



Awareness of Hypertension, Blood Pressure Profile, Anthropometric Parameters and Lifestyle of Adults in Urban and Rural Communities of Sokoto State, Nigeria

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Authors' contributions

This work was carried out in collaboration between all authors. Authors MDA and KJA gave the study concept and design and drafted the manuscript. Authors MOO, EUY, HTU and BAI gave the study concept and design and performed the data collection, analysis and interpretation. All authors read and approved the final manuscript.

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ABSTRACT

Introduction: The increasing prevalence of hypertension and its associated complications have become major health challenges globally despite availability of effective therapies and interventions for the disease. This has been attributed to poor awareness of the disease and the rising prevalence of its risk factors particularly in the developing countries. This study aimed to assess the awareness of hypertension, blood pressure profile, anthropometric parameters and lifestyle of adults in Sokoto State, Nigeria.

Methods: A comparative cross-sectional study was conducted among adults (selected by multistage sampling technique) in rural and urban communities of Sokoto State, Nigeria. Data was collected with a set of pretested, interviewer- administered, semi-structured questionnaire, in addition to blood pressure measurement and anthropometry. Data was analyzed using IBM SPSS version 20 statistical package.

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Results: Most of the participants in both the rural (87.7%) and urban (91.3%) groups were aware of hypertension. Seventy one (28.2%) and 75 (29.8%) of the 252 respondents in each of the rural and urban groups respectively were hypertensive. Less than a third of participants with hypertension in both the rural 20 (28.2%) and urban 20 (26.7%) groups were aware that they had the disease. Similarly, less than a third of participants with hypertension in both the rural 21 (29.6%) and urban 22 (29.3%) groups received treatment for the disease. While about a quarter and less of participants in both groups were overweight/obese (rural 26.2%, urban 19.4%), about one-tenth currently smoke cigarette (rural 10.4%, urban 9.9%), and very few engaged in alcohol consumption (rural 0.4%, urban 2.0%). Only about one-fifth of participants in both the rural (17.1%) and urban (20.6%) groups consistently engaged in regular moderate exercise.

Conclusion: Although awareness and prevalence of hypertension were high among the participants in the study, only a few were aware of their blood pressure status, and treatment/control of high blood pressure was very poor among them. Similarly, obesity/overweight and sedentary lifestyle were prevalent among the participants. These findings suggest the need for routine community based screening and intensification of health education on the disease and its risk factors across the populations in the state.

Keywords: Awareness; hypertension; anthropometry; lifestyle; adults.

1. INTRODUCTION

Hypertension is a common and major global public health problem [1], the prevalence is on the increase worldwide, and there are strong evidences to suggest that hypertension and its associated complications are major health challenges of the 21st century [2]. As at the year 2000, more than 900 million people were living with hypertension worldwide, and it has been predicted that this number could rise to more than 1.5 billion in 2025 if drastic measures are not taken to control it [3].

Approximately 970 million people worldwide and approximately 77.9 million American adults (1 in 3 people) have high blood pressure [4]. It is estimated that by 2015, 1.56 billion adults will be living with hypertension [5]. The prevalence of hypertension in USA increased from 23.4% in 2000 to 32.3% in 2002; approximately 1 in 3 American adults have high blood pressure [6], and it was estimated to cost the nation about \$47.5 billion each year. This includes the cost of health care services, medications to treat high blood pressure and missed days of work [7]. Recent reports did not indicate any substantial change; from 2011-2014 the overall prevalence of hypertension among adults in the United States was 29.0%, and it was similar among men (30.0%) and women (28.1%) [8].

Hypertension has also become a significant health problem in many developing countries experiencing epidemiological transition with the double burden of communicable and non-communicable diseases [9]. The emergence of hypertension and other cardiovascular diseases

as public health problems in these countries is strongly related to the aging of the populations, urbanization, and the socioeconomic changes favoring sedentary habits, obesity, alcohol consumption and high salt intake among others [10]. Although hypertension is one of the most common modifiable risk factors for cardiovascular diseases, its prevention and control has not received sufficient attention in many developing countries. It is estimated that by 2030, mortality due to cardiovascular diseases in the adult population will reach 23 million with about 85% of such deaths occurring in low- and middle-income countries [11]. The level of awareness, treatment and control of hypertension is extremely low in these countries [12].

In sub-Saharan Africa, hypertension affects over 20 million people and remains a leading cause of hospitalization and mortality [13]. Hypertension is the commonest co-morbidity of diabetes. It exerts a huge financial burden on individuals, families, communities and the health system of any country. In Nigeria hypertension is the commonest cardiovascular disease reported [14], with a national prevalence between 12.4 and 34.8% [15,16]. Kadiri submitted that in Nigeria, hypertension is the commonest non-communicable disease with over 4.3 million Nigerians above the age of fifteen years classified as being hypertensive [16]. It is believed that with an increasing adult population, and rising prevalence of hypertension, Nigeria could experience economic and health challenges due to the disease if the tide is not arrested [17].

A review of studies on hypertension in Nigeria over the past five decades shows that the overall prevalence ranged from 8% - 46.4%, and the level of awareness, treatment and control of hypertension were generally low with attendant high burden of hypertension related complications [17]. Despite effective therapies and lifestyle interventions, optimal control of hypertension remains a very serious health challenge to health professionals in many developing countries, including Nigeria. Less than one-third of people with hypertension in Nigeria undergo medications and less than one-third of those undergoing treatment have their problem being absolutely managed [16]. The inability to adequately prevent or manage hypertension in Nigeria has been attributed to inadequate knowledge of hypertension. Thus, reaching the healthy people vision 2020 objectives may be difficult if necessary actions are not taken to prevent and control the disease [18]. A previous study in Sokoto, Nigeria (the study area), reported that only 15% of people living with hypertension at community level are aware of their high blood pressure status [19].

Similar to the situation in many developing countries, variations have been observed in the prevalence of hypertension across Nigeria, and between urban and rural communities in the country. In 2008, the prevalence of hypertension in Nigeria was estimated at 42.8% [20], while studies conducted in Sokoto, Nigeria, reported hypertension prevalence of 33.3%, 31.9% and 24.8% among teachers, civil servants and two ethnic communities respectively [21-23].

Uncontrolled hypertension is associated with serious end organ damage such as heart disease, stroke and renal disease. Of the 4,771 patients with hypertension that were seen at the Usmanu Danfodiyo Teaching Hospital, Sokoto, Nigeria, over a 5-year period, about 10% were hospitalized on account of complications of high blood pressure including heart failure (36.4%), stroke (34.8%), chronic kidney disease (10%) and other complications (21.7%) [19]. It is known that these complications can be prevented by adequate blood pressure control [9].

Once considered a high-income country problem, overweight and obesity are now on the rise in low- and middle-income countries, particularly in urban settings. In 2008, more than 1.4 billion adults, 20 years and older, were overweight. Of these, over 200 million men and nearly 300 million women were obese [24]. According to the

World Health Organization (WHO), up to 20% of the population in developed countries may suffer from obesity associated hypertension, and it possibly accounts for 78% and 65% of essential hypertension in men and women respectively [25]. Developing countries are now witnessing an increase in overweight, obesity, and obesity-related morbidity [26]. Urbanization and economic development has resulted in a nutritional shift to a higher caloric content of diet and reduction in physical activity whose consequences are changes in the body composition of the individual [27].

Reliable epidemiological data are useful for design and implementation of effective strategies for the prevention and control of hypertension and obesity. As a result of changes in the trends of prevalence and epidemiology of hypertension, it is important to regularly revisit the assessment of its prevalence and awareness to generate recent data in the developing countries, especially in sub-Saharan Africa. In this regard, efforts need to be made to generate comparable data to yield useful information needed to build the empirical evidence base that would be accumulated to trigger the necessary policy response. The high prevalence of hypertension and obesity, and the increasing exposure to its risk factors in Sokoto, Nigeria, similar to the situation in many populations in the developing countries informed the need to assess the awareness of hypertension, blood pressure profile, anthropometric parameters and lifestyle of adults in urban and rural communities of Sokoto State Nigeria. The findings would be invaluable in designing strategies for addressing gaps in awareness of hypertension and developing appropriate interventions for the control of hypertension and obesity in the study area; and in other populations with similar characteristics.

2. MATERIALS AND METHODS

2.1 Study Design

This was a comparative cross-sectional descriptive study among adults in urban and rural communities of Sokoto State, Nigeria, between June and July 2016. Sokoto State has 23 Local Government Areas (LGAs), five urban, and 18 rural, and the inhabitants largely reside in the rural areas [28]. House hold members (both males and females) aged 18 years and above, that were present at the time of conduct of the study and gave their consent to participate were

considered eligible to participate in the study. Pregnant women, those seriously ill and those with other disease conditions that made it difficult to take their anthropometry were excluded.

2.2 Ethical Consideration

Ethical approval was obtained from the Ethical committees of the Usmanu Danfodiyo University Teaching Hospital Sokoto, Nigeria, and Sokoto State Ministry of Health, Sokoto, Nigeria. Permission to conduct the study was obtained from the chairmen of the LGAs selected for the study. Advocacy visits were carried out to establish rapport with the leaders of the communities selected; informed consent was also obtained from the participants prior to questionnaire administration.

2.3 Sample Size Estimation and Sampling Technique

The sample size was estimated at 233 and adjusted to 258 per group to compensate for non-response (with an anticipated 90% response rate) using the formula for estimating sample size for comparing two proportions [29].

$$n = \frac{(Z_{1-\alpha/2} + Z_{\beta})^2 x (p_1 q_1 + p_2 q_2)}{(p_1 - p_2)^2}$$

The level of significance was set at 5% ($\alpha = 0.05$), and a power of 80%.

Where: n = minimum sample size per group; $Z_{1-\alpha/2}$ = two-sided percentage point of the normal distribution corresponding to the required significance level ($\alpha = 0.05$) = 1.96; Z_{β} = one-sided percentage point of the normal distribution corresponding to $100 - \text{the power (i.e., } 100 - 80\% = 20\% = 0.2) = 0.84$; p_1 = awareness of hypertension in an urban area from a previous study [30] = 23.2% = 0.232; q_1 = complementary probability of $p_1 = 1 - p_1 = 0.768$; p_2 = awareness of hypertension in a rural area from a previous study [23] = 13.9% = 0.139; p_2 = complementary probability of $p_2 = 1 - p_2 = 0.861$.

The eligible participants were selected by multistage sampling technique. At the first stage, the Local Government Areas (LGAs) in the State were stratified into urban and rural LGAs; of these, 1 urban and 1 rural LGAs were selected by simple random sampling using the balloting option. At the second stage, the wards in each of the selected LGAs were listed and two were randomly selected from the eleven wards in each

of the LGAs by balloting. At the third stage, a line list of all the settlements and their respective populations in the selected wards were made and two settlements from each ward were randomly selected by balloting. At the fourth stage, house numbering and listing was carried out to determine the number of houses in each of the selected settlements. One in four houses was selected by systematic sampling technique (in direct proportion to the number of houses in the respective settlements) until the required sample size was obtained. In a house with no eligible subject, the next was selected; in a house with more than one eligible subject, one was selected by simple random sampling using the balloting option.

2.4 Data Collection

The methods of data collection comprised of personal interview, and anthropometric assessment. A standardized semi-structured, interviewer-administered questionnaire was used to obtain information on the socio-demographic characteristics of the study participants, awareness of hypertension as a disease, drug treatment for hypertension, awareness of being treated for hypertension, and behavioral measurements. The questions on behavioral measurements were adapted from the WHO STEPS Instrument for chronic diseases risk factors surveillance that was used for a national survey on health behavior monitor among Nigerian adult population [31]. The instruments were pretested on 26 adults in one of the LGAs not selected for the study, no ambiguity was detected and there was no need for any modification.

Weight was measured with shoes off to the nearest 0.5kg using a Seca Optimal scale; it was validated with a standard weight and corrected for zero error. Height was measured without shoes to the nearest 0.5 cm using a stadiometer. Blood pressure was measured using a sphygmomanometer (Dekamet MG3, England) and stethoscope (Littman quality) with all tight clothing and other similar materials removed from the arm and in the sitting position. The first measurement was taken after the participant had rested for at least 10 minutes in a sitting position with the arm rested on a table such that the middle of the forearm is about the level of the heart. The second measurement was taken at the end of the interview; the mean of the 2 readings was used in the analysis. Five resident doctors assisted in data collection after pre-

training on the objectives, selection of participants and use of survey instruments.

2.5 Operational Definition of Terms

Body mass index (BMI) was calculated as weight (kg) divided by height² (m²) and used as marker for overweight and obesity [32]. Underweight was defined as BMI less than 18.5 kg/m², normal weight was defined as BMI of 18.5 to 24.9 kg/m², overweight was defined as BMI of 25.0 to 29.9 kg/m², while obesity was defined as BMI of 30.0 kg/m² and above. Hypertension was defined using the World Health Organization and International Society of Hypertension criteria [33], as systolic blood pressure (SBP) \geq 140 mmHg and/or diastolic blood pressure (DBP) \geq 90 mmHg or both or self reported anti hypertensive medication during the past 1 week. Participants were also asked to present the drugs used in the past 1 week for inspection.

2.6 Data Analysis

Data was analyzed using the IBM SPSS version 20 computer statistical software package. Frequency distribution tables were constructed; and cross tabulations were done to examine relationship between categorical variables. The Chi-square test was used to compare differences between proportions. The independent student's t-test was used for comparison of mean differences between the two groups. All levels of significance were set at $p < 0.05$.

3. RESULTS

3.1 Socio-demographic Characteristics of Participants

A total of 260 questionnaires each were administered to the participants in the urban and rural groups. Of these, 250 each were completely filled, returned and analyzed, giving a response rate of 96.9% in both the urban and rural groups. A larger proportion 80 (31.7%), of participants in both the rural and urban groups were in the 15 - 24 years age group. The mean age of the participants in the rural group was 40.67 ± 17.75 , while that of participants in the urban group was 39.38 ± 16.64 , but there was no significant difference in the mean age of the participants in both groups (mean difference = 1.29); $t = 0.844$, $p = 0.399$. While the rural group had equal proportions of males and females (50.0%), a majority, 132 (52.4%) of the urban group

participants were males. The rural group had a significantly higher proportion of participants that were married (72.2%) compared to the urban group (64.7%), $\chi^2 = 9.154$, $p = 0.027$. Islam was the most predominant religion among the participants in both the rural (98.8%) and the urban (97.6%) groups. A significantly higher proportion of the urban group participants (79.7%) had formal education compared to the rural group participants (43.2%), $\chi^2 = 47.106$, $p < 0.001$. While a larger proportion of the rural group participants were farmers (39.6%), a larger proportion of the urban group participants were civil servants (34.9%); and this was found to be significant ($p < 0.05$) as shown in Table 1.

3.2 Awareness of Hypertension by Participants

Most of the participants in both the rural (87.7%) and urban (91.3%) groups have ever heard of hypertension, and the difference in the level of awareness of hypertension between the two groups was not significant ($\chi^2 = 1.708$, $p = 0.191$). While friends / relatives constitute the most common source of information on the disease among the participants in the two groups, a significantly higher proportion of participants in the urban group (58.7%) obtained information on the disease from friends / relatives as compared to participants in the rural group (41.4%), $\chi^2 = 8.830$, $p = 0.003$ (Table 2).

3.3 Participants' Blood Pressure Profile

Seventy one (28.2%) and 75 (29.8%) of the 252 participants in each of the rural and urban groups respectively were hypertensive (Fig. 1). There was no significant difference in the prevalence of hypertension between both groups ($\chi^2 = 0.155$, $p = 0.768$). In both groups, a larger proportion of participants with hypertension were aged 40 years and above, and there was no significant difference in the distribution of participants with hypertension by age in both groups ($\chi^2 = 0.010$, $p = 0.920$). While a larger proportion of participants with hypertension in the rural group were females, a larger proportion of participants with hypertension in the urban group were males. The difference in the distribution of participants with hypertension by sex in the two groups was statistically significant ($\chi^2 = 5.520$, $p = 0.021$) as shown in Table 3.

Less than a third of participants with hypertension in both the rural 20 (28.2%) and urban 20 (26.7%) groups were aware that they

had the disease. Similarly, less than a third of participants with hypertension in both the rural 21 (29.6%) and urban 22 (29.3%) groups received treatment for the disease. Three participants (1 in the rural group and 2 in the urban group) presented anti hypertensive drugs among the drugs they took in the past one week, but they reported that the drugs were prescribed for them by healthcare workers without being informed

that they were being treated for hypertension. Even though control of hypertension was achieved in just about a fifth of hypertensive participants in both groups, it was significantly higher among the participants in the urban group (13.3%) as compared to those in the rural group (11.3%), $\chi^2 = 3.201$, $p = 0.0213$ (Table 4).

Table 1. Socio-demographic profile of participants

Variables	Rural group n = 252 frequency (%)	Urban group n = 252 frequency (%)	Test of significance
Age groups (in years)			
15 – 24	80 (31.7)	80 (31.7)	$\chi^2 = 7.58$, $p = 0.181$
25 – 34	47 (18.7)	41 (16.3)	
35 – 44	33 (13.1)	53 (21.0)	
45 – 54	43 (17.1)	41 (16.3)	
55 - 64	23 (9.1)	21 (8.3)	
65 and above	26 (10.3)	16 (6.3)	
Sex			
Male	126 (50.0)	132 (52.4)	$\chi^2 = 0.285$, $p = 0.593$
Female	126 (50.0)	120 (47.6)	
Marital status			
Single	51 (20.21)	78 (31.0)	$\chi^2 = 9.159$, $p = 0.027$
Married	182 (72.2)*	163 (64.7)*	
Divorced	2 (0.8)	2 (0.8)	
Widowed	17 (6.7)	9 (3.6)	
Religion			
Islam	249 (98.8)	246 (97.6)	$\chi^2 = 1.018$, $p = 0.313$
Christianity	3 (1.2)	6 (2.4)	
Educational status			
Non-formal (None and qurranic only)	143 (56.8)*	51 (20.3)	$\chi^2 = 47.106$, $p < 0.001$
Formal (primary, secondary, and tertiary)	109 (43.2)	201 (79.7)*	
Occupation			
Unemployed	39 (15.5)	16 (6.3)	$\chi^2 = 35.4$, $p < 0.001$
Student	39 (15.5)	55 (21.8)	
Business/ trading	42 (16.7)	53 (21.0)	
Civil servant	32 (12.3)	88 (34.9)*	
Farmer	100 (39.6)*	27 (10.7)	
Full-time housewife	1 (0.4)	3 (5.2)	

*Statistically significant

Table 2. Awareness of hypertension by participants

Variables	Rural group n = 252 frequency (%)	Urban group n = 252 frequency (%)	Test of significance
Ever heard of hypertension			
Yes	221 (87.7)	230 (91.3)	$\chi^2 = 1.708$, $p = 0.191$
No	31 (12.3)	22 (8.7)	
**Source(s) of information			
Friends / relatives	102 (41.4)	148 (58.7)*	$\chi^2 = 8.830$, $p = 0.003$
Mass media	91 (40.3)	88 (34.9)	
Health workers	102 (40.4)	107 (42.3)	

*Statistically significant; **Multiple responses allowed

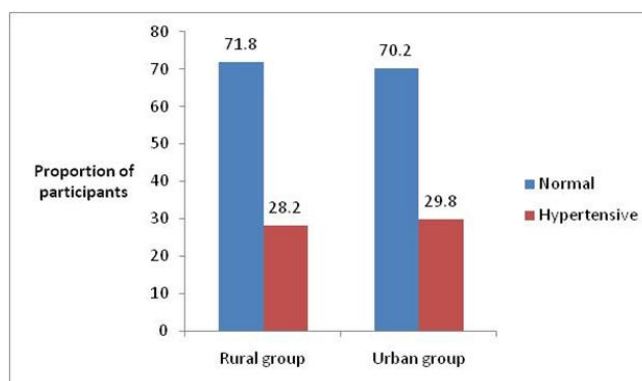


Fig. 1. Prevalence of hypertension among participants

Table 3. Distribution of hypertension by participants' socio-demographic profile

Variables	Rural group n = 71 frequency (%)	Urban group n = 75 frequency (%)	Test of significance
Age groups (in years)			
< 40	10 (14.1)	11 (14.7)	$\chi^2 = 0.010$, p = 0.920
≥ 40	61 (85.9)	64 (85.3)	
Sex			
Male	30 (42.3)	46 (61.3)	$\chi^2 = 5.320$, p = 0.021
Female	41 (57.3)	29 (38.7)	
Marital status			
Single	1 (1.4)	12 (16.0)	$\chi^2 = 11.340$, p = 0.010
Married	55 (77.5)	55 (73.3)	
Divorced	2 (2.8)	31 (1.3)	
Widowed	13 (18.3)	7 (9.3)	
Religion			
Islam	70 (98.0)	72 (96.0)	$\chi^2 = 0.919$, p = 0.338
Christianity	1 (1.4)	3 (4.0)	
Educational status			
Non-formal (None and qurranic only)	54 (76.1)	38 (50.7)	$\chi^2 = 10.088$, p = 0.001
Formal (primary, secondary, and tertiary)	17 (23.9)	37 (49.3)	
Occupation			
Unemployed	11 (15.5)	1 (1.3)	$\chi^2 = 25.345$, p < 0.001
Student	2 (2.8)	9 (12.0)	
Business/ trading	32 (45.1)	27 (36.0)	
Civil servant	8 (1.3)	22 (29.0)	
Farmer	18 (25.4)	11 (14.7)	
Full-time housewife	0 (0)	13 (15.2)	

Table 4. Awareness, treatment and control of hypertension among hypertensive participants

Variables	Rural group n = 71 frequency (%)	Urban group n = 75 frequency (%)	Test of significance
Aware of being hypertensive	20 (28.2)	20 (26.7)	$\chi^2 = 0.002$, p = 0.960
Treated for hypertension	21 (29.6)	22 (29.3)	
Blood pressure under control	8 (11.3)	10 (13.3)*	$\chi^2 = 3.201$, p = 0.0213

*Statistically significant

Table 5. Participants' anthropometric parameters and lifestyle

Variables	Rural group n = 252 frequency (%)	Urban group n = 252 frequency (%)	Test of significance
BMI			
Underweight	24 (9.5)	16 (6.3)	$\chi^2 = 5.856$, p = 0.117
Normal	165 (65.5)	150 (59.5)	
Overweight	49 (19.4)	66 (26.2)	
Obese	14 (5.6)	22 (7.9)	
Smoking			
Ever smoked	52 (20.6)	38 (15.1)	$\chi^2 = 2.651$, p = 0.103
Currently smoke	26 (10.4)	25 (9.9)	
Alcohol consumption			
Ever consumed alcohol	3 (1.2)	15 (6.0)	$\chi^2 = 0.751$, p = 0.132
Currently consume alcohol	1 (0.4)	5 (2.0)	
Intake of fatty foods			
Always	60 (23.8)	70 (27.8)	$\chi^2 = 5.035$, p = 0.810
Sometimes	177 (70.2)	168 (66.6)	
Never	5 (6.0)	14 (5.6)	
Moderate exercise			
Always	43 (17.1)	52 (20.6)	$\chi^2 = 11.998$, p = 0.002
Sometimes	156 (61.9)	175 (69.4)	
Never	53 (21.0)	25 (9.9)	
Add extra salt to food			
Yes	69 (27.7)	84 (33.6)	$\chi^2 = 2.035$, p = 0.154

3.4 Participants' Anthropometric Parameters and Lifestyle

Majority of participants in both the rural (65.5%) and urban (59.5%) groups had normal weight. While about a quarter and less of participants in both groups were overweight/obese (rural 26.2%, urban 19.4%), about one-tenth currently smoke cigarette (rural 10.4%, urban 9.9%), and very few engaged in alcohol consumption (rural 0.4%, urban 2.0%). Only about one-fifth of participants in both the rural (17.1%) and urban (20.6%) groups consistently engaged in regular moderate exercise (Table 5).

4. DISCUSSION

Awareness of hypertension was high among the participants in this study, and a substantial proportion of participants in both the rural (40.3%) and urban (34.9%) groups had access to basic information on hypertension through the mass media. Similar good levels of exposure to basic hypertension information have been

reported in several previous studies among both hypertensive and non-hypertensive individuals [34,35].

Awareness of blood pressure status was low among the participants in this study; less than a third of participants with hypertension in both the rural (28.2%) and urban (26.7%) groups were aware that they had the disease, with a slightly higher proportion of participants in both the rural 21 (29.6%) and urban 22 (29.3%) groups on treatment for the disease condition. A cause for concern is the fact that some of the participants on antihypertensive drug treatment were never informed that they were being treated for hypertension; this has serious implications for drug compliance. This finding agrees with that of the national survey where only about a third of hypertensive individuals were aware of their high blood pressure status [36]. Only 27% of the participants in the urban areas were aware of their hypertensive status compared to 26.7% in the rural areas. The result in the urban area compares well with the findings in studies by

Okpara et al. [37] and Ulasi et al. [38] that reported 21.6 and 29.4% awareness of hypertension status respectively. In contrast to the findings in this study, Meshram et al. [39], reported a much lower prevalence of awareness of hypertension status of 9.8%.

Hypertension status awareness, treatment and control rates have been found to be comparatively higher and ranged between 26 – 43%, 34 – 42% and 12 – 16% respectively among Caucasians [40]. Recent data from the National Health and Nutritional Examination Surveys in the United States, however, showed high rates of hypertension awareness (78%), treatment (68%) and control (64%) [41]. The low level of awareness of hypertension in the developing countries could be due to the relative absence of symptoms in hypertension until the late stages of the disease when complications set in and the patients present at the health facility for these symptoms; hypertension may then be diagnosed incidentally.

The overall prevalence of hypertension in this study was (29.1%), with a slightly higher (but not significant) prevalence in the urban group (29.9%) as compared with the rural group (28.3%). This finding is in agreement with the estimated global adult burden of hypertension of 26.4% [2]. While the prevalence of hypertension among the participants in this study compares well with the 29.0% prevalence of hypertension obtained among adults aged 18 years or more in the United States [41], it is much lower than the 38.0% prevalence of hypertension obtained in a study among adults in an urban community of Namibia [42]. Differences in intra- and inter-population variations in hypertension prevalence are believed to be related to differences in genetics and environmental determinants of blood pressure [2].

Contrary to the findings in previous studies in Africa including Nigeria [34,43-45] there was no significant rural-urban difference in the prevalence of hypertension in this study. Rural – urban differences in the epidemiology of hypertension are attributable to variations in geographical distributions of environmental determinants of hypertension, particularly lifestyles, which are in turn related to socio-economic status. These gaps might have been closed in this study population (majority of who belong to the middle or low socio-economic class) irrespective of their place of domicile (urban or rural).

Overweight and obesity were more prevalent among the urban group (overweight 26.2%, obesity 7.9%) than the rural group (overweight 19.4%, obesity 5.6%). This could be related to the significantly higher prevalence of sedentary lifestyle in the urban group (21.0%) compared to the rural group (9.9%). Disparities in the prevalence rates of obesity between urban and rural communities have been reported in a number of studies, with urban areas having high prevalence rates [36,46,47]. The interplay of socio-cultural lifestyle, high physical activity, high caloric energy intake and environmental factors may have contributed to the higher prevalence of obesity among the urban dwellers as against the rural dwellers that tend to have more of agrarian lifestyle. Even though there was a low prevalence of the other behavioral risk factors such as cigarette smoking (rural 10.4%, urban 9.9%) and alcohol consumption (rural 0.4%, urban 2.0%), the relatively lower prevalence of alcohol consumption as compared to cigarette smoking could be due to the fact that the participants were predominantly Muslims and Islam prohibits alcohol consumption. The findings from this study bring to the fore the fact that the rural communities in Sokoto State, Nigeria, are on a par with the urban communities in the state with respect to the burden of hypertension and its risk factors, and they underscore the need to focus on both communities in interventions for the control of the disease in the state, considering the prevalent multi-dimensional inequality (including education, income and access to healthcare services) between urban and rural communities of sub-Saharan Africa [48].

5. CONCLUSION

Although awareness and prevalence of hypertension were high among the participants in the study, only a few were aware of their blood pressure status, and treatment/control of high blood pressure was very poor among them. Similarly, obesity/overweight and sedentary lifestyle were prevalent among the participants. These findings suggest the need for routine community based screening and intensification of health education on the disease and its risk factors across the populations in the state.

CONSENT

As per international standard or university

standard, patient's written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

As per international standard or university standard, written approval of Ethics committee has been collected and preserved by the author(s).

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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