure 2
Prevalence of Hypertension in relation to BMI (Kg/M2)



<25 Kg/M2= normal weight, 25.-29.9 Kg/M2= overweight, ≥ 30 Kg/M2= obese

As shown in Figure 2, Prevalence of HBP increased with BMI. HBP prevalence in those who had normal BMI was 24.3% increasing to 28.8% in those overweight and more than double fold in those found to be obese (52.0%).

Figure 3
Awareness about Blood pressure status before the study

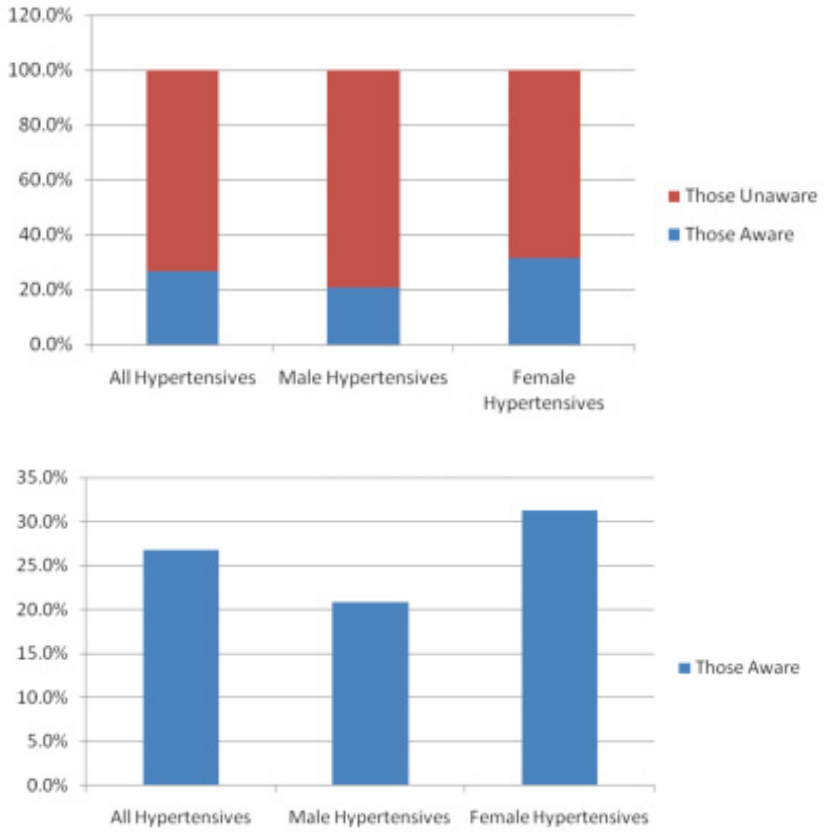


Figure 3 shows that 26% of the participants (20.8% of males and 31.3% of females) who were found to have hypertension had prior knowledge of it.

DISCUSSION

The prevalence of hypertension (HBP) in this urban slum study was 29.3%. This is lower than the prevalence documented recently for developing nations (21) and in South Africa (11) but higher than the finding in many previous community based studies in Nigeria (7,9,10,15-17) and some other countries (22-24). Although many of those studies defined HBP as BP≥ 160/90mmHg, the findings in this and similar recent studies in Nigeria (13,25) suggest that the proportion of Nigerians (majority of whom inhabit slums) with HBP and other associated co- morbidities may be rising consistently. This is further buttressed in a study (25) conducted in two communities in the same state as this study. In that study, 18% of the general population and 34.7% of those found to have HBP in the semi- urban community had metabolic syndrome. Associated morbidities in that study varied between 13.9% to 14.1% and 21.2% to 55% in the general population and hypertensive participants respectively. Again, a study similar to this one conducted in a semi urban community in Western Nigeria (13) found 36% of the participants to have blood pressure ≥ 140/90mmHg. More participants in this study had both isolated systolic hypertension (ISH) (25.1%) and isolated diastolic hypertension (IDH) (22.0%) compared with the findings in that study (ISH; 22.1%, IDH; 14.5%). However, that study (13) determined these values using the former cut off of ≥160/95mmHg while in this study; the current cut off of ≥140/90mmHg was used. The mean age of participants in this study (44.1 years) is similar to that of those in the study (44.2 years) but the male –to—female ratio of those with HBP in this study (3:4) when compared with the male –to—female ratio of those with Bp ≥ 140/90mmHg in that study (13) (1.7:1) showed that among those found to have HBP in this study, females were proportionally more than the males. This may not be surprising because studies (26) have shown that lower socio-economic status appeared to be associated with raised diastolic and systolic BP in females but not necessarily in males.

Hypertension prevalence increased with age and males had higher prevalence of HBP (42.1%) than females (23.9%) agreeing with most other studies in Nigeria (7,9,10,15,16) and else where (20-24,27). A national surveillance in Iran, however, found higher prevalence of most cardiovascular risk factors (including HBP) in females (24). Among the males,

HBP increased linearly with age with highest value among those 55- 74 years (61.1%) and subsequent reduction in prevalence (57.1%) thereafter. This may not be surprising as this age group (55- 74 years) also had the highest mean values for systolic and diastolic BP and a study in Northern Nigeria (7) found a peak and trough level for HBP at the 5th decade. Also, a hospital based study (8) which found HBP as the commonest cause of morbidity and mortality in males found the average age of hospital admission in males to be 55.5 years. It is therefore possible that the drop in HBP prevalence after 55- 74 years may be accounted for by mortality rate from this disease before this age. from the disease. Among the females, HBP prevalence was least in those less than 35 years (8.5%) increasing appreciably in those 35- 54 years (32.8%) and showed little differences afterwards with highest value in those 75 years and above (33.3%).

IS H rose linearly with age but IDH rose with age peaking at 55- 74 years (34.1%) and dropped after 75 years (10%). In a rural community study in Western Nigeria12 ,systolic HBP increased linearly with age while diastolic HBP peaked at mid 40s and declined. The difference noted in the age at which IDH peaked in these two studies may be due to the different age ranges used in this and the other study.

The mean BMI of participants in this study was 25.1± 5.2Kg/M^2. This is higher than the findings in two recent studies (one community based and one hospital based) studies in western Nigeria (3,6). Mean BMI was highest in those 35-54 years (25.8± 4.6Kg/M2) and least (24.0± 2.6Kg/M^2) in those ≥ 75 years and above. This agrees with a study done several years ago in a rural community in Western Nigeria which found body build to rise increasingly with age until middle age leveling at 6th decade in males and 4th decade in females (28).

The prevalence of obesity using BMI was 13.1%. This prevalence is similar to the finding (13.2%) in a study done on salaried workers in one state capital in Western Nigeria (9). In that study, the prevalence in males (5.3%) was the same as in this study (5.3%) but their females had higher prevalence (22.9%) than those in this study (16.4%). This difference in prevalence values in females in this and the other study may be because those earning salary have higher purchasing power and as such are more likely to indulge in unhealthy eating habits than those in the urban slum studied. Compared with findings in some other African (21,23) and non- African nations (21,24,29,30) the prevalence of obesity found in this study was lower. It is also lower than the findings in some studies in certain parts of Nigeria (15,31). The higher values obtained in those two studies may be because of the nature of the participants involved in those studies. Whereas one (15) involved a mixed population (hospital workers, local residents and relations of in- hospital patients), the other (31) involved hospital patients (who may have possibly been to hospital ab-initio due t obesity related illness). Thus objective comparison may not really be possible between these studies. A rural community based study in southwest Nigeria found a lower prevalence of obesity in that population (10) than in this urban slum.

In relation to gender, females had higher prevalence of obesity than the males both generally and within the age groups, thus agreeing with previous studies both locally and elsewhere 9,10,15,16,20,23-25,28-31). Obesity prevalence was highest in those 35-54 years (17.6%) whereas none of those 75 years and above had obesity. Among the males, the prevalence as highest in those 55-74 years (11.1%) while in females, it was highest at 35-54 years (23.0%). This trend has been demonstrated in a previous study in western Nigeria (28) which demonstrated rise in body build with rising age until middle age with a peak at the 6th decade for males and at the 4th decade for females.

In this study, higher BMI, was associated with higher prevalence of HBP. Obese participants had higher prevalence of HBP (52.0%) compared to those with normal BMI (24.3%) and those over weight (28.8%) thus, highlighting the long d documented association between HBP and obesity (9,10,15,16,23-25,28).

Awareness level about hypertension between developed and developing nations is said to be getting closer (21) but awareness of participants in this study about their BP status is still low as only 26.0% of those found to have HBP had a prior knowledge of it. This is quite low compared with 40.6% awareness level documented recently for developing nations (21). Although the awareness level in this study is higher than that found in the Nigeria National survey some years ago (16) and also in a recent community based survey in Northern Nigeria (7), it is still unacceptably low compared to studies in other countries (21,22,27). Other studies in Nigeria (14,32) had equally shown that awareness/ knowledge, attitude and practice about HBP were poor since even among those who were aware in most; if not all the studies, only few are drug compliant and achieve good control . Whereas hypertension prevalence is increasing significantly in all studies done in recent times in Nigeria, awareness is increasing at a much slower pace as found in this study and in fact, static or droping (7) compared to what it was over a decade ago (16).

With the seeming transformation of the life style of the average Nigerian from the typical African to western life style coupled with the degree of ignorance about hypertension and obesity recorded in different recent studies in Nigeria, cardiovascular morbidity and mortality is more likely to continue to rise unless something is done urgently. More so, when over 60% of hypertensive subjects are diagnosed for the first time in hospital and about 34% of hypertensive

patients in a typical Nigerian society have been shown to commute a distance of more than 5 km to receive anti hypertensive care (14).

In conclusion, hypertension and obesityare on the increase in Nigeria and degree of ignorance about these major cardiovascular risk factors has remained very high.

ACKNOWLEDGEMENT

The researchers are grateful to the management of the Nnamdi Azikiwe University Teaching Hospital (NAUTH) for partly sponsoring this study and to the medical officers who assisted in data collection.

REFERENCES

1. Mvo Z, Dick J, Steyn K. Perceptions of overweight African women about acceptable body size of women and children. *Curationis*. 1999;**22**:27-31
2. Williams KJ, Taylor CA, Wolf KN, Lawson RF, Crespo R. Cultural perceptions of healthy weight in rural Appalachian youth. *Rural Remote Health*. 2008; **8**: 932
3. Akinpelu AO, Akinola OT, Gbiri CA. Adiposity and quality of life: a case study from an urban center in Nigeria. *J Nutr Educ Behav.* 2009;**41**:347-352.
4. Zhou X, Dibley MJ, Cheng Y, Ouyang X, Yan H. Validity of self-reported weight, height and resultant body mass index in Chinese adolescents and factors associated with errors in self-reports. *BMC Public Health*. 2010;**10**:190.
5. Dorsey RR, Eberhardt MS, Ogden CL. Racial / Ethnic differences in weight perception. Obesity (Silver Spring). 2009; **17**: 790-795.
6. Ekore RI, Ajayi IO, Arije A. Case finding for hypertension in young adult patients attending a missionary hospital in Nigeria. *Afr Health Sci.* 2009;**9**:193-199.
7. Isezuo SA, Sabir AA, Ohwovorilole AE, Fasanmade OA. Prevalence, associated factors and relationship between prehypertension and hypertension: a study of two ethnic African populations in Northern Nigeria. *J Hum Hypertens*. 2010 Jun 17. [Epub ahead of print]
8. Odenigbo CU, Oguejiofor OC. Pattern of medical admissions at the Federal Medical Centre, Asaba-a two year review. *Niger J Clin Pract*. 2009;**12**:395-397.
9. Oghagbon EK, Okesina AB, Biliaminu SA. Prevalence of hypertension and associated variables in paid workers in Ilorin, Nigeria. *Niger J Clin Pract*. 2008;**11**:342-346.
10. Oladapo OO, Salako L, Sodiq O, Shoyinka K, Adedapo K, Falase AO. A prevalence of cardiometabolic risk factors among a rural Yoruba south-western Nigerian population: a population-based survey. *Cardiovasc J Afr*. 2010;**21**:26-31.
11. Thorogood M, Connor M, Tollman S, Lewando Hundt G, Fowkes G, Marsh J. A cross-sectional study of vascular risk factors in a rural South African population: data from the Southern African Stroke Prevention Initiative (SASPI). *BMC Public Health*. 2007;**7**:326. Nigerians with hypertension. *J Coll Physicians Surg Pak*. 2007;**17**:8-11.
12. Opadijo OG, Salami TA, Sanya EO, Omotoso AB. Systolic hypertension in adult Nigerians with hypertension. *J Coll Physicians Surg Pak*. 2007;**17**:8-11.
13. Rufus AA, Chidozie EM , Michael OB, Tanimola M, Rasaaq AA, Anthony AA, Patience OA. Prevalence and pattern of hypertension in a semiurban community in Nigeria. *Eur J Card Prev and Rehab*. 2008; **15**:688-687.
14. Katibi IA, Olarinoye JK, Kuranga SA. Knowledge and practice of hypertensive patients as seen in a tertiary hospital in the middle belt of Nigeria. *Niger J Clin Pract*. 2010;**13**:159-62.
15. Sani MU, Wahab KW, Yusuf BO, Gbadamosi M, Johnson OV, Gbadamosi A. Modifiable cardiovascular risk factors among apparently healthy adult Nigerian population - a cross sectional study. *BMC Res Notes*. 2010; **20**:11.
16. Akinkugbe OO. Non-communicable diseases in Nigeria, Final Report of a National Survey, Lagos. Federal Ministry of Health and Social Services 1997; 12-41
17. Ogah O. Hypertension in Sub-Saharan African populations: the burden of hypertension in Nigeria. *Ethn Dis*. 2006;**16**:765.
18. The Challenge of Global Hypertension: Local Experts focus on problems of Detecting and Treating Hypertension in Africa. *Medscape Cardiology*. 2006; **10**(1)
19. Tann Vom Hove. More than one million people call urban slum their home. Citimayors. Com / reports / slums. 21st May, 2010.
20. Kyobutungi C, Ziraba AK, Ezeh A, Ye Y. The burden of disease profile of residents in Nairobi's slums: Results from a Demographic Surveillance System. *Popul Health Metr*. 2008; **6**:1 (ISSN: 1478-7954)
21. Pereira M, Lunet N, Azevedo A, Barros H. Differences in prevalence, awareness, treatment and control of hypertension between developing and developed countries. *J Hypertens* 2009;**27**:963-975.
22. Chaturvedi S, Pant M, Yadav G. Hypertension in Delhi: prevalence, awareness, treatment and control. *Trop Doct*. 2007; **37**: 142-145.
23. Marina A Njelekela, Rose Mpembeni, Alfa Muhihi, Nuru L Mligiliche, Donna Spiegelman, Ellen Hertzmark, Enju Liu, et al. Gender-related differences in the prevalence of cardiovascular disease risk factors and their correlates in urban Tanzania. *BMC Cardiovasc Disord*. 2009; **9**: 30.
24. Alireza Esteghamati, Alipasha Meysamie, Omid Khalilzadeh, Armin Rashidi, Mehrdad Haghazali, Fereshteh Asgari, et al. Third national surveillance of risk factors of non-communicable diseases (SuRFNCD-2007) in Iran: methods and results on prevalence of diabetes, hypertension, obesity, central obesity, and dyslipidemia. *BMC Public Health* 2009. May 29;**9**:167
25. Ulasi II, Ijoma CK, Onodugo OD. A community-based study of hypertension and cardio-metabolic syndrome in semi-urban and rural communities in Nigeria. *BMC Health Serv Res*. 2010 **19**:71.
26. Ansa VO, Anah MU, Odey FA, Mbu PN, Agbor. Relationship between Parental Socio-economic Status and Casual Blood Pressure in Coastal Nigerian Adolescents. *West Afr J Med*.2010;**29**:146-152.

27. Cutler JA, Sorlie PD, Wolz M, Thom T, Fields LE, Roccella EJ. Trends in hypertension prevalence, awareness, treatment, and control rates in United States adults between 1988- 1994 and 1999-2004. *Hypertension*. 2008; **52**:818-27.
28. Ezeoma IT, Abioye-Kuteyi EA, Oladeji AO. Body build and blood pressure in a rural Nigerian community. *Niger Postgrad Med J*. 2001;**8**:140-4.
29. Hauner H, Bramlage P, Loosch C, Steinhagen-Thiessen E, Schunkert H, Wasem J, Jockel KH, Moebus S. Prevalence of obesity in primary care using different anthropometric measures – results of the German metabolic and cardiovascular risk project (GEMCAS). *BMC Public Health*. 2008; **8**: 282.
30. Ogden CL, Yanovski SZ, Carroll MD, Flegal KM. The epidemiology of obesity. *Gastroenterology*. 2007; **132**: 2087-102.
31. Siminialayi IM, Emem-Chioma PC, Dapper DV. The prevalence of obesity as indicated by BMI and waist circumference among Nigerians adults attending family medicine clinics as outpatients in Rivers State. *Niger J Med*. 2008 ;**17**: 340-345.
32. Osuji CU, Nzerem BA, Meludu SC, Dioka CE, Nwobodo E, Amilo GI. Hypertension Prevalence and Awareness amongst a group of women attending "August Meeting". *Journal of Biomedical Investigation*. 2008; **1**: 24-28.