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*Corresponding author: Azeez Oyemomi Ibrahim, MBCh B (Ife), FMC-FM, Federal Teaching Hospital, Ido Ekiti, Nigeria, Tel: +2348034139321; E-mail: ibrahimazez1434@gmail.com

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Research Article

Blood pressure control and its associated factors among hypertensive patients in federal teaching hospital, ido- ekiti, Southwest Nigeria

Azeez Oyemomi Ibrahim^{1*}, Tosin Anthony Agbesanwa²,
Olabode Muftau Shabi¹, Olusegun Emmanuel Omosanya¹,
Waheed Olalekan Ismail³ and Olabisi Olamide Deji-Dada²

¹Federal Teaching Hospital, Ido Ekiti, Nigeria

²Ekiti State University Teaching Hospital, Ado Ekiti, Ekiti state, Nigeria

³Obafemi Awolowo University Teaching Hospital, Ile Ife, Nigeria

Abstract

Background: Hypertension is a modifiable risk factor for cardiovascular disease, stroke and renal disease worldwide. Despite improvement in treatment modality and therapeutic intervention, with proven benefits in reducing the burden of uncontrolled hypertension, majority of peoples' blood pressure still remain uncontrolled.

Aim: To assess the patterns of blood pressure control and its associated factors among hypertensive patients on follow-up.

Setting: This study was done at the general out-patient department of Federal Teaching Hospital, Ido- Ekiti, Southwest Nigeria, which is a referral centre for private and government owned - health facility in the state and its environs.

Methods: Hospital-based cross sectional study was conducted from June 4 – August 31, 2019. Systematic random sampling method was used to select the 320 participants. Semi-structured interviewer- administered questionnaire was used to seek information on participants' socio-demographic characteristics, lifestyle changes and level of adherence to antihypertensive medication. Blood pressure was measured and recorded. Data was analyzed using SPSS 20. Multivariate logistic regression analysis was used to identify the factors associated with poor blood pressure control.

Results: Mean age of the participants was 63.9± 11.5 years. 56.6% had their blood pressure controlled within the recommended limits. In multivariate analysis, civil servant (OR =45.160, 95% CI: 6.143 – 332.000) and adherence to medication (OR=15.35, 95% CI: 6.303 – 37.391) were the independent associated factors with good blood pressure control while old age (OR= 0.894, 95% CI: 0.837- 0.955) and diabetes (OR= 0.072, 95% CI: 0.016-.0,318) were independent associated factors with poor blood pressure control.

Conclusions: Old age and diabetes are the predictors of poorly controlled blood pressure and therefore, clinicians and other stakeholders should provide close attention and targeted blood pressure control among this set of patients.

Abbreviations

FTH: Federal Teaching Hospital; AOR: Adjusted Odds Ratio; BMI: Body Mass Index; OR: Odds Ratio; CI: Confidence Interval; SPSS: Statistically Packaged for Social Sciences; BP: Blood

Pressure; SBP: Systolic Blood Pressure; DBP: Diastolic Blood Pressure; GOPD: General Outpatient Department

Introduction

Poorly controlled hypertension is a major cause of



morbidity and mortality globally, and a modifiable risk factor for cardiovascular disease, stroke and chronic renal disease especially in Sub-Saharan Africa [1,2]. Globally, around one billion individuals are living with uncontrolled hypertension with a tendency to increase to 1.5 billion in year 2025 [3]. Uncontrolled hypertension and its complications constitute about 25% of emergency medical admissions in tertiary hospitals in Nigeria [4]. The burden of uncontrolled hypertension in developing countries has increased despite increasing awareness of its complications, due to problems of availability and accessibility to quality health care [5].

Studies conducted by Husain et al in USA revealed that the proportion of blood pressure (B.P) control was 69% [6]. In another study by Yang et al in Seoul, Korea, proportion of blood pressure (BP) control was 84.4% [7]. Comparative prevalence of B.P control in Africa revealed 50.3% in Ethiopia and 33.4% in Kenya [8,9]. In Nigeria, proportion of blood pressure control ranges from 17.2 – 53.3% [10-13]. The current emphasis is on the control of both the systolic and diastolic blood pressure, the systolic hypertension is by far common in low socio-economic people as compared to diastolic hypertension [9]. Between 2009 and 2010, only 50% of adult subjects with hypertension have their B.P controlled below 140/90mmHg [11].

Studies have shown that the control of B.P is still low even among the subjects who offer themselves for treatment [11-14]. Reasons for poor B.P control are multi-factorial [7,10-13]. Socio demographic factors, co-morbidities and poor lifestyle changes have been found to be associated with poorly controlled hypertension. [7,11,12]. Obesity, sedentary lifestyle, consumption of red meat, cigarettes smoking and alcoholic intake are the common poor lifestyle changes linked with poorly controlled hypertension [7-9].

Researchers have discovered that good management and adequate control of B.P result in reducing morbidity and mortality that are associated with cardiovascular disease and stroke [5,6]. Non adherence to antihypertensive medication is a significant but independent risk factor for poorly control blood pressure [10,12].

Majority of recent studies on hypertension in this study area focus on the prevalence and pattern of blood pressure control, but there are paucity of data on the associated factors for poorly controlled hypertension. This study, therefore, aimed to close this knowledge gap. Findings from this study would help to create awareness on the pattern of blood pressure control and its associated factors among patients attending Federal teaching hospital (FTH), Ido- Ekiti, South West Nigeria. This will contribute to better management of this patients.

Research methods and design

Study area

FTH Ido-Ekiti is located along the federal highway linking Ekiti State to the neighbouring States of Osun, Kwara and Kogi. Ido – Ekiti is the Local Government headquartes of Ido- Osi and one of the 16th local government areas of Ekiti State. The hospital is a referral centre for the private and government

owned health facility in the state and its environs. The hospital has 180 bed facility and runs in-patients, general and specialized out- patient clinics. FTH Ido-Ekiti is an accredited centre for residency training for both West Africa College of Physician and the National Postgraduate Medical College of Nigeria.

Study design and population

The study was an hospital- based analytical cross sectional among adult hypertensive patients on follow up a General Out-Patient Department (GOPD) of FTH, Ido-Ekiti.

Inclusion criteria

This includes all consenting hypertensive patients aged 18 years and above that were on medication(s) and on follow up treatment for at least 3 months.

Exclusion criteria

Hypertensive patients who were visiting the hospital for the first time and the critically ill patients that required an emergency care were excluded.

Sample size determination: This was determined using the formula [15];

$$n = \frac{Z^2 (P - P1)}{d^2} \text{ and } nf = n / N$$

Where n is the minimum sample size when the population of the participants is greater than 10,000 over a period of one year; and nf is the minimum sample size when the population of the participants was less than one year. N is the estimate of the population size of the participants in the study area over the previous one year. From the medical record of hypertensive patients attending GOPD ; N was 5,200 over a period of year 2017. Z = 1.96% 95% Confidence Interval and d is the degree of accuracy at 0.05. P is the estimated proportion with the attribute of interest which was 27.7% [16]. Therefore; minimum sample size nf = 290. However, 10% attrition was added for unexpected data losses and drop out during recruitment; and sample size of 320 was used for this study.

Sampling technique and sampling interval

Systematic sampling technique was used in this study. Using $K = N/n$ where k was the sampling interval; N was the sample frame (which was 1,600 hypertensive patients from the medical record) and n =320. Therefore, sampling interval k = 5.

The first participant was selected by simple random and every 5th participant was selected by systematic random sampling until sample size of 320 participants were selected. A sticker was placed on each of the selected folders to avoid re-sampling at the subsequent clinics.

Data collection tools and methods

Using inclusion and exclusion criteria, eligibility of the

participants was determined and consent was taken. The principal investigator and his team assisted by two trained resident doctors in the clinic collected the data using a pretested semi structured interviewer administered questionnaire. The pretesting of the questionnaire was conducted on 15 hypertensive patients who were selected randomly from the General Outpatient Department-(GOPD) of the Ekiti State University Teaching hospital, (EKSUTH), Ado-Ekiti and lasted for three days. The pretesting was to ascertain the fairness of the questionnaires on the participants and corrected any ambiguity. Therefore, necessary adjustment was rectified after the pretest. The questionnaire consisted of four sections: Section one assessed the socio-demographic characteristics of the participants such as age, gender, occupation, highest education attained. Other information included average daily income and duration of hypertension. Section two assessed the following lifestyle changes of the participants: alcoholic intake, cigarette smoking status, consumption of red meat, habit of salt intake and physical activity. These were all self reported. Cigarette smoking status was grouped into "never smoker", "passive smoker" or "active smoker". Alcoholic intake was either "yes" or "no." And If the answer was yes; then, follow up question was "how often?" Was it daily, weekly or monthly?. Habit of salt was either "yes" or "no" salty food. If yes; was it "added salt on cooked food" or food cooked with salt?. Physical activity was assessed by the number of minutes by day and the number of days per week a participant spent in doing physical exercise. The exercise could be in the form of trekking, street hawking ,or farming. The participant was assessed as physically active if he/she exercised more than 30 minutes per day and at least five times in a week, otherwise, as physically inactive. Section three assessed the co-morbid ailments as recorded by the Physician in the folder of the participant. Types and total number of antihypertensive medications taken by the participants were also retrieved from the folder. Section four assessed the participants' medication adherence using the Morisky's Medication Adherence Scale (MMAS-8) [17]. A score of less than 3 indicated adherence while equal or greater than 3 indicated non adherence to medication. All the questionnaires were written in English Language and translated to the local language and back translated to English language by a competent personnel in order to maintain the validity of the questionnaire.

Clinical parameters of the participants

Body Mass Index (BMI): This was determined by the weight and height of the participants using weight divided by the square of the height. The weight was measured to the nearest 0.5 kg using a standard weighing scale while the height was measured to the nearest 0.5cm using a Stadiometer. The BMI was categorized into Underweight (BMI $\leq 18\text{kg/m}^2$), Normal (BMI $18-24.9\text{kg/m}^2$), Overweight (BMI $25-29.9\text{kg/m}^2$), and Obese (BMI $\geq 30\text{kg/m}^2$).

Blood pressure: Blood pressure was measured using an Accosson brand of Mercury Sphygmomanometer with the appropriate cuff size. The first phase of Korotkoff sound was recorded as Systolic Blood Pressure (SBP), while the second phase, which was the disappearance of the Korotkoff sound was

recorded as Diastolic Blood Pressure (DBP). The process was repeated after about 5 minutes and the average measurement of the SBP and DBP was recorded as Mean SBP and DBP for each participant. The reading of B.P was done by a Senior resident doctor. The SBP and DBP at first visit were retrieved from the folder and recorded. Blood Pressure less than or equal to $140/90\text{mmHg}$ in non- diabetic and less than or equal to $130/80\text{mmHg}$ in diabetes was classified as controlled [18].

Data entry and analysis: Data collected were entered in SPSS Version 20.0 (Chicago, SPSS Inc) and cross checked before analysis. Computations, tabulations of proportions, percentages and other summary statistics were done. Chi-square analysis was used to determine the significant of association. Mean value was compared with student- t- test. Pearson Chi-square (χ^2) and Fisher's exact test were used to compare the proportion of categorical variables. A P- value < 0.05 was considered significant. Multiple logistic regression analysis was done for multivariate analysis with a 95% Confidence Interval (CI) for the Odds Ratio (OR).

Ethical clearance, consideration and consent

Ethical approval was obtained from the Human Research and Ethics Committee of FTH, Ido-Ekiti before the study was conducted (ERC/2019/02/14/190A) Informed consent was obtained from all the willing participants. Confidentiality of all the information was assured by maintaining anonymity on the questionnaires. Participation was voluntary and participants were free to withdraw at anytime they so desire without losing any benefit of care or favour to those that participated. The study involved no extra cost to the participants.

Results

A total of 320 participants were studied. Their mean age was 63.9 ± 11.5 years. (range 36 -85). Most, 197 (61.6%) were females and 222 (70.9%) were married. One hundred and forty five (45.0%) were traders/ artisans. Over one third, 112 (35.0%) had tertiary education. Almost one third, 104(32.5%) lived below the poverty level. Majority, 259 (80.9%) have been hypertensive for more than one year with 128 (40.0%) being over five years. There was a statistically significant association between blood pressure control and participants' marital status ($p < 0.001$), occupation ($p < 0.001$), education ($p < 0.003$), and family history of hypertension in both parents ($p < 0.006$) (Table 1).

Only four (1.3%) participants consumed alcohol daily and three (0.9%) were passive cigarette smokers. Nearly half, 148 (46.3%) consumed red meat regularly. Most, 211 (65.9%) cooked their food with salt. Majority, 240 (75.0%) were classified as inactive with 116 (36.2%) being sedentary. Participants with overweight and obesity were 108 (33.7%) and 53 (16.6%) respectively. There was a statistically significant association between blood pressure control and smoking ($p < 0.047$), salty food ($p < 0.001$) and BMI ($P < 0.04$) (Table 2). Diabetes mellitus 111 (34.7%) and Osteoarthritis 104 (32.5%) were the common co-morbid ailments. Other co-morbid ailments were dyslipidaemia, 50 (15.6%), PUD 14 (15.0%) and Obesity 47 (14.7%). There was a statistically significant



association between blood pressure control and diabetes ($p < 0.001$), obesity ($p < 0.001$) and PUD ($P < 0.031$), (Table 3).

Regularly prescribed antihypertensive medication was calcium channel blocker (CCB), 284 (88.8%) followed by Diuretics, 216 (67.5%) and ACEI, 183 (57.2%), Table 4. Most, 239 (74.7%) of the participants were adherent to their medication(s). There was a statistically significant association between B.P control and medication adherence ($P < 0.001$), Table 5.

In all the 320 participants, 111 (34.7%) were diabetic hypertensive and 209 (65.3%) were non diabetic hypertensive. Among the diabetic, 47 (42.3%) had their B.P control at less

Table 1: Association between socio-demographic characteristics and BP control (WHO criteria).

Variables	BP control n (%)		Total	χ^2 **	P value
	Controlled	Uncontrolled			
Age group (yrs)					
< 40	8 (100.0)	0 (0.0)	8 (100.0)	22.069	< 0.001
40 – 49	28 (87.5)	4 (12.5)	32 (100.0)		
50 – 59	30 (47.6)	33 (52.4)	63 (100.0)		
60 – 69	59 (51.3)	56 (48.7)	115 (100.0)		
≥ 70	56 (54.9)	46 (45.1)	102 (100.0)		
Mean ± SD	61.2 ± 12.6	66.0 ± 9.5	63.9 ± 11.5	-3.349	0.001*
Sex					
Male	76 (61.8)	47 (38.2)	123 (100.0)	2.221	0.136
Female	105 (53.3)	92 (46.7)	197 (100.0)		
Marital status					
Single	2 (100.0)	0 (0.0)	2 (100.0)	11.144	0.011
Married	140 (61.7)	87 (38.3)	227 (100.0)		
Separated	2 (33.3)	4 (66.7)	6 (100.0)		
Widow	37 (43.5)	48 (56.5)	85 (100.0)		
Occupation					
Civil servants	67 (77.0)	20 (23.0)	87 (100.0)	25.756	< 0.001
Traders / artisans	62 (43.1)	82 (56.9)	144 (100.0)		
Farmers	18 (60.0)	12 (40.0)	30 (100.0)		
Retirees	23 (59.0)	16 (41.0)	39 (100.0)		
Unemployed	11 (55.0)	9 (45.0)	20 (100.0)		
Education					
None	39 (52.7)	35 (47.3)	74 (100.0)	16.007	0.003
Primary	44 (51.8)	41 (48.2)	85 (100.0)		
Secondary	12 (34.3)	23 (65.7)	35 (100.0)		
Tertiary	75 (67.0)	37 (33.0)	112 (100.0)		
Postgraduate	11 (78.6)	3 (21.4)	14 (100.0)		
Religion					
Christianity	166 (56.5)	128 (43.5)	294 (100.0)	0.015	0.903
Islam	15 (57.7)	11 (42.3)	26 (100.0)		
Ethnicity					
Yoruba	177 (56.7)	135 (43.3)	312 (100.0)	0.144	0.705
Ibo	4 (50.0)	4 (50.0)	8 (100.0)		
Domicile					
Rural	83 (53.5)	72 (46.5)	155 (100.0)	1.112	0.292
Urban	98 (59.4)	67 (40.6)	165 (100.0)		
Income					
< NGN 500 / day	53 (51.0)	51 (49.0)	104 (100.0)	1.967	0.161
≥ NGN 500 / day	128 (59.3)	88 (40.7)	216 (100.0)		
Duration of hypertension					
< 6 months	19 (76.0)	6 (24.0)	25 (100.0)	4.575	0.206
6 - 12 months	18 (50.0)	18 (50.0)	36 (100.0)		
1 - 5 years	73 (55.7)	58 (44.3)	131 (100.0)		
> 5 years	71 (55.5)	57 (44.5)	128 (100.0)		

* independent samples t test with unequal variances assumed, ** Pearson chi square

Table 2: Association between BP control and lifestyle changes.

Variables	BP control n (%)		Total	χ^2 **	P value
	Controlled	Uncontrolled			
Frequency of alcohol intake					
None	154 (56.4)	119 (43.6)	273 (100.0)	6.149	0.188
Once a month	11 (68.8)	5 (31.3)	16 (100.0)		
Once weekly	4 (36.4)	7 (63.6)	11 (100.0)		
Thrice a week	8 (50.0)	8 (50.0)	16 (100.0)		
Everyday	4 (100.0)	0 (0.0)	4 (100.0)		
Smoking					
No	181 (57.1)	136 (42.9)	317 (100.0)	3.943	0.047
Yes (passive)	0 (0.0)	3 (100.0)	3 (100.0)		
Red meat					
None	21 (63.6)	12 (36.4)	33 (100.0)	0.879	0.644
Occasional	79 (56.8)	60 (43.2)	139 (100.0)		
Regularly	81 (54.7)	67 (45.3)	148 (100.0)		
Salty food					
None	12 (33.3)	24 (66.7)	36 (100.0)	25.167	< 0.001
Food cooked with salt	140 (66.4)	71 (33.6)	211 (100.0)		
Add salt on cooked food	9 (47.4)	10 (52.6)	19 (100.0)		
Both (Cooked and Added)	20 (37.0)	34 (63.0)	54 (100.0)		
Level of activity					
> 30 min/day, > 3 times / week	52 (65.0)	28 (35.0)	80 (100.0)	3.853	0.146
<30 min/day, < 3 times / week	70 (56.5)	54 (43.5)	124 (100.0)		
BMI					
Underweight	2 (40.0)	3 (60.0)	5 (100.0)	8.291	0.040
Normal	92 (59.7)	62 (40.3)	154 (100.0)		
Overweight	66 (61.1)	42 (38.9)	108 (100.0)		
Obesity	21 (39.6)	32 (60.4)	53 (100.0)		
BMI (Kg/m ²)	25.56 ± 3.91	26.78 ± 5.82	26.09 ± 4.87	-2.129	0.034*
Weight (kg)	65.9 ± 10.2	68.3 ± 15.2	66.9 ± 12.7	-1.592	0.113*
Height (m)	1.6 ± 0.0	1.6 ± 0.1	1.6 ± 0.1	1.594	0.112*

* independent samples t test with unequal variances assumed, ** Pearson chi square

or equal to 130/80mmHg, while 64 (57.7%) were uncontrolled. Almost half, 49 (44.1%) had their SBP controlled while 73 (65.8%) had their DBP controlled as well. Also, among the non diabetic- hypertensive, 134 (64.1%) had their B.P controlled while 75 (35.9%) uncontrolled. Majority 145 (69.4%) had their SBP controlled while most, 156 (74.6%) had their DBP controlled as well. (Table 6).

In the combined analysis for both the diabetic and non-diabetic hypertensive participants, the proportion of good B.P control was, 181 (56.6%) and uncontrolled was 139 (43.4%), (Figure 1). Using multivariate logistic regression analysis for B.P control, Advanced age (OR, 0.894; 95% CI, (0.837-0.955) and diabetes (OR, 0.072; 95% CI, (0.016- 0.318) were factors associated with poor B.P control (Table 7).

Discussion

In this study, 56.6% of the hypertensive patients on follow up at FTH, Ido - Ekiti, had their blood pressure controlled within the recommended limits. However, this level of blood pressure control was better than 17.2% in Enugu, South East Nigeria [10], 24.2% in Port Harcourt, South South Nigeria[14],



34.5% in Kano, North West Nigeria [12], 46.4% in Abeokuta, South West Nigeria[11] and 53.3% in Ilorin, North Central Nigeria[13]. Our finding was also better than the reported findings in other African countries with 33.4% in Kenya [9] and 50.3% in Ethiopia [8]. The relatively high proportion in this study might be due to better adherence among the studied participants. Poor adherence to therapeutic plans has been identified as factor contributing to poor B.P control [11,13]. Adherence to antihypertensive medication in this study was 74.7% as compared to 53.0% found in Kano [12] and 60.5% in Ethiopia [8]. Antihypertensive medications decrease and regulate high blood pressure by increasing vasodilatation and decreasing vasoconstriction with resultant increase in urinary output [18]. Proportion of blood pressure control in this study was lower than 69.0% reported in USA [6] and 84.4% in Korea [7]. The differences with our finding could be due to many hypertensive patients still pay out of pocket in a low resource setting as found in the area of study.

In this study, multivariate analysis revealed that civil servants and adherence to medication are associated with good B.P control. Being a civil servant provides a source of income

Table 3: Association between BP control and Co-morbid ailments.

Variables	BP control n (%)		Total	χ ² *	P value
	Controlled	Uncontrolled			
Diabetes					
Yes	47 (42.3)	64 (57.7)	111 (100.0)	13.988	< 0.001
No	134 (64.1)	75 (35.9)	209 (100.0)		
Chronic renal disease					
Yes	0 (0.0)	2 (100.0)	2 (100.0)	2.621	0.105
No	181 (56.9)	137 (43.1)	318 (100.0)		
Dyslipidaemia					
Yes	22 (44.0)	28 (56.0)	50 (100.0)	3.806	0.051
No	159 (58.9)	111 (41.1)	270 (100.0)		
Obesity					
Yes	14 (29.8)	33 (70.2)	47 (100.0)	16.075	< 0.001
No	167 (61.2)	106 (38.8)	273 (100.0)		
Osteoarthritis					
Yes	52 (50.0)	52 (50.0)	104 (100.0)	2.701	0.100
No	129 (59.7)	87 (40.3)	216 (100.0)		
PUD					
Yes	34 (70.8)	14 (29.2)	48 (100.0)	4.681	0.031
No	147 (54.0)	125 (46.0)	272 (100.0)		
Asthma					
Yes	4 (57.1)	3 (42.9)	7 (100.0)	0.001	0.975
No	177 (56.5)	136 (43.5)	313 (100.0)		
Other comorbidity					
Yes	29 (65.9)	15 (34.1)	44 (100.0)	1.814	0.178
No	152 (55.1)	124 (44.9)	276 (100.0)		

*Pearson chi square

Table 4: Anti-hypertensive medications.

Variables	Frequency	Percent
CCB	284	88.8
Diuretics	216	67.5
ACEI	183	57.2
Methyldopa	20	6.3
ARD	17	5.3
Beta blockers	15	4.7

Table 5: Association between BP control and Adherence to Anti-hypertensive medications.

Grades of Adherence	BP control n (%)		Total	χ ² *	P value
	Controlled	Uncontrolled			
Medication Non-Adherence					
Adherent	165 (69.0)	74 (31.0)	239 (100.0)	59.808	< 0.001
Non-Adherent	16 (19.8)	65 (80.2)	81 (100.0)		
Total	181 (56.6)	139 (43.4)	320 (100.0)		

*Pearson chi square

Table 6: Patterns of BP control in diabetics (≤ 130/80 mmHg) and Non-Diabetics (≤ 140/90 mmHg).

Variables	Sex n(%)		Total (N = 111)	χ ² *	P value
	Male (n = 39)	Female (n = 72)			
BP control (≤ 130/80 mmHg)					
Controlled	22 (56.4)	25 (34.7)	47 (42.3)	4.874	0.027
Uncontrolled	17 (43.6)	47 (65.3)	64 (57.7)		
SBP control (≤ 130 mmHg)					
Controlled	24 (61.5)	25 (34.7)	49 (44.1)	7.378	0.007
Uncontrolled	15 (38.5)	47 (65.3)	62 (55.9)		
DBP control (≤ 80 mmHg)					
Controlled	25 (64.1)	48 (66.7)	73 (65.8)	0.074	0.786
Uncontrolled	14 (35.9)	24 (33.3)	38 (34.2)		
BP control (< 140/90 mmHg)					
Controlled	54 (64.3)	80 (64.0)	134 (64.1)	0.002	0.966
Uncontrolled	30 (35.7)	45 (36.0)	75 (35.9)		
SBP control (< 140 mmHg)					
Controlled	62 (73.8)	83 (66.4)	145 (69.4)	1.298	0.255
Uncontrolled	22 (26.2)	42 (33.6)	64 (30.6)		
DBP control (< 90 mmHg)					
Controlled	66 (78.6)	90 (72.0)	156 (74.6)	1.146	0.284
Uncontrolled	18 (21.4)	35 (28.0)	53 (25.4)		

*Pearson chi square

Pattern of Blood Pressure

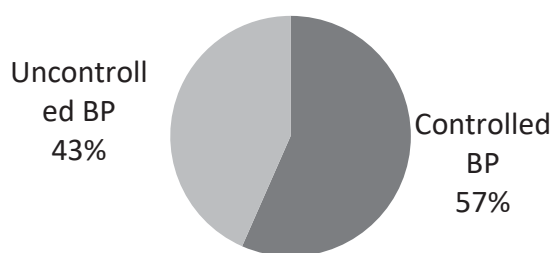


Figure 1: Pattern of Blood Pressure.

**Table 7:** Logistic regression analysis for predictors of BP control.

Variables	B	S.E.	OR (95% CI)	P value
Age*	-0.112	0.033	0.894 (0.837- 0.955)	0.001
Occupation				
Civil servants	3.810	1.018	45.160 (6.143 - 332.000)	0.000
Traders / artisans	1.290	0.709	3.633 (0.905 - 14.585)	0.069
Farmers	0.404	0.722	1.498 (0.364 - 6.162)	0.576
Retirees	3.473	1.017	32.247 (4.397 - 236.511)	0.001
Unemployed			1	
Education				
None	0.267	0.980	1.306 (0.191 - 8.918)	0.785
Primary	0.302	0.912	1.352 (0.226 - 8.075)	0.741
Secondary	-2.321	0.981	0.098 (0.014 - 0.672)	0.118
Tertiary	-2.483	0.962	0.084 (0.013 - 0.550)	0.110
Postgraduate			1	
Salty food				
None	-2.100	0.729	0.122 (0.029 - 0.511)	0.104
Food cooked with salt	0.317	0.515	1.373 (0.501 - 3.768)	0.538
Add salt on cooked food	-1.001	0.949	0.367 (0.057 - 2.359)	0.291
Both (Cooked and Added)			1	
Diabetes				
Yes	-2.630	0.758	0.072 (0.016 - 0.318)	0.001
No			1	
PUD				
Yes	1.281	1.352	3.600 (0.254 - 50.948)	0.343
No			1	
CCB				
Yes	-0.688	1.216	0.502 (0.046 - 5.442)	0.571
No			1	
ARD				
Yes	1.641	1.697	5.160 (0.185 - 143.685)	0.334
No			1	
Medication Non-Adherence				
Adherent	2.731	0.454	15.351 (6.303 - 37.391)	0.000
Non-Adherent			1	

* Variable entered as a continuum

to procure medication and also to come to the hospital for follow up. Study has established that majority of civil servant subjects are likely to be enlightened about the need to have proper health seeking behaviour irrespective of their gender [19]. Retirees subjects are linked to good B.P control because they are likely to have more time to take care of their health due to less demands of daily work.

Adherence to anti-hypertension medication has been linked to good B.P control in this study and is related to findings from previous studies [11,13]. The terms adherence is comprehensive and reflect both taking the medication as prescribed (compliance) and continuing to take the medication for the duration required (persistence) [13]. Therefore, clinicians should use the opportunity of every encounter with

hypertensive subjects to provide effective health education and screening for adherence as a way to reduce cardiovascular risk associated with uncontrolled hypertension.

In this study, multivariate analysis revealed that advanced age and diabetes were significant contributors to poor B.P control. Old age has been identified as an important risk factor for poor B.P control in a number of studies [8,9,12]. Elderly populations were more likely to have multiple co-morbidities as shown in this study and therefore may significantly affect their level of blood pressure control [8]. Previous studies have linked advanced age to a decrease in systemic arterial elasticity that culminated in an increase in systolic blood pressure [8,12]. This finding may suggest that Physicians who see after elderly hypertensive patients should also seek for and address other medical challenges that may be hiding in the patient.

Diabetic co-morbidity had a significant association with poorly controlled B.P in this study. This is consistent with previous studies. [11,13]. The prevalence of diabetes among the various identified co-morbid ailments in this study was 34.7%. This may be due to greater proportion of overweight and obesity as well as age of the study participants. In this study, the control of B.P among the diabetic hypertensive participants was 42.3%. This finding was poor considering the fact that adequate B.P control is of particular concern in patient with diabetes, as hypertension increases morbidity and mortality associated with stroke and cardiovascular diseases [11]. However, finding from this study was better than the reported findings of 18.4% in Abeokuta and 23.7% in Ilorin [11,13]. The differences may be due to high burden of co-morbidities and non adherence to antihypertensive medication. Previous study has shown that diabetic hypertensive patients required multiple drugs and this may result in additional burden, both in terms of medication adherence and high cost of the drug especially in low resource setting [11]. Other study has stated that poor B.P control in diabetic patient might be due to microvascular and macrovascular complications [20]. In this study, only 44.1% of the diabetics hypertensive participants had their SBP controlled, indicating a higher long term risk of cardiovascular disease [11,20]. This finding is important given the existing evidence that SBP is more important than DBP in predicting cardiovascular and renal disease in an ageing population [9,11]. The relevance of good B.P control have also been documented by several studies [8,9,11]. The outcome of this finding confirmed that achieving optimal B.P control in diabetic hypertensive patients is often challenging and difficulty; as only a few patients with diabetes had their B.P control below the recommended goal. This finding reinforces the need for close attention and adequate B.P control in diabetic patients.

Conclusions

The proportion of hypertensive patients with optimal B.P control in this study was still low, though, higher than those reported by some other researchers in Nigeria. Control of B.P in patients with diabetes as a co-morbid ailment was also low. Advanced age and diabetes were the two independent predictors of poorly controlled B.P in this study. Therefore, Clinicians and other health care providers should provide close attention and



targeted B.P control on elderly diabetic hypertensive patients. Also, SBP control among these categories of patients should be prioritized, given that it was a particular problem identified in this study. Further research is needed to identify other factors negating good B.P control and suggests possible interventions to achieve better B.P control.

Limitations

This study was a cross sectional and involved patients being followed up. Therefore, the findings may not reflect the picture in the general population. Also, there might be a recall bias since the lifestyle practices of the study participants were based on self reports and performance of these behaviours was not observed. However, this study has added to the existing knowledge and provides an important entry point to understanding the burden and factors for poor B.P control in federal teaching hospital, Ido- Ekiti and other health facilities in Nigeria.

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Authors' contribution

AOI- Conceptualization of the study, data analysis, and drafted the manuscript

TAA- Literature review, data acquisition and analysis, review of manuscript for intellectual content

OMS- Literature review, review of manuscript for intellectual content

OEO- Data acquisition and analysis, review of manuscript for intellectual content

WOI- Data acquisition and analysis, review of manuscript for intellectual content

OOD- Data acquisition and analysis, review of manuscript for intellectual content.

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