Original Article

Population-based Prevalence and Associated Risk Factors of Hypertension among Adults in Benue State, Nigeria

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ABSTRACT

Background: The increasing prevalence of hypertension in low- and middle-income countries is associated with increased morbidity and mortality. **Aim:** To determine the prevalence of hypertension and associated risk factors in Benin state, Nigeria. **Materials and Methods:** A population-based cross-sectional study was conducted among 1265 adults selected by multistage sampling technique. The World Health Organization (WHO) STEPwise approach was used to collect data. Data were analyzed using Statistical Package for the Social Sciences (SPSS) software program, version 23.0 (IBM). We estimated prevalence and odds of hypertension at 5% level of significance. **Results:** The prevalence of hypertension was 35.6%. The odds of hypertension was higher among age 30–39 (aOR: 2.0; 95% CI: 1.3–3.1) compared to age 18–29 years, males (aOR: 1.4; 95% CI: 1.1–2.0) compared to females, overweight (aOR: 2.3; 95%CI: 1.6–3.2), and obesity (aOR: 4.9; 95%CI: 3.2–7.7) compared to normal weight, and high cholesterol (aOR: 1.6; 95% CI: 1.1–2.3) compared to normal cholesterol. **Conclusion:** The prevalence of hypertension was high among young adults in Benue State. The associated risk factors for hypertension were age, sex, overweight, obesity, and high total cholesterol.

Keywords: *Community, hypertension, Nigeria, population-based, risk factors*

Introduction

Hypertension, a leading preventable cause of death, is a fast-growing global public health concern. It is the key risk factor for cardiovascular disease (CVD), which is a major cause of mortality, accounting for >17 million deaths worldwide annually.[1,2] Globally, hypertension-related complications alone account for >50% of CVD-related deaths and >10% of all deaths.[2,3] The global burden of CVD-related mortality is exponentially increasing, disproportionately affecting low- and middle-income countries (LMIC), with more than 75% of the CVD-related deaths occurring in these settings and amidst weak health systems.[2] In addition, hypertension is a leading risk factor for stroke and end-stage renal disease and hypertensive end-organ damage is a major cause of morbidity and mortality in Africa.[4]

Systolic hypertension is estimated to be responsible for 14% of total deaths in 2015[1] and is expected to affect 1.54 billion persons by 2025.[5] Regional-wise, hypertension prevalence is highest in the Africa region, accounting for 46% of people with hypertension globally[6] and is projected to increase exponentially partly due to rapid population growth and a growing aging population.[7]

In Nigeria, as in other countries in sub-Saharan Africa, the burden of hypertension is not different and is projected to be increasing among different population groups in the country, although there current data on exact burden is

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limited. A meta-analysis of studies between 1980 and 2013 revealed 28.9% overall prevalence of hypertension (29.5% in men and 25.8% in women), 30.6% urban prevalence and 26.4% rural, and an abysmal 17.4% pooled awareness rate.[8] From the same study, it is projected that the prevalence of hypertension will increase to 39.1 million cases, a prevalence of 30.8% by 2030.[8] It is increasingly crucial for governments and health organizations in Africa to take proactive steps to characterize this emerging hypertension epidemic so as to identify at risk groups and to inform development of effective prevention and control interventions. In Nigeria, there are limited data on hypertension prevalence from population-based studies. Therefore, as a part of a larger study we conducted a population-based survey to determine the prevalence of hypertension and its associated risk factors among the adult population in Benue state using the World Health Organization (WHO) STEPwise approach.[9]

Materials and Methods

Study setting, design, and sample size

This was a cross-sectional study carried out (July–August 2017) in Benue State, Nigeria. It has the projection population of 5,741,800 in 2016. The main ethnic tribes are Tiv, Idoma, and Igede. There are 23 local government areas (LGAs). The survey was conducted in six LGAs (Kastina-Alla, Markudi, Obi, Oturkpo, Takar, and Ushongo) across the three senatorial zones in the state. The study population comprised all eligible residents aged 18 years and older in the selected LGAs. Sample size of 1265 was calculated based on WHO recommended formula for population-based survey for noncommunicable diseases.[9] The prevalence of hypertension of 31.4% in a previous population-based study from Southeast, Nigeria was used for the estimation of the minimum sample size.[10]

Study population and sampling technique

All consenting adults of 18 years and older, who had been residents of the area for more than 3 months, were eligible. Pregnant women, chronically ill, mentally impaired, and unconscious persons were excluded.

A multistage sampling technique was used to select the study participants. Benue state is traditionally divided into three senatorial zones. One rural and one urban LGA were randomly selected from each senatorial zone. These were Katsina-Ala and Ushongo for Benue Northeast, Makurdi and Tarka for Benue Northwest, and Oturkpo and Obi for Benue South. On the basis of the listing from the National Population Commission, 33 enumeration areas (EAs) were selected in the six LGAs. The EAs were selected using probability proportionate to size of the LGA. Households in these EAs were further listed and were selected using systematic random method. The sampling interval was computed by considering the total household listed in the EA and desired number of household needed in the EA. Forty households were selected from each EA. In each household, all eligible adults were listed and one was selected for interview using computer generated table of random numbers. In situations where the selected eligible participant was not available, two follow-up visits were carried out.

Study instrument and data collection

We adapted and pretested the WHO STEPwise questionnaire for data collection. The questionnaire has been validated in Africa for NCD data collection.[8] The questionnaire had information on sociodemographic characteristics, awareness and treatment history of hypertension, anthropometric, blood pressure (BP), and biochemical measurements of cholesterol and triglycerides. Anthropometric measurements were obtained with the participant wearing light clothing and no foot wear. Body weight was measured to the nearest 0.1 kg using a digital scale (OMRON BF212) and height to the nearest 0.1 cm in the standing position using a portable Stadiometer. Waist circumference was measured to the nearest 0.1 cm using tape, directly over the skin or over the skin or light clothing at the level of the midpoint in between the inferior margin of the last rib and iliac crest along the mid axillary line. The BP was measured in the sitting position using a digital device (Omron M6 Comfort) after the study participant rested for at least 5 minutes. Three consecutive measurements were made in an interval of at least 5 minutes. Systolic and diastolic BPs were determined from the average of the second and third measurements. Trained research assistants administered the questionnaire and did the anthropometric measurement under supervision. The survey was conducted between July and August 2017 with research teams visiting selected households. In situations where the participant was not available at the initial field visit, two follow up visits were carried out after which if not successful, the participant was considered non-response. We minimized missing respondents by making two follow-up visits.

Measurement of variables

We defined hypertension as systolic BP ≥140 mm Hg and/or diastolic BP of ≥90 mm Hg or those on treatment for hypertension. Hypercholesterolemia was defined as a total cholesterol level of ≥200 mg/dL, high-density lipoprotein cholesterol (HDL-C) ≤40 mg/dL for men or ≤50 mg/dL for women and/or triglyceride concentration of ≥150 mg/dL. Physical activity was defined as participants who in 30 days prior to the study meet any of the following: 3 or more days of vigorous-intensity activity of at least 20 min per day or 5 or more days of moderate-intensity activity or walking of at least 30 min per day or 5 or more days of any combination of walking, moderate or vigorous intensity activities achieving a minimum of at least 600 metabolic equivalent of task (MET) minutes per week. Otherwise, participant was classified as physically inactive.

We classified overweight as a body mass index (BMI) 25–29.9 kg/m^2 and obesity as BMI ≥30 kg/m^2. Waist circumference was categorized as high cardiovascular risk if ≥88 cm (women) or ≥102 cm (men).

Table 1: Sociodemographic characteristics and prevalence of hypertension among respondents

Characteristics	Total *n*=1265 (%)	Hypertensive *n* (%)	Nonhypertensive *n* (%)
Age (years)			
18-29	395 (31.2)	44 (11.1)	351 (88.9)
30-39	309 (24.4)	78 (25.2)	231 (74.8)
40-49	193 (15.3)	95 (49.2)	98 (50.8)
50-59	179 (14.2)	114 (63.7)	65 (36.3)
≥60	189 (14.9)	119 (63.0)	70 (37.0)
Sex			
Male	613 (48.5)	243 (39.6)	370 (60.4)
Female	652 (51.5)	207 (31.8)	445 (68.2)
Education			
None	162 (12.8)	71 (43.8)	91 (56.2)
Primary	232 (18.3)	82 (35.3)	150 (64.7)
Secondary	460 (36.4)	109 (23.7)	351 (76.3)
Tertiary	411 (32.5)	188 (45.7)	223 (54.3)
Marital status			
Single	283 (22.4)	40 (14.1)	243 (85.9)
Married	842 (66.5)	340 (40.4)	502 (59.6)
Others*	140 (11.1)	70 (50.0)	70 (50.0)
Occupation			
Unemployed	446 (35.3)	80 (17.9)	366 (82.1)
Employed	819 (64.7)	370 (45.2)	449 (54.8)

*Others include separated, divorced, and widowed

Data analysis

The data were analyzed using the Statistical Package for the Social Sciences software program, version 23.0. We estimated the prevalence of hypertension, the relationship between sociodemographic and cardiovascular risk factors with hypertension using Chi-square statistics. The factors that were significant at bivariate analysis were modeled in multivariable logistic regression at 5% level of significance.

Ethical consideration

The ethics approval for the study was obtained from National Health Research and Ethics Committee (NHREC) with approval number NHREC/01/01/2007-22/12/2016. Written informed consent was obtained from each study participant. Respondents were free to withdraw anytime during the study if they so desired. Confidentiality of information provided by participants was maintained.

Results

A total of 1265 respondents participated in the survey with the mean age of 40.2 ± 16.1 years. There were 652 (51.5%) females, 842 (66.5%) were married, and 1103 (87.2%) were literate [Table 1].

The prevalence of hypertension among the respondents was 35.6%. The prevalence was significantly higher among males (39.6%) than females (31.8%, $P = 0.003$). Age and educational status were also significantly associated with hypertension ($P < 0.001$) [Table 2].

Hypertension was also significantly associated with alcohol consumption, physical activity, family history of hypertension, waist circumference, BMI, total

Table 2: Association between the sociodemographic characteristics and hypertension among respondents

Characteristics	Total *n* (%)	Hypertensive *n* (%)	Non Hypertensive *n* (%)	*P**
Age (years)				
18-29	395 (31.2)	44 (11.1)	351 (88.9)	<0.001
30-39	309 (24.4)	78 (25.2)	231 (74.8)	
40-49	193 (15.3)	95 (49.2)	98 (50.8)	
50-59	179 (14.2)	114 (63.0)	65 (37.0)	
≥60	189 (14.9)	119 (63.0)	70 (37.0)	
Sex				
Male	613 (48.5)	243 (39.6)	370 (60.4)	0.003
Female	652 (51.5)	207 (31.8)	445 (68.2)	
Educational status				
None	162 (12.8)	71 (43.8)	91 (56.2)	<0.001
Primary	232 (18.3)	82 (35.3)	150 (64.7)	
Secondary	460 (36.4)	109 (23.7)	351 (76.3)	
Tertiary	411 (32.5)	188 (45.7)	223 (54.3)	

**P* value of chi-square statistics

Table 3: Association between cardiovascular disease risk factors and hypertension among respondents

Characteristics	Total *n* (%)	Hypertensive *n* (%)	Not Hypertensive *n* (%)	*P*
Alcohol consumption				
Yes	525 (41.5)	221 (42.2)	303 (57.8)	<0.001
No	741 (58.5)	229 (30.9)	512 (69.1)	
Physical activity				
Yes	745 (58.9)	235 (31.5)	510 (68.5)	<0.001
No	520 (41.1)	215 (41.3)	305 (58.7)	
Family history of hypertension				
Yes	364 (28.8)	147 (40.4)	217 (59.6)	0.02
No	901 (71.2)	303(33.6)	598 (66.4)	
Waist circumference				
High risk	325 (25.7)	188 (57.8)	137 (42.2)	<0.001
Low risk	940 (74.3)	262 (27.9)	678 (72.1)	
BMI range				
Normal weight	815(64.4)	206 (25.3)	609 (74.7)	<0.001
Overweight	279 (22.1)	132 (47.3)	147 (52.7)	
Obesity	171 (13.5)	112 (65.5)	59 (34.5)	
Total cholesterol				
Normal	1062 (84.0)	342 (32.2)	720 (67.8)	<0.001
High	203 (16.0)	108 (53.2)	95 (46.8)	
Total triglyceride				
Normal	989 (78.2)	321 (32.5)	668 (67.5)	<0.001
High	276 (21.8)	129 (46.7)	147 (53.3)	

Table 4: Logistic regression for risk factors of hypertension

Characteristics	Hypertension	No hypertension	aOR (95% CI)	*P*
Age (years)				
18-29	44 (11.1)	351 (88.9)	Ref.	
30-39	78 (25.2)	231 (74.8)	2.0 (1.3-3.1)	< 0.001
40-49	95 (49.2)	98 (50.8)	5.1 (3.2-8.0)	< 0.001
50-59	114 (63.0)	65 (37.0)	9.7 (6.0-15.9)	< 0.001
>60	119 (63.0)	70 (37.0)	11.9 (7.1-19.9)	<0.001
Sex				
Female	207(46.0)	445(54.6)	1.4 (1.1-2.0)	0.005
Male	243(54.0)	370(45.4)	Ref.	
Education				
None	71 (43.8)	91 (56.2)	Ref.	
Primary	82 (35.3)	150 (64.7)	0.9 (0.5-1.4)	0.581
Secondary	109 (23.7)	351 (76.3)	1.0 (0.6-1.7)	0.911
Tertiary	411 (32.5)	188 (45.7)	1.1 (0.7-1.8)	0.683
Alcohol intake				
Yes	221 (42.2)	303 (57.8)	1.6 (0.7-2.05)	0.231
No	229 (30.9)	512 (69.1)	Ref.	
Physical activity				
No	215(41.3)	305 (58.7)	Ref.	
Yes	235 (31.5)	510 (68.5)	0.9 (0.7-1.2)	0.558
BMI				
Normal	206 (25.3)	609 (74.7)	Ref.	
Overweight	132 (47.3)	147 (52.7)	2.3 (1.6-3.2)	<0.001
Obesity	112 (65.5)	59 (34.5)	4.9 (3.2-7.7)	<0.001
Total triglycerides				
High triglycerides	129 (46.7)	147 (53.3))	1.2 (0.82-1.60)	0.420
Normal triglycerides	321 (32.5)	668 (67.5)	Ref	
Total cholesterol				
High total cholesterol	108 (53.2)	95 (46.8)	1.6 (1.1-2.3)	0.014
Normal total cholesterol	342 (32.2)	720 (67.8)	Ref.	

cholesterol, and total triglyceride [Table 3]. The odds of having hypertension increased with increasing age. Respondents aged ≥60 years were 12 times higher odds of developing hypertension compared to those aged 18–29 years (aOR: 11.9; 95%CI: 7.1–19.9). Males had 1.4 times higher odds of developing hypertension compared to females (aOR: 1.4; 95%CI: 1.1–2.0). The odds of developing hypertension increased with increasing BMI. Those that were obese had nine times odds of being hypertensive compared to those with normal BMI (aOR: 8.8; 95%CI: 3.9–19.9). Those who were overweight had four times odds of developing hypertension compared to those with normal BMI (aOR: 4.1; 95%CI: 1.8–8.8) [Table 4]).

Discussion

The overall prevalence of hypertension in our study was high. The prevalence was higher than that reported in previous studies in Nigeria,[10-13] in West Africa[14,15] and among blacks in United State.[16] This shows that hypertension has assumed an epidemic dimension in communities in Nigeria. In a growing population such as that in Nigeria, an increasing prevalence of hypertension puts extra burden on lean health resources and the quality of life of the populace.

This portends greater impact of hypertension-related NCDs in the future. Our study community already has high burden of HIV and other infectious diseases, the increasing burden of NCDs in the presence of weak health system presents triple challenge to the life of the populace. These effects have implication for the various subpopulation in the community.

Hypertension is known to increase with increasing age; however, we observed a high prevalence of hypertension in younger age groups. This might be an indication of epidemiologic transition of hypertension in our environment. This could be due to changes in diet, lifestyle, and rapid urbanization occurring in the country. The implication of early inception of the disease is likely to lead to early manifestation of complications, reduced productivity and poor quality of life of the individual. The implication of this in an environment where the health seeking behavior is poor and the asymptomatic nature of hypertension means that most affected young people would present with complications.

The odds for hypertension was higher among the male respondents than female, which is consistent with findings from other studies.[17,18] However, a study carried out in Accra Ghana, revealed higher prevalence in women than men.[14] Overweight and obesity are known risk factors for hypertension.[19] Same were observed in our study population, the odds of hypertension was five times higher among obsessed compared to normal weight respondents. High cholesterol level was also found to be significantly associated with higher odds of hypertension in the respondents.

Our study is population based with larger dataset compared to prior studies on the subject in Nigeria in recent time. We also used the robust WHO STEPwise approach in generating evidence. The study unveiled the rising trend of hypertension with particularly high prevalence among the younger population exceeding the projected figure from an earlier systematic review.[8]

However, this was a cross-sectional study and was only carried out in a single state in Nigeria. Therefore, the external validity might be limited. A population-based prospective cohort study among adolescents will be required to explore the risk factors of early onset of and long term effects of hypertension.

The prevalence of hypertension was high among adults in Benue State, Nigeria. Age, sex, overweight, obesity and high cholesterol levels were risk factors of hypertension in our study. Apart from Age and sex, other risk factors are modifiable lifesytle related conditions. Thus hypertension control programmes should optimize creating awareness on lifestyle modification for prevention. The high prevalence of hypertension in lower age group has grave implication to hypertension controls and to the health system in general.

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Conflicts of interest

There are no conflicts of interest.

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