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Impact of urbanization on obesity, anthropometric profile and blood pressure in the Igbos of Nigeria

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Abstract

Background: Hypertension in developing setting is often attributed to westernization of life style and stresses of urbanization, some of these increases have been noted in Nigeria. **Aim:** This is a study on rural-urban differences on the blood pressure, obesity and anthropometrics among a major ethnic group in Nigeria. **Patients and Method:** A total of 325 men and 242 women aged 20 to 80 years, of the Igbo ethnicity were selected for this study. The samples were selected from the rural and urban subgroups of the Igbo population. Systolic and diastolic blood pressure, body mass index, waist-hip ratio, waist-height ratio, waist circumference, triceps, subscapular, calf and sum of the three skin fold thicknesses and other anthropometric measurements were obtained using standard procedures. **Result:** Blood pressure correlated with age and most of the anthropometric parameters ($p< 0.05$). All adiposity and blood pressure indicators were higher in the urban than in the rural sample. Women showed higher predisposition to both general and abdominal obesities in both samples. High blood pressure occurred more often in the urban sample than the rural. Urban men had the highest mean blood pressure ($p< 0.05$). High blood pressure appeared much connected with the pressures of city life. Regression formulae were derived for all the adiposity measures of Igbos in both rural and urban locations. **Conclusion:** High rates of obesity and hypertension are noted among Igbos in both rural and urban areas. This is especially in the urban setting. The finding is indicative of a low level of attention on hypertension and obesity in the Igbos. The data reported here call for intervention programs on the risks, preventions and management of obesity and obesity related conditions.

Keywords: Impact, urbanization, obesity, hypertension, anthropometry.

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Introduction

The growing trend of obesity has been associated with many factors. Among these include socioeconomic status [1, 2] physical activity [3, 4], socioeconomic level and urbanisation [3, 5].

Obesity has been noted to be on the increase worldwide [6, 7]. Some of these increases have been noted in some West African countries such as South Western Nigeria [8-11]. Increasing adiposity and hypertension in developing setting is often attributed to westernization of life style and stresses of urbanization [12].

Cooper and Kaufman [13] have called attention to 'racial' predispositions to diseases. Africans seem to be more susceptible to elevated blood pressure and excessive adiposity than Europeans and Asians and easily reflect this indexes by often being more severely affected [12, 14]. This situation has been seen to be getting worse and this study more pertinent with the results from Cooper and Rotimi [12] and Shaper and Qhincup [15], which showed that increased blood pressure with age is accelerated in black Africans adopting western lifestyle and is more rapid in Americans of African origin than those of European origin. Edward et al [16] suggest that both genetic and

environmental factors play key roles in hypertension, 90% of which is better classified as idiopathic. High blood pressure impacts highly on the economy and on the quality of life of individuals.

Rapid increases in adopting Western culture have characterized Nigerian urban areas [11]. This study examines impacts of culture change on blood pressure and anthropometric profiles of the Igbos of Nigeria.

Patients and Methods

Study Area and people

The Igbos are one of the ethnic groups in West Africa and the second largest group of people living in southern Nigeria. They occupy states such as Abia, Anambra, Ebonyi, Enugu, Imo, Delta, as well as some parts of Bayelsa and Rivers States. Other populations are found living in other parts of Nigeria. So many are in Diaspora. They have one language which is spoken in many dialects. Igboland which is the indigenous territory of the Igbos has a total land area of about 15,800 square miles (about 41,000 square kilometers) with a population of over 20 million [17]. Many Igbos were originally farmers and blacksmiths, but today they are found in all forms of professions and businesses. Socially, the Igbos have various subgroups which are set according to clan, lineage, village affiliation and dialect. Politically, they are a fragmented group. Zaria, one of the major cities in Kaduna state North of Nigeria, is a centre for large scale commercial agriculture and as a result has a vibrant economy, improved infrastructures, educational institutions and advanced health care services. Given its affluence, Zaria has attracted other people from various tribes, towns, villages and states and hosts a sizable population of Igbos.

Study design

Participants were recruited using a simple random sampling method. The data for this study was collected between May 2005 and February 2006. Of 650 persons recruited for this research, only 567 (325 men and 242 women) aged 20 to 80 years of Igbo ethnicity were included in these analyses. Data were collected at two main locations. First was the Igbos residing in their remote villages of origin in the south-eastern part of Nigeria. Individuals that qualified were Igbos living, working and carrying out most of their daily activities within these rural areas with little or no infrastructure, and limited health and educational facilities, where no pipe borne water and electricity were available. Subsistence farming was the major occupation in these remote areas. The other location was Zaria. Many Igbos have moved to Zaria for access to improved economic activities. Persons that qualified for this group were Igbos living, working and carrying out most of their daily activities in urban area. The data from these two major locations were separated for analyses of rural urban differences.

This research was approved by the department of Anatomy, Faculty of Medicine, Ahmadu Bello University, Zaria, Nigeria. Igbo communities included were first communicated through the community leaders after which focused group discussions were held for the participants and the importance of the study explained to them. With the consent of the participants, the measurements were made and demographic data obtained using a questionnaire. Pregnant women, hypertensive patients, individuals with structural deformities, and individuals with any form of debilitating disease conditions were excluded from measurements.

Blood Pressure Measurement (BP)

BP was measured using a mercury sphygmomanometer (Diamond Co., Industrial Electronics and Allied Products) following standard protocol [18].Participants were allowed to rest at least 20 minutes in a seated position and arm supported at the level of the heart before blood pressure measurements were taken. BP was measured three times on the right arm of participants, with the cuff completely evacuated and recovery time of 5 minutes allowed between readings. The average of the readings was recorded for the systolic blood pressure (SBP) and diastolic blood pressure (DBP).

Anthropometry

Height (HT) was measured to the nearest 0.5cm using a vertical scale of portable stadiometer with the participant in erect position without shoes and head held in the frank fort plane. Weight was measured to the nearest 0.1kg using a spring scale with the participant lightly clothed. BMI was calculated as weight divided by square of height (kg/m^2). Waist circumference (WC) was measured in centimeters at the narrowest point of the waist [19]. Hip circumference (HC) was measured at the largest posterior extension of the buttocks. WHR was calculated by dividing the WC with HC. Thigh circumference (TC) was measured at the midpoint of the thigh. Waist-height ratio (WHTR) was calculated by dividing WC with HT. Arm circumference (AC) and forearm circumference (FAC) were taken at the midpoints respectively. Skinfold thickness was measured on the subject's body at 3 sites (triceps, subscapular and calf) with a large calliper (Cambridge, MD). The triceps skinfold (TSF) was measured in midline of the posterior aspect of the arm over the triceps muscles, midway between the lateral projections of acromion process of the scapula and the inferior margin of the ulna olecranon process. The subscapular skin folds (SSF) was taken about 2cm beneath the inferior angle of the scapula. Calf skinfold thickness was measured in the midline over the level of maximum protrusion. In each case a double thickness of skin and underlying tissue were raised and measured. A sum of the three skin folds (STS) was calculated. All measurements were taken on the right side.

Measurement cut-off points

Based on the WHO definition for cardiovascular disease risk [20], the following were accepted as cut-off points for obesity, BMI > 29.9 Kg/m^2, WC>102cm for men and 88cm for women, WHR > 1.0 in men and 0.85 in women.

WHTR > 0.05 was used as a cut-off point [21]. Following WHO standard for definition of elevated blood pressure [22], the following were accepted as elevated BP, SBP $\geq$ 140mmHg and/or DBP $\geq$ 90mmHg.

Statistical Analyses

Data were analysed using SPSS 15.0. The population characteristics, anthropometric indicators, SBP and DBP for both rural and urban samples are shown as means and standard deviations. The frequencies and percentage frequencies of adiposity as indicated by the various measures also are detailed. Pearson correlations between SBP, DBP and adiposity indicators were also examined as well as the differences between the various adiposity indicator in rural and urban settings using t-tests.

Result

A total of 567 Igbos aged 20-80 years, 234 (41%) from the rural areas and 333 (59%) from urban areas were enrolled for this study. Of the rural sample, 111 (47%) were women, the other 123 (53%) were men. Men outnumbered the women in the urban sample [202 (61%) to 131(39%)]. The mean age of the rural sample is 36$\pm$16 years, that of the urban is 31$\pm$11. The overall rate of obesity and hypertension in the urban sample is slightly higher (22.5%) than the rural (20.5%).

In the general pool of men and women, higher values of anthropometric and blood measures were obtained for Igbos in the urban location. This difference in the anthropometric measures though not significant for most of the parameters, became significant when the comparisons were made between same sexes in the two locations. Also, modal and median values of the anthropometric indicators for general (BMI) and central (WC, WHR, WHTR) obesities were higher in the urban sample than the rural for both men and women. The same also was observed for SBP and DBP ($p<0.01$). Sizes of the Arm and Thigh circumferences are not affected by factors, which are associated with living in urban and rural settlements.

Percentage overweight and general obesity (BMI>29.9) were higher in the urban sample than in the rural.
The highest percentage overweight (BMI >25 and <29.9) was amongst the urban men (33.7%), while urban women had the highest percentage of obese individuals (22.1%).

Assessing the occurrence of abdominal fat based on WC, WHR and WHTR, women showed higher occurrences of central obesity than men across the samples. Although urban men showed higher occurrences of abdominal fat than their rural counterparts ($P<0.01$). Central obesity was higher in the rural women than the urban women. In both men and women, urban sample showed higher occurrences of hypertensive individuals than rural. Urban men showed the highest percentages of individuals with elevated blood pressure. A significant difference ($p=0.05$) between the mean percentage occurrence of obesity was observed between rural and urban.

The results show the correlations of the anthropometric measures with blood pressure. These correlations show the variables included here are highly correlated. The highest index for blood pressure for Igbos in the urban setting was WC followed by BMI, while WC followed by WHTR was noted for the Igbos in the rural setting. WHTR followed by WC gave the highest indication of blood pressure in men, whether in rural or urban settings. WC followed by WHTR gave the highest indication in women in the rural locations while AC, followed by SSF was noted for women in the urban areas.

Given that blood pressure and adiposity measures are intercorrelated and both are correlated with age and sex, multivariate regression is used to assess the independent effects of age, sex, and location on each of the dependent variables. These tables show differences in correlations in urban and rural locations. Source of data (i.e. rural or urban) also accounted for the differences in the regression formulae derived for most of the adiposity indicators in the two samples.

DISCUSSION

A study on hypertension by Edward et al [16], in Tanzania, showed high prevalence of hypertension in rural and urban areas of Tanzania, which are hardly detected and known causes poorly treated. This study confirms earlier works which show adiposity and increased BP as increasing public health concerns [23] in both rural and urban communities [6, 7, 16, 24]. Significant linear associations of SBP and DBP with age and all the anthropometric parameters (except for height and CSF) were observed ($p< 0.05$ or $p< 0.01$). These associations are seen in the adiposity indicators considered for this study: WC, BMI, WHR, WHTR and STS. Other studies have noted similar relationships in developed and developing countries, urban and rural areas, Asian, European and African samples [24-27].

The differences noted in the correlation matrices, blood pressure and the regression formula of the adiposity measures in the two samples, clearly establishes a difference in the anthropometric profile and blood pressures of Igbos living in Urban areas from those in the rural areas. This research, for both samples has derived formula predicting WC, WHR, WHTR; (which are measures of central obesity) and BMI (measure of general obesity) using - limb sizes (i.e. AC and TC), blood pressure (SBP and DBP), subcutaneous layer of fat (i.e. TSF, SSF, CSF).

This report establishes a high level of obesity amongst Igbos in urban areas compared to rural ones. A Larger percentage of urban dwellers were more overweight and also more generally obese than the rural dwellers. Such differences noted within the individuals of same ethnicity but different socioeconomic settings have been expressly attributed to influences of westernization [24, 28, 29]. Westernization is seen in the high consumption of high-fat

diets, greater availability and affordability of packaged foods, choice of processed foods over naturally occurring non-processed ones. Another influence of westernization and improved social and economic factors is the reduction of physical activities amongst the urban dwellers. The presence of available and affordable transportation systems, sedentary jobs, dish washers, laundry machines and remote controlled appliances have reduced physical activities. Urbanites tend to live separate lifestyle from rural residents who live in areas where long distances are walked, vigorous activities are carried out in farming and other means of livelihood, and foods are locally obtained.

Alarming in this report is the proportion of android obesity. Using cut-off points of both WHR and WHTR as measures of central obesity, approximately 66% and 60% of the rural and urban women, respectively have android obesity. This report shows that Igbo women are more vulnerable to obesity and the attendant cardiovascular disease risk than their men. Similar gender differences in adiposity has been reported [24, 27]. Greater responsiveness of BP in women to gain in relative weight or abdominal deposition has also been documented [24, 30]. Igbo men in the urban setting by this research have shown higher prevalence of both general and android obesities than their rural counterparts.

Individuals in the urban environment did not only show higher prevalence of obesity but also more elevated blood pressure level. The Pearson correlation analysis shows high levels of correlation with adiposity indicators and other anthropometric parameters with SBP and/or DBP. The most elevated BP level was noted amongst males of the urban population. Doll et al [24] explained obesity associated hypertension as an inadequate vasodilatation in the presence of increased blood volume and cardiac output which are natural consequences of an increased mass. Hypertension has been characterized by Weder [31] as a "disease of civilization" resulting from an incompatible interaction between a modern affluent lifestyle and paleolithic genes.

Higher prevalence of hypertension amongst urban samples has been attributed to westernization [32]. Environmental and psychosocial factors have been shown to play important roles in the development of hypertension. Poulter et al [32] showed that when people move from a traditional tribal society to an urban, westernized lifestyle, their blood pressure rises. In their work, participants who had moved to Nairobi had higher blood pressures than people living in villages, even if they had been in the city for only one month.

This report has noted a high prevalence of both general and android obesities in both rural and urban samples of Igbos. Obesity is higher in the urban samples. It calls attention to an increasing rate of obesity and coronary risks among women whether in urban or rural setting, and also high rates of hypertension, especially amongst the urban men. The percentage of women with large WC in both the rural and urban communities calls for urgent intervention, particularly in creating awareness programs on the dangers of abdominal obesity. Many studies [33-35] have reported WC as strong predictor for visceral adipose tissue and central obesity. Multiple reports also have shown that central adiposity is highly correlated with hypertension, coronary heart disease, type 2 diabetes and increased mortality risk [36, 37]. Visceral adipose tissue also is strongly associated with glucose and insulin concentrations [38]. These statistics support calls for cost-effective strategies to improve primary prevention, detection and treatment of obesity related conditions that are geometrically increasing among Africans and African-descended population worldwide.

References

1. Sobal J, Stunkard AJ . Socioeconomic status and obesity: a review of the literature. Psycho Bull 1989; 105: 260-275.
2. Gortmaker SL, Must A, Perrin JM, Sobal AM, Dietz WH. Social and economic consequences of overweight in adolescence and young adulthood. N Engl J Med 1993; 329:1008-10012.
3. Ramadan J, Barac-Nieto M. Reported frequency of physical activity, fitness, and fatness in Kuwait. Am J Hum Bio 2003; 15(4):514-521.
4. Blair SN, Connelly JC. Development of public policy and physical activity initiatives internationally. Sports Med 1988; 21:157-163.
5. Al Muhailan ARS, Ramadan J, Gjorgov AN, Moussa M. Assessment of selected coronary risk factors in adult Kuwaiti males. Med Princip Pract 1990; 2: 199-203.
6. Flegal KM, Carroll MD, Kuczermarski RJ, Johnson CL. Overweight in the US. Int J Obes Relat Metab Disord 1988; 22: 39-47.
7. Delpeuch F, Maire B. Obesity and developing countries of the south. Med Trop 1997; 57: 380-388.
8. Cooper R, Rotimi C, Ataman S, et al. The prevalence of hypertension in seven populations of West African origin. Am J Publ Health 1997; 87: 160-168.
9. Gwatkin D, Guillot M, Heuveline P. The burden of disease among the global poor. Lancet 1999; 354: 586-589.
10. Cappuccio FP, Cook DG, Atkinson RW, Strazzullo P. Prevalence, detection, and management of cardiovascular risk factors in different ethnic groups in south London. Heart. 1997; 78: 555-563.
11. Erhun WO, Olayiwola G, Agbani, EO, Omotoso, NS. Prevalence of Hypertension in a University Community in South West Nigeria. Afr J Biomed Res 2005; 8:15-19.
12. Cooper R, Rotimi C. Hypertension in blacks. Am J Hypertens 1997;10: 804-812.
13. Cooper RS, Kaufman JS. Race and hypertension: science and Nescience. Hypertension 1998; 32: 813–816.
14. Forrester T, Cooper RS, Wetherall D. Emergence of Western diseases in the tropical world: the experience

with chronic cardiovascular diseases. Br Med Bull 1998; 52: 463-473.
15. Shaper AG, Whincup PH. Hypertension in populations of African origin. Am J Publ Health 1997; 87: 155-156.
16. Edwards RU, Nigel M, Ferdinand W, et al. Hypertension prevalence and care in an urban and rural area of Tanzania. J Hypert 2000; 18:145-152.
17. Onwuka O. Nigeria peoples and cultures: Historical Socio-cultural Perspective. Echrisi and Company. 2002; 23.
18. Beevers G, Lip GYH, O'Brien E. ABC of hypertension: Blood Pressure Measurement Part II: Conventional Sphygomonometry: Technique of auscutatory blood pressure measurement. Clinical Review. BMJ 2001; 322: 1110-1114.
19. Lohman TG. Anthropometric standardization reference manual. Abridged edition. Champaign, IL: Human Kinetics. 1988; 28-80.
20. World Health Organization consultation on obesity. Preventing and Managing the global Epidemic. Geneva, Switzerland: Division of Non communicable Diseases, Programme of Nutrition, Family and Reproductive Health, World Health Organization. 1998.
21. Hsieh SD, Muto T. A simple and practical index for assessing the risk of metabolic syndrome during routine health checkups. Nippon Rinsho 2004; 62: 1143-1149.
22. The guidelines subcommittee of the WHO-ISH Mild Hypertension Liaison committee World Health Organization International Society of Hypertension guidelines for the management of hypertension. J Hypert 1999; 17: 151-183.
23. Yalcin BM, Sahin EM, Yalcin E. Which anthropometric measurement is most closely related to elevated blood pressure? Fam. Prac 2005; 22: 541-547.
24. Doll S, Paccaud F, Bovet P, Burnier M , Wietlisbach V. Body mass index, abdominal adiposity and blood pressure: consistency of their association across developing and developed countries. Int J Obes 2002; 26: 48-57.
25. Kaufman JS, Durazo-Arvizu RA, Rotimi CN, McGee DL, Cooper RS. For the Investigators of the International Collaborative Study on Hypertension in Blacks. Obesity and hypertension prevalence in populations of African origin. Epidemiology 1996; 7: 398-405.
26. Pi-sunyer FX. Medical hazards of obesity. Ann Intern Med 1993;119:655-660.
27. Deshmuk PR, Gupta SS, Dongre AR, et al. Relationship of anthropometric indicators with blood pressure levels in rural Wardha. Indian J Med Res 2006; 123: 657-664.
28. Popkin BM. The nutrition transition and its health implications in lower-income countries. Publ Health Nutr 1998; 1: 5-21.
29. Ghebremeskel K, Crawford MA. Nutrition and health in relation to food production and processing. Nutr Health 1994; 9: 237-253.
30. Okosun IS, Prewitt TE, Cooper RS. Abdominal obesity in the United States: prevalence and attributable risk of hypertension. J Hum Hypertens 1999; 13: 425-430.
31. Weder AB. Membrane sodium transport. In: Izzo JL, Black HR. Hypertension Primer. Dallas, TX: American Heart Association. 1993; 36–37.
32. Poulter NR, Khaw KT, Hopwood BE, et al. The Kenyan Luo migration study: Observations on the initiation of a rise in blood pressure. BMJ. 1990; 300: 967-972.
33. Ashwell M, Cole TJ, Dixon AK. Ratio of waist circumference to hip is a strong predictor of intra-abdominal fat. BMJ 1996; 313: 559-560.
34. Turcato E, Bosello O, Francisco V. Waist circumference and abdominal sagittal diameter as surrogates of body fat distribution in the elderly: their relation with cardiovascular risk factors. Int J Obes Relat Metab Disord 2000; 24:1005-1010.
35. Rexorde KH, Buring JE, Manson JE. Abdominal and total adiposity and risk of coronary heart disease in men. Int J Obes Relat Metab Disord 2001; 25: 1047-1056.
36. Jansseen I, Katzmarzyk PT, Ross R . Body mass index, waist circumference and health risk: evidence in support of current National Institutes of Health guidelines. Arch Intern Med 2002;162: 2074-2079.
37. Grinker JA, Tucker KL, Vokonas PS, Rush D. Changes in patterns of fatness in adult men in relation to serum indices of cardiovascular risk: The Normative Aging Study. Int J Obes Relat Metab Disord 2000; 24:1369-1378.
38. Bochard C, Johnson FE. Fat Distribution During Growth and Later Healthy Outcomes. New York: Alan R Liss. 1988; 193-201.