Prevalence and Determinants of Hypertension in Abia State Nigeria: Results from the Abia State Non-Communicable Diseases and Cardiovascular Risk Factors Survey

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Objective: Hypertension is the most common non-communicable disease and risk factor for heart failure, stroke, chronic kidney disease and ischemic heart disease in sub-Saharan Africa. Few population-based studies have been conducted recently in Nigeria and, in Abia State, no previous study has been conducted on the prevalence and correlates of hypertension among the populace. The purpose of our study was, therefore, to determine the prevalence and determinants of high blood pressure in Abia State, south-eastern Nigeria. We hypothesise that high blood pressure burden is high in Abia State.

Design: The study was a community based cross-sectional house-to-house survey aimed at ascertaining the burden/prevalence of hypertension in the state as well as identifying related risk factors associated with them.

Setting: The study was conducted in rural and urban communities in Abia State, Nigeria.

Participants: Participants in the study were men and women aged ≥15 years and were recruited from the three senatorial zones in the state.

Main Outcomes: A total of 2,999 respondents were selected for the survey and, 2,983 consented to be interviewed giving a response rate of 99.5%. The data for 2,928 participants were suitable for analysis. Of these, 1,399 (47.8%) were men. The mean age of the population was 41.7 ± 18.5 years (range 18–96 years). About 54% of the population were ≤40 years. Ninety percent had at least primary education with about 47% having completed secondary education. Expectedly, 96% of the respondents were Ibos, the predominant tribe in the southeastern part of the country. Women had significantly higher BMI than the men. Similarly, waist circumference was also larger in women but waist-to-hip ratio was only significantly higher in women in the urban areas compared to those in rural areas.Thirty-one percent of all participants had systolic hypertension (33.5% in men and 30.5% in women). This sex difference was statistically different in the urban area. On the other hand, diastolic hypertension was 22.5% in all the population (23.4% in men and 25.4% in women). Age and indices of obesity were the strongest predictors of blood pressure.

Conclusion: The prevalence of hypertension was high in our study both in rural and urban settings. The major determinants of blood pressure in our participants included age, sex, indices of obesity and pulse rate. (*Ethn Dis.* 2013;23[2]:161–167)

Key Words: Prevalence, Non-communicable Disease, Hypertension, Blacks, Abia State, Nigeria

Introduction

Epidemiological studies have shown that hypertension is a major global health problem. Worldwide prevalence estimates for hypertension may be as high as one billion individuals, and approximately 7.1 million deaths per year may be attributable to hypertension.[1] More so, it is responsible for 4.5% of disease burden worldwide, translating to 64 million disability adjusted life years (DALYs). The relationship between blood pressure and risk of cardiovascular disease is continuous, consistent, and independent of other risk factors. The higher the blood pressure, the greater the chance of heart attack, heart failure, stroke and kidney disease, and also the more likely that various cardiovascular diseases will develop prematurely through acceleration of atherosclerosis, the pathological hallmark of uncontrolled hypertension. When not treated, about 50% of hypertensive patients die of coronary heart disease or congestive heart failure, about 33% of stroke, and 10–15% of renal failure. Those with rapidly accelerating hypertension die more frequently of renal failure.[2]

Data from the National Health and Nutrition Examination Survey (NHANES) have indicated that 50 million or more Americans have high blood pressure warranting some form of treatment. Wolf-Maier et al reported the prevalence of hypertension in North America and Europe at 28%, and 44% respectively.[3] In West Africa, the prevalence of hypertension is estimated to be about 14%.[4] In Nigeria, various studies have been carried out in different parts of the country on the prevalence of hypertension.[4–9] A study done in Benin City confirmed that systolic and diastolic blood pressures of Nigerians rise with

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We conducted this study to determine the prevalence of hypertension in Abia State, in any of its urban or rural areas; these data are needed in the state to guide health policy programs.

advancing age. It also showed that the body mass index is an important factor in the levels of blood pressure attained. The prevalence of hypertension was found to be 14% and 10% for males and females, respectively.[5]

A survey on non-communicable disease in Nigeria reported the prevalence of hypertension in adult Nigerians to be at 8%–10% in rural and 10%–12% in urban communities.[10] Other studies also conducted in Nigeria reported hypertension prevalence to be between 9.3%–20.8%.[4,7,8]

However, in a more recent study, Adedoyin et al[9] in their work in a semi-urban community in Nigeria (Ile–Ife), reported a prevalence of 36.6%. This may be an indicator that the prevalence of hypertension is on the rise.

Because no study, to our knowledge, had been conducted in Abia State to determine the prevalence of hypertension in any of its urban or rural areas, we sought to gather and analyze these data, which are needed in the state to guide health policy programs.

METHODS

Study Area and Participants

A house-to-house survey was conducted in randomly selected communities in Abia State of Nigeria. Abia, one of the 36 states in Nigeria, has an estimated population of 3,152,691 inhabitants and is located in the southeastern part of the country. The state is divided into three senatorial zones, 17 local government areas and has 291 political wards. It is largely inhabited by Igbo people (one of the three major ethnic groups in Nigeria). The state's economy depends mainly on agriculture and commerce; the latter contributing about 27% to the state's gross domestic product.

In terms of health facilities, Abia State has 517 public primary health care centers, 17 public secondary health care facilities, two public tertiary health care centers and two diagnostics centers. This is complemented by many privately owned primary and secondary health care facilities.

For our study, the target population was adult men and women aged ≥18 years who lived in the state. Pregnant women, temporary visitors to the state and those who refused consent were excluded from the study.

Study Design

The purpose of this cross-sectional study was to ascertain the burden/prevalence of hypertension in the state as well as to identify related risk factors. The calculated minimum sample size for the survey was 2,880 and study was 80% powered.

Sampling Technique

A multistage stratified sampling method was used to select the study participants who were randomly selected from each senatorial zone, one rural and one urban local government area (LGA): Ohafia and Isuikwuato/Bende for Abia North, Umuahia North and Ikwuano for Abia Central and Aba South and Ukwa East for Abia South. In each selected LGA, four enumeration areas (EAs) were randomly selected from a listing of all the EAs. The households in each selected EA were listed and eligible respondents in each household identified beforehand such that not more than 2 eligible respondents of either sex were selected from each household. Using the EA map and starting from a prominent landmark, trained interviewers proceeded from household to household, interviewing eligible listed respondents until a minimum of 120 respondents were interviewed. Prior to the survey, a meeting was held with the village chiefs and community leader in order to achieve maximum participation by the community members.

Data Collection

Questionnaire

Data were collected from the respondents using an interviewer-administered pre-validated version of WHO STEPS questionnaire. The questionnaire was administered by a team of trained research assistants comprising 1 supervisor and 6 interviewers per team. The supervisors were consultants (public health physicians and consultants from internal medicine), while the interviewers were health workers (medical doctors and nurses). Data were collected on biodemographic and socioeconomic characteristics.

Blood Pressure and Anthropometric Measurement

We measured the participants' blood pressure (BP), height, weight, hip and waist circumference. Both systolic and diastolic blood pressure were measured two or three times with the participant in a seated position using the Omron Electronic sphygmomanometer with the appropriate cuff sizes for each participant.

Using a stadiometer, we measured each respondent's height in centimeters, while weight was measured using a bathroom scale in kilograms. Body mass index (BMI) was calculated from these two height and weight measurements. Using a measuring tape, hip and waist circumference was measured in centimeters. Systemic hypertension was defined as systolic BP≥140 mm Hg and/or diastolic BP≥90 mm Hg. Systolic hypertension was defined as systolic BP≥140 mm Hg and diastolic BP< 90mm Hg. Diastolic hypertension was

Table 1. Demographic characteristics of subjects according to locality

Characteristics	Urban	Rural
Sex, *N*=2928	*n*=1375	*n*=1553
Male	689 (50.1)	710 (45.7)
Female	686 (49.9)	843 (54.3)
Age category, *n*=2902	*n*=1363	*n*=1539
<20	83 (6.1)	81 (5.3)
20–29	441 (32.4)	403 (26.2)
30–39	290 (21.3)	265 (17.2)
40–49	197 (14.5)	189 (12.3)
50–59	136 (10.0)	237 (15.4)
60–69	106 (7.8)	167 (10.9)
≥70	110 (8.1)	197 (12.8)
Mean age	39.3 (17.4)	43.9 (19.2)
Education, *n*=2922	*n*=1371	*n*=1551
None	87 (6.3)	188 (12.1)
Primary	254 (18.5)	458 (29.5)
Secondary	658 (47.8)	708 (45.6)
Tertiary	356 (26.0)	178 (11.5)
No response	18 (1.3)	19 (1.2)
Occupation, *n*=2900	*n*=1360	*n*=1540
Unemployed	204 (15.0)	219 (14.2)
Tribe, *n*=2927	*n*=1374	n=1553
Ibo	1313 (95.6)	1508 (97.1)
Annual Income, *n*=1973[a]	*n*=917	*n*=1056
<50,000 Naira	208 (22.1)	378 (35.8)
50,000–99,999 Naira	181 (19.7)	225 (21.3)
100,000–199,999 Naira	210 (22.9)	219 (20.7)
200,000–499,999 Naira	222 (24.2)	161 (15.2)
≥500,000 Naira	101 (11.0)	73 (6.9)
Marital Status, *n*=2919	*n*=1368	*n*=1551
Married	737 (53.9)	968 (62.4)

[a] 150 Naira = 1 US Dollar.
Data are *n* (%) unless specified otherwise.

defined as diastolic BP≥90mm Hg and a systolic BP<140 mm Hg.

Statistical Methods

Data obtained were entered using EpiData Software Version 3.1 (EpiData Association Odense, Denmark), while analysis was carried out using SPSS Version 17.0 (SPSS Inc, Chicago Illinois, USA). Continuous variables were reported as mean ± standard deviation while categorical variables were reported as proportions. Pearson correlation was used to test separately the association of blood pressure (SBP and DBP) with age, body weight, height, BMI, waist circumference, hip circumference, and pulse rate. Significant variables were entered into a multiple regression to determine the independent predictors of blood pressure; 95% confidence intervals were reported where appropriate and a *P* of <.05 was considered significant.

Consent and Ethical Approval

Ethical approval for the survey was obtained from the Abia State Ministry of Health Ethics Review Committee. Participation in the survey was voluntary and written consent was obtained from participants prior to enrollment after explanation of the purpose, objectives, benefits and risks of the survey.

RESULTS

A total of 2,999 respondents were selected for the survey; 2,983 consented to be interviewed giving a response rate of 99.5%. Nine hundred and fifty one participants were from Abia North, 1057 from Abia Central, and 991 from Abia South.

Sociodemographic Characteristics

Table 1 shows the demographic characteristics of the participants. Of the 2,928 data records suitable for analysis, 1,399 (47.8%) were male and 1,529 were female. The mean age of the population was 41.7 ± 18.5 years (range 18–96 years). About 54% of the population were aged <40 years. One thousand and twenty six (34.5%) of the participants were single, 1705 (58.3%) were married, while 213 (7.2%) participants were either widows/widowers or separated from their marriage partners.

Ninety percent had at least primary education with about 47% having completed secondary education. Expectedly, 96% of the respondents were Ibos, the predominant tribe in the southeastern part of the country. The common occupations were artisans (19.9%), trading (16.2%), students/apprenticeship (13.7%) and farming (13.6%) (Table 1).

Table 2 shows the anthropometry and blood pressure of the participants according to locality and sex. Women were heavier than the men in both rural and urban areas (BMI= 24.9 ± 4.9 vs 23.7 ± 3.7, *P*<.001; 25.9 ± 5.5 vs 24.7 ± 3.9 kg/m^2 , *P*=.001 respectively (Table 2). Women also had statistically higher waist circumference than men but the waist-to-hip ratio was not statistically different in either area.

The mean systolic blood pressure was significantly higher in men than women in both rural and urban areas (136.0 ± 24.8 vs 130.3 ± 31.2 mm Hg, *P*<.001; 136.1 ± 21.1 vs 127.1 ± 17.5, *P*<.001, respectively). For diastolic blood pressure, the difference was only significant in the urban setting (77.9 ± 13.8 vs 74.5 ± 17.5, *P*<.001). (Table 2)

Prevalence of Hypertension

Thirty-one percent of all participants had systolic hypertension (33.5%

Table 2. Anthropometric and blood pressure parameters according to locality and sex

Variable	All	Rural		*P*	Urban		*P*
		Men	Women		Men	Women	
Age, yrs	41.7 (18.5)	43.9 (19.8)	43.8 (18.6)	.041	39.0 (17.2)	39.5 (17.6)	.636
Weight, kg	66.4 (13.5)	66.1 (11.7)	61.3 (12.8)	.026	70.6 (11.8)	66.2 (15.6)	.000
Height, m	1.63 (.09)	1.67 (.08)	1.57 (.08)	.211	1.69 (.08)	1.60 (.08)	.000
BMI	24.7 (4.62)	23.7 (3.7)	24.9 (4.9)	.000	24.7 (3.9)	25.9 (5.5)	.001
WC, cm	83.7 (11.4)	80.5 (9.3)	85.3 (12.2)	<.001	82.9 (10.0)	86.3 (13.1)	<.001
HC, cm	94.0 (11.7)	90.4 (9.8)	94.9 (12.8)	<.001	93.5 (9.4)	97.0 (13.1)	<.001
WHR	.89 (.09)	.89 (.08)	.90 (.10)	.027	.89 (.08)	.89 (.09)	.359
Pulse	77.4 (11.7)	74.5 (11.7)	79.1 (11.1)	.001	76.0 (11.8)	80.0 (11.7)	<.001
Systolic BP	134.3 (22.4)	136.0 (24.8)	130.3 (31.2)	.000	136.1 (21.1)	127.1 (17.5)	.000
Diastolic BP	77.8 (12.6)	77.4 (14.6)	76.3 (16.8)	.268	77.9 (13.8)	74.5 (17.5)	.000
Systolic HTN	31.4%	33.5%	30.5%	.214	33.6%	26.4%	.003
Diastolic HTN	22.5%	23.4%	25.4%	.380	20.6%	18.4%	.311

Data are means (standard deviations) unless indicated otherwise.

in men and 30.5% in women); this sex difference was statistically different in the urban area (P=.003). On the other hand, diastolic hypertension was 22.5% in all the population (23.4% in men and 25.4% in women). Systolic and diastolic blood pressure by age group are shown in Table 3.

Determinants of Hypertension

In a univariate analysis (Table 4), systolic and diastolic blood pressure were found to be related to age, weight, height, waist circumference, hip circumference, BMI, waist-to-hip ratio and pulse rate. Most of the variables (except height) were positively related to blood pressure; and were independently related to blood pressure indices in a multiple regression analysis (Table 5).

DISCUSSION

High blood pressure is the most common non-communicable disease in Nigeria, the foundation[9] of cardiovascular disease in the country,[11] and the most common risk factor for heart disease, stroke and chronic kidney disease in the country.[11] Since the first attempt at description of blood pressure and hypertension in the country by Abrahams and colleagues,[12] some other workers have reported on the prevalence of hypertension in the country.[5,13–16] These include some few recent population based studies on the subject.[8,17,18] In the early 60s up to the late 90s, the

Table 3. Systolic and diastolic blood pressure stratified according to age group and locality

Age Group	*n*	Systolic BP	Diastolic BP	*n*	Systolic BP	Diastolic BP
		Urban			Rural	
<24	292	122.6 (18.9)	70.1 (13.0)	272	123.8 (15.0)	71.9 (10.6)
25–34	391	125.9 (19.6)	73.2 (13.4)	373	122.5 (21.1)	72.3 (13.9)
35–44	256	129.6 (26.5)	77.6 (16.5)	211	126.5 (19.0)	75.9 (12.3)
45–54	174	138.5 (27.3)	82.4 (16.9)	244	134.8 (35.3)	80.4 (20.2)
55–64	114	139.0 (34.6)	80.7 (19.5)	195	140.1 (27.3)	81.3 (15.7)
>65	157	153.1 (29.5)	82.6 (15.3)	276	154.3 (33.4)	82.4 (17.0)
		r=.364, P<.000	r=.281, P<.001		r=.399, P<.000	r=.263, P<.000
		Men			Women	
<24	278	126.7 (19.1)	70.9 (13.5)	286	119.7 (14.4)	71.2 (13.2)
25–34	375	129.8 (15.5)	74.2 (11.1)	389	118.9 (23.0)	71.4 (15.6)
35–44	221	132.6 (18.6)	78.3 (13.0)	246	124.2 (24.5)	75.6 (16.2)
45–54	195	140.4 (23.4)	82.6 (14.8)	223	132.8 (38.0)	80.0 (21.9)
55–64	144	143.6 (24.0)	83.4 (13.2)	164	136.2 (34.5)	79.0 (20.0)
≥65	209	154.7 (27.7)	83.9 (14.8)	224	153.1 (35.6)	81.1 (17.7)
		r=.412, P<.001	r=.348, P<.001		r=.514, P<.001	r=.328, P<.001

Data are means (standard deviations).

Table 4. Relationship of blood pressure to biophysical variables

Variable		Age	Weight	Height	BMI	WC	HC	WHR	PR
SBP	*r*	.480	.064	−.065	.109	.172	.103	.086	.037
	P	<.001	.001	.001	<.001	<.001	<.001	<.001	.045
DBP	*r*	.345	.177	−.074	.177	.192	.145	.067	.147
	P	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001

SBP, systolic blood pressure; DBP, diastolic blood pressure, BMI, Body mass index; WC, Waist circumference; HC, Hip circumference; WHR, Waist to hip ratio; BP, Blood pressure, HTN, Hypertension; PR, pulse rate.

prevalence of hypertension in the country was reported to be low. Recent reports, however, have shown a rising trend in the prevalence of hypertension. Most of these studies reported a higher prevalence of hypertension in urban than in rural environments. They also showed that blood pressure increased with age in both sexes.

In 1968 Akinkugbe[13] reported a prevalence of 15.2% in men and 13.1% in women in the age group of 40–44 yrs rising to 45.0% in men and 39.3% in women in those aged ≥70 years in a rural community near Ibadan in southwestern Nigeria.

The national survey of non-communicable disease in Nigeria in 1997 reported that the crude prevalence of hypertension using a definition of 160/95 mm Hg was 11.2% for both men and women (11.1% men, 11.2% women).[10] Re-analysis of the data using DBP≥ 90 mm Hg as a definition of hypertension gave a crude prevalence of 17.6%. In the same year, Cooper et al[19] reported a prevalence of 16.0% from Nigeria and Cameroon in a study of seven populations of West African origin.

Recently, Oladapo et al[8] reported a prevalence of 20.8% (21.1% in men and 20.8% in women in a rural Yoruba community in South Western Nigeria. Adedoyin[9] et al reported a prevalence of 36.6% in a semi-urban community. In another recent study, Ulasi et al[18] reported a prevalence of 24.7% and 34.7% for rural and semi-urban areas respectively in southeastern Nigeria.

Our study is unique in several ways. This is the first population-based survey of blood pressure and hypertension in Abia State. Most previous studies in the region centered on Enugu and its environment. Our study was community based and involved a house-to-house survey of the different sections of the state and could be said to be a representative sample of this state. We recruited both urban and rural population. The definition of rural and urban communities was based on the standard criteria adopted by the Nigerian National Population Council.

Table 5. Multiple regression analysis to show the determinants of blood pressure in our study population

Variable	Beta	*t*	*P*	95% CI
Systolic BP				
BMI	.064	2.82	.005	.098, .551
WC	.069	2.98	.003	.049, .235
Sex	−.134	−7.37	<.001	−7.59, −4.40
Age	.453	24.9	<.001	.499, .584
Heart rate	.062	3.46	<.001	.052, .187
Diastolic BP				
BMI	.139	5.64	<.001	.260, .536
WC	.047	1.85	.064	−.003, .111
Sex	−.071	−3.61	<.001	−2.75, −.814
Age	.324	16.41	<.001	.191, .243
Heart rate	.155	7.95	<.001	.125, .208

BMI, Body mass index; WC, Waist circumference; BP, Blood pressure, HTN, Hypertension.

Prevalence of Hypertension

The prevalence of hypertension in our study was higher than that reported in the country before 2000 but similar to recent studies[18] as well as the value of 32.6% reported in American Blacks[19] and rural South Africa.[20]

It could be said that this population is undergoing transition from traditional communicable diseases to chronic non-communicable diseases associated with lifestyle changes. The psychological, dietary, economic and stress related transformation which accompany these changes may have a profound effect on the population blood pressure.

In acculturated societies, it is well known that blood pressure does not change with age. But as these commu-

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nities adopt a Western lifestyle, they become predisposed to an age-related increase in blood pressure. Therefore, economic development and lifestyle changes may be the reason for the emergence of hypertension in our population comparable to rates in industrialized countries.[3]

The prevalence of hypertension in our study was similar in urban and rural areas. This is at variance with reports from many parts of the country sub-Saharan Africa, which reported higher prevalence in urban communities.[5,10,16,21] It is, however, similar to some reports from Nigeria[19,22] and many countries in Europe. This may be explained by the fact that, in our study, the rural populations were older. Older people in this part of the world tend to retire to their villages. Age is also the strongest determinant of blood pressure from our multivariate analysis. Also, women, compared to men, had higher waist circumferences in both rural and urban areas, 85.3 ± 12.2 cm vs 80.5 ± 9.3 cm and 86.3 ± 13.1 cm vs 82.9 ± 10.0 cm, respectively. Obesity is a well-known risk factor for hypertension.

The sex difference in prevalence of hypertension was clearly visible in the urban areas where it was higher in men than in women. This is similar to observations made by several researchers in Nigeria[7,8,10,17,23–25] and sub-Saharan Africa.[26] On the older hand, Cappuccio et al[27] reported the reverse in a study in semi-urban area of Ghana. Many studies from South Africa[28,29] and Tanzania[30,31] also reported a higher prevalence of hypertension in women.

In both urban and rural environments, blood pressure was noted to rise with age as has been observed in all the studies in Nigeria and elsewhere in Africa. We also showed that systolic hypertension was more common than diastolic hypertension in the community. This is similar to the reports by Onwubere et al,[17] Ulasi et al[18] and Adedoyin et al[9] in Nigeria and Banegas.[32] Although hypertension guidelines put emphasis on both SBP and DBP in terms of associated risk, the risk tends to be more with SBP.[33,34]

Determinants of Hypertension

The main determinants of hypertension in our study were age and obesity. These are major predictors of both systolic and diastolic blood pressures. Arterial compliance reduces with age and results in increase in SBP but DBP reduces or flattens out usually after the age of 50 years as noted in this study. Diastolic blood pressure also rises with the increase in peripheral resistance but declines where there is loss of elasticity of the vessels. As individuals advance in age the counterbalance effect of these two factors results in normal or mildly elevated DBP.

Limitations of Our Study

The use of blood pressure reading taken at one visit may have affected the values obtained. Our study was cross-sectional and may have been affected by bias, which may have arisen in our method of selection of our participants.

Conclusions

The prevalence of hypertension is high in our population both in rural and urban settings. The major determinants of blood pressure in our participants include age, sex, pulse rate and obesity. Isolated systolic hypertension is more common and may be responsible for the observed high morbidity and mortality associated with hypertension in our population.

The rising prevalence of hypertension may be attributed to a changing life style in the state. This includes increasing levels of physical inactivity, obesity and increased consumption of foods high in sodium, but less in potassium. There is a great need for population-based blood pressure programs in the state to curb this emerging epidemic.

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