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Determinants of Uncontrolled Hypertension in two Tertiary Hospitals in Ekiti State, South-West, Nigeria.

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Abstra

Background: Poorly controlled hypertension is among the leading risk for fatal cardiovascular events in many African settings. We sought to determine the prevalence and determinants of uncontrolled hypertension in two tertiary hospitals in Ekiti State, South-west, Nigeria. **Methods**: This was a cross-sectional study of 427 patients receiving treatment for hypertension, recruited from two tertiary health institutions in Ekiti State, Nigeria. Uncontrolled hypertension was defined as an average systolic blood pressure ≥140 mmHg or an average diastolic blood pressure ≥90 mmHg, among those receiving treatment for hypertension. We explored factors associated with poor blood pressure control among patients using univariate and multivariate regression models. **Results**: The mean age of the sample was 60.6 ± 15.3 years, with 268 (62.8%) being women. There were 295 persons with poorly controlled blood pressure was(69.1%; 95% confidence interval, CI=64.5-73.4), with prevalence among women higher at 70.9% compared to men (66.0%).Being over 65 years old (adjusted odd ratio, AOR=1.58; 95% CI=1.01–3.53), low educational status (AOR=2.54; 95% CI=1.09–2.54), primary education (AOR=2.44; 95% CI=1.11–5.36), and low-income (less than 30,000 Naira per month or US Dollar 70) (AOR=2.23; 95% CI=1.66–4.30) were major determinants of poor blood pressure control. **Conclusions**: Many hypertension cases in this study are poorly controlled, suggesting a need to prioritise re-addressing the overall management of hypertension in the country to reduce fatal outcomes among patients.

Keywords: Uncontrolled hypertension, determinants, poor blood pressure control

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Quick Response Code:

Introduction

Globally, about one billion individuals are living with uncontrolled hypertension (1). Every one in five adults (21%) has hypertension under control (2). Uncontrolled hypertension is a predominant risk factor for cardiovascular disease, which remains a leading cause of death worldwide. The number of cardiovascular deaths steadily increased from 12.1 million in 1990 to 18.6 million in 2019 (3). High systolic blood pressure contributed largely to disability-adjusted life years due to cardiovascular diseases between 2006 and 2016 (4). Control rates of hypertension still remain poor despite the improved diagnostic and treatment options. Poor control rate of hypertension has been reported in all settings, especially in countries like Nigeria (5-8). Of individuals receiving anti-hypertensive medication, 58.8% had uncontrolled BP in one of the largest BP screening campaigns undertaken in Nigeria (9). Various determinants for uncontrolled hypertension have been reported such as advanced age, increased body mass index and low income. However, limited studies exist on uncontrolled hypertension in Ekiti State, this study therefore, assessed the prevalence and the factors associated with uncontrolled hypertension in Ekiti State, South-west, Nigeria.

Patients and Methods

Study setting and design

This was a cross-sectional study carried out in two tertiary centres in Ekiti State, South West Nigeria between August 2020 and December 2020. The participating centres were Ekiti State University Teaching Hospital (EKSUTH), Ado-Ekiti, and Federal Teaching Hospital, Ido-Ekiti (FETHI), Ekiti State. Ekiti State has two teaching hospitals, EKSUTH in Ado Ekiti the state capital and FETHI in Ido Ekiti a semi-urban town in the state. EKSUTH being in the state capital receives far more patients than FETHI. A total of four hundred and twenty-seven (427) participants were recruited from both sites over a period of three (3) months. Three hundred and fifty participants (350) and seventy-seven (77) were recruited from EKSUTH and FETHI respectively.

Study population

The participants were patients with hypertension attending the medical and general outpatient department clinics of EKSUTH and FETHI. All consenting adults, aged 18 years and above were recruited into the study. Patients with secondary hypertension, heart failure, renal failure, pregnancy, mental health conditions and any critical illness that could interfere with their response to the study questions were excluded from the study.

Sampling

The sampling technique was consecutive sampling if they met the above inclusion criteria during the study period.

Sample size calculation was based on the estimated prevalence of uncontrolled hypertension of 43.4% in a similar study in Ekiti State, Nigeria (5), the minimum sample size calculated was 378 using the Epi info online calculator (10,11). However, this was increased to 427 to increase the power of the study.

Data collection methods and tools

Data was collected by research assistants using the Open Data Kit collection form. The questionnaire had sections on socio-demographic characteristics, hypertension-related questions.

Baseline clinical and demographic characteristics were obtained from the study participants using an interview-based questionnaire. Height, weight, waist and hip circumferences and blood pressure (BP) were obtained using standard protocols. The weight of each participant was taken with light clothing and standing barefooted, measured to the nearest 0.1kg and the height to the nearest 0.1m without cap or head-gear, were determined with bathroom scales and stadiometer respectively. The body mass index

(BMI) was calculated from weight (in kilograms) divided by the square of the height (in metres) while the waist-to-hip ratio (WHR) was calculated from the values of waist divided by the hip circumferences.

Research Assistants were trained on the appropriate BP measurement. BP was measured using validated digital Omron Sphygmomanometer, according to the 2018 European Society of Hypertension/European Society of Cardiology (ESH/ESC) guidelines, with the participants having rested for at least 5 minutes (12). An average of three BP readings was taken and this was used to classify the subjects into those with controlled BP and uncontrolled BP according to Joint National Committee (JNC) VII criteria (12).

Definition of Terms
Hypertension was defined according to the 2018 ESH/ESC guidelines as systolic blood pressure $\geq$ 140 mmHg and/or diastolic blood pressure $\geq$ 90 mmHg and/or positive history of hypertension and/or self-report treatment of hypertension using antihypertensive medications (12).

Control of hypertension was defined as systolic blood pressure (SBP) lower than 140 mmHg and diastolic blood pressure (DBP) lower than 90 mmHg in a participant receiving treatment for hypertension.

Based on the World Health Organization, BMI was defined thus: underweight < 18.5 kg/m^2, normal 18.5-24.9 kg/m^2, overweight 25–29.9kg/ m^2 and obese $\geq$30kg/ m^2 (13).

Statistical analysis
Descriptive statistics were used to summarize the socio-demographic and clinical characteristics of the participants. Categorical variables were described as frequency and percentages. The chi-square was used to compare the categorical variables between two groups. Factors associated with poor BP control were analysed using univariate and multivariate analysis in the study population. Variables with a P-value of less than 0.05 in the univariate were included in the multivariate model. The results were presented as the odds ratio with corresponding 95% confidence interval. For all tests, a P-value <0.05 was considered to be statistically significant.

Statistical analysis was performed using the Statistical Package for Social Sciences (SPSS) 23.0 (Chicago Ill).

Ethics
Approval for the study was obtained from the Human Research and Ethics Committee of EKSUTH, Ado-Ekiti and FETHI, Ido-Ekiti respectively. Also, informed written consent was obtained from each participant before the commencement of the study. Ethical conduct was maintained during data collection and throughout the research process.

Results
The demographic and anthropometric characteristics of the study population
Overall, 427 participants which comprised 159 males (37.2%) and female participants 268 (62.8%) were recruited into the study. Their mean age was 60.6 ± 15.3 years. Patients in the age category 65 years and above (182; 42.6%), 45-64 years (174; 40.7%) and < 45 years (71; 16.6%). Most of our study population (333; 78%) earned above the 30,000 Naira (70 US Dollar) monthly and most were not in the government employment (civil service) (Table 1).

Duration of hypertension was more than 5 years in the majority of our study population and they were mostly overweight/obesity. There was inadequate physical activity and fruits/vegetable intake by majority of the participants: 316 (74%) and 344 (80.6%) respectively as shown in Table 1.

Table 1: Socio-demographic characteristics of respondents

Variable	Frequency N = 427	Percentage (%)
Age group (in years)		
Less than 45	71	16.6
45 – 64	174	40.7
65 and above	182	42.6
Mean age ± SD	60.6 ± 15.3	
Age range (min – max)	22 – 96	
Sex		
Male	159	37.2
Female	268	62.8
Marital Status		
Single	18	4.2
Married	309	72.4
Divorced	12	2.8
Widowed	88	20.6
Education		
None	72	16.9
Primary	68	15.9
Secondary	113	26.5
Tertiary	136	31.8
Post-graduate	38	8.9
Occupation		
Civil Servant	99	23.2
Self- employed	185	43.3
Pensioner	110	25.8
Unemployed	33	7.7
Monthly Income		
Less than 30,000 Naira	94	22.0
30,000 Naira and above	333	78.0
Duration of hypertension (in years)		
Less than 1	112	26.2
1 – 5	180	42.2
6 – 10	67	15.7
11 – 15	39	9.1
Above 15	29	6.8
Body Mass Index		
Underweight	8	1.9
Normal	125	29.2
Overweight	136	31.9
Obese	158	37.0
Alcohol intake		
Yes	36	8.4
No	391	91.6
Smoke cigarette		
Yes	5	1.2
No	422	98.8
Adequate exercise		
Yes	111	26.0
No	316	74.0
Adequate fruit/vegetable intake		
Yes	83	19.4
No	344	80.6
Add extra salt		
Yes	35	8.2
No	392	91.8

Prevalence and correlate of poor blood pressure control

The prevalence of uncontrolled hypertension was 295 (69.1%; 95% CI=64.5-73.4), with higher prevalence among women at 70.9% compared to men at 66.0%.

\Table 2: Relationships between respondents' socio-demographics and poor BP control

Variable	Poor BP Control		Total N (%)	χ^2	p-value
	Yes n (%)	No n (%)			
Age group (in years)				**10.481**	**0.005**
Less than 45	44 (62.0)	27 (38.0)	71 (100.0)		
45 – 64	110 (63.2)	64 (36.8)	174 (100.0)		
65 and above	141 (77.5)	41 (22.5)	182 (100.0)		
Sex				1.103	**0.294**
Male	105 (66.0)	54 (34.0)	159 (100.0)		
Female	190 (70.9)	78 (29.1)	268 (100.0)		
Marital Status				0.975	**0.807**
Single	12 (66.7)	6 (33.3)	18 (100.0)		
Married	210 (68.0)	99 (32.0)	309 (100.0)		
Divorced	9 (75.0)	3 (25.0)	12 (100.0)		
Widowed	64 (72.7)	24 (27.3)	88 (100.0)		
Education				20.242	**<0.001**
None	60 (83.3)	12 (16.7)	72 (100.0)		

Table3: Relationships between other risk factors, lifestyle pattern and poor BP control

Variable	Poor BP Control			χ²	p-value
	Yes n (%)	No n (%)	Total N (%)		
Duration of hypertension (in years)				10.195	0.037
Less than 1	84 (75.0)	28 (25.0)	112 (100.0)		
1 – 5	117 (65.0)	63 (35.0)	180 (100.0)		
6 – 10	43 (64.2)	24 (35.8)	67 (100.0)		
11 – 15	25 (64.1)	14 (35.9)	39 (100.0)		
Above 15	26 (89.7)	3 (10.3)	29 (100.0)		
Body Mass Index				3.980	0.264
Underweight	7 (87.5)	1 (12.5)	8 (100.0)		
Normal	92 (73.6)	33 (26.4)	125 (100.0)		
Overweight	94 (69.1)	42 (30.9)	136 (100.0)		
Obese	102 (64.6)	56 (35.4)	158 (100.0)		
Alcohol intake				1.171	0.279
Yes	22 (61.1)	14 (38.9)	36 (100.0)		
No	273 (69.8)	118 (30.2)	391 (100.0)		
Smoke cigarette				2.004	0.157
Yes	2 (69.4)	3 (60.0)	5 (100.0)		
No	293 (69.4)	129 (30.6)	422 (100.0)		
Adequate exercise				0.098	0.754
Yes	78 (70.3)	33 (29.7)	111 (100.0)		
No	217 (68.7)	99 (31.3)	316 (100.0)		
Adequate fruit/vegetable intake				1.519	0.218
Yes	62 (74.7)	21 (25.3)	83 (100.0)		
No	233 (67.7)	111 (32.3)	344 (100.0)		
Add extra salt				0.098	0.754
Yes	25 (71.4)	10 (28.6)	35 (100.0)		
No	270 (68.9)	122 (31.1)	392 (100.0)		

As shown in Tables 2 and 3 below, age categories above 45 years, low educational status, non-civil service employment, low monthly income and duration of hypertension greater than 15 years reached significance in the univariate analysis.

Table 4: Binary logistic regression for the predictors of poor BP control in this study

Variable	AOR	95% CI LB	95% CI UB	p-value
1 – 5	0.739	0.422	...294	0.290
Age group (in years) / 6-10	0.582	0.287	1.179	0.133
Less than 45 (ref) / 11-15	1.000 / 0.844	0.360	1.979	0.697
Above 15 / 45-64	3.308 / 1.229	0.634 / 0.847	12.925 / 2.361	0.085 / 0.947
65 and above	1.583	1.006	3.532	**0.048**
Education				
None	2.538	1.090	5.911	**0.031**
Primary	2.439	1.110	5.358	**0.026**
Secondary	2.119	0.991	8.428	0.052
Tertiary(ref)	1.167	0.447	3.048	0.752
Post-graduate	1.000			
Occupation				
Civil Servant(ref)	1.000			
Self- employed	2.847	1.487	5.450	**0.002**
Pensioner	3.098	1.542	6.227	**0.001**
Unemployed	4.640	1.452	14.830	**0.010**
Income				
Less than 30,000 Naira	2.230	1.658	4.297	**0.027**
30,000 Naira and above(ref)	1.000			
Duration of hypertension (in years)				
Less than 1(ref)	1.000			

reference category   AOR – Adjusted Odd Ratio

Multivariate logistic regression analysis (in Table 4) showed that predictors of uncontrolled hypertension were being over 65 years of age (adjusted odds ratio, AOR=1.58; 95% CI 1.01–3.53), having low educational status: None (AOR 2.54; 95% CI 1.09–2.54), primary education; AOR 2.44; 95% CI 1.11–

5.36, low-income of less than 30,000 naira (AOR 2.23; 95% CI 1.66–4.30), self-employed (AOR 2.85; 95% CI 1.49–5.45), pensioner (AOR 3.10; 95% CI 1.54–6.23), unemployed (AOR 4.64; 95% CI 1.45–14.83).

Discussion

This study shows that 69.1% of our study population had uncontrolled hypertension. However, the prevalence in this study is higher than the prevalence of 43.4 % (5) of uncontrolled BP in an earlier study in Ekiti State. This may be due to the fact that the earlier study considered patients who were hypertensive and has been on follow up for upto three months unlike this study that considered all patients with hypertension irrespective of the duration. It is also higher than 58.8% reported in one of the largest BP screening campaigns undertaken in Nigeria (9). Also, the prevalence of uncontrolled hypertension in this study is higher than 57.2% reported in a nationwide survey done in Cameroon in 2017 (14) and 61.6%in Mozambique (15). The fact that all categories of hypertensives were considered in this study, including newly diagnosed may have accounted for the high prevalence compared to the other studies. It is however, in tandem with 64.2% reported in Ilorin (16) and 66.0% in Congo (17). Noteworthily, advanced age appears to be a recurring factor that could account for the variation in the prevalence of uncontrolled BP control among various studies, as the mean age in our study was higher than in previous studies. In support of this fact, among the elderly population in Ibadan, Raji et.al reported poor BP control in 77.3% of their hypertensive patients on treatment (18).

Additionally, in our study, factors associated with poor BP control were advanced age, poor educational level, non-governmental employment and low-income. In our study, age > 65 years and increased duration of hypertension above 15 years were determinants of uncontrolled BP. Previous studies showed advanced age as one of the factors associated with uncontrolled hypertension (6,19,20). Those with chronic hypertension were more likely to be older than those with newly diagnosed hypertension. Moreover, there is more likelihood of presence of other co-morbidities in the elderly populations compared with the younger populations. Therefore, this may significantly affect their level of blood pressure control (20). Aging has been linked to a decrease in systemic arterial elasticity that culminated in an increase in systolic blood pressure. Other reasons for this, might be poverty due to the fact that the elderly patients may be retired and dependent on others. Hence, they may be financially handicapped and unable to procure their medications as required.

Furthermore, those who were not in the civil service had twice likelihood of having uncontrolled hypertension. This is similar to previous study in Ekiti State that revealed that civil servants had better BP control (5). This could be due to the fact that the majority of civil servants are likely to have higher level of education and will likely have better health-seeking behaviour than those who are in the informal

sector. Furthermore, civil servants have regular source of income compared with the elderly and those not gainfully-employed. Additionally, in our study, low educational and low-income status were associated with uncontrolled hypertension. This is in tandem with previous study which showed low educational status was a predictor of poor BP control. Low-income status has also been identified as a major factor for uncontrolled hypertension (21,22), as most patients with low-income would be unable to procure their anti-hypertensive medications regularly. It has been previously documented that the proportion of uncontrolled hypertension progressively increased with decreasing level of patient individual wealth (23). Individuals in low and middle-income countries have higher likelihood of having uncontrolled hypertension than those in high-income countries (23). Currently in Nigeria, the minimum monthly wage is 30,000 naira which approximately 77 US dollars. In fact, close to half of its Nigeria's population live in below the poverty line (below $1.90 a day). There is still poor penetrance of National Health Insurance Scheme (NHIS) in the country as a large percentage of its citizens pay through out-of-pocket means for its health services except for 5% of Nigeria's population, who are under the National Health Insurance Scheme (NHIS), and most of whom belong to the formal sector (24). For the unemployed or underemployed, unskilled individuals, health care is expensive and unaffordable. Illiteracy and ignorance also play a vital role, allowing even those who are aware of their hypertensive status to prefer living in self-denial of the true state of their health.

In this study, gender, body mass index, inadequate physical activity, inadequate intake of fruits and vegetables and addition of extra salts to food were not associated with uncontrolled BP as documented in other previous studies. Similar study also showed that gender, inadequate physical activity, inadequate intake of fruits and vegetables and addition of extra salts to food were not associated with uncontrolled BP (18). However, studies have shown that body mass index was associated with poor BP control (19,25). Also, a previous reported that physical inactivity was associated with poor BP control (1).

Conclusions
The prevalence of uncontrolled hypertension was high in Ekiti State, Nigeria. Strategies for hypertension control should not neglect the informal workforce and those people with lower income and low-educational status.

Limitations
It is a cross-sectional and hospital-based study. Additionally, optimal blood pressure control may be blunted by coexisting metabolic risk factors such as hyperglycaemia, dyslipidaemia, hyperuricaemia which were not assessed in this study.

Authors'Contributions
DBF, OOD, OJA, and OTIA made substantial contributions to conception and design of the study; BFD and OOD were involved in data collection and collation. All authors were involved in data analysis and interpretation, drafting of the manuscript and revising it critically for intellectual content. All authors have read and approved the final manuscript.

Conflict of Interest
The authors declare no conflict of interest whatsoever.

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