

Parameters Predicting Poor Blood Pressure Control among Male Hypertensives in A Primary Care Setting, Kwara State Nigeria

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ABSTRACT

Background: Poor blood pressure control is a global challenge and male hypertensives constitute an important group of patients that should be treated with utmost priority because previous studies have associated male gender with high prevalence of hypertension and poor blood control.

Aim: This was to determine the level of blood pressure (BP) control and to find the relationship between the demographic, clinical and laboratory parameters that can predict uncontrolled BP among male hypertensives.

Material and Method: This study was a hospital-based descriptive cross-sectional descriptive study done in Family Medicine department of the University of Teaching Hospital, Ilorin, Kwara State, Nigeria. The study population was male hypertensives. Interviewers' questionnaires were used to obtain information and clinical measurements such as BP and body mass index were taken with appropriate instruments. Laboratory measurement including fasting blood glucose and fasting lipid profile were also carried out. Data was collected using the Version 20 software packages of the Statistical Package for Social Sciences (SPSS-20).

Result: About half (48%) of the respondents had control at BP $\leq 140/90$ mmHg, 34.9% at $\leq 130/80$ and only 15.7% had optimum BP control. The diastolic BP control 154(67.2%) was higher than those with systolic BP control 107(46.2%). Multiple regression analysis shows that only increasing age (P value = 0.003) and low level of education (P value = 0.009) can predict the development of uncontrolled hypertension.

Conclusion: This study shows that there is poor BP control among male hypertensives and increasing age and low level of education can predict uncontrolled hypertension.

Keywords: Blood pressure, blood pressure control, male hypertensives, uncontrolled hypertension.

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I. INTRODUCTION

Hypertension is a major non-communicable risk factor that is increasing in prevalence globally, most especially in the less developed countries of the world [1]. It has been defined as persistently elevated blood pressure (BP) of $\geq 140/90$ mmHg [1], [2]. In the year 2017, another guideline by American College of Cardiology/American Health Association (ACC/AHA) was released which reduced the threshold of hypertension diagnosis and control to $\geq 130/80$ mmHg [3]. Hypertension is the most essential modifiable risk factor for coronary artery disease, stroke, congestive heart failure, end-stage renal disease and peripheral vascular disease [4]. According to [1], less than half of the adult population globally are diagnosed and treated and just about

one-fifth of them had it under control. A systematic review and meta-analysis done across six geopolitical zones in Nigeria by [5] showed the overall prevalence of hypertension to be 28.9%. Previously, studies have shown that the prevalence of hypertension among men is usually higher than women especially at ages less than 60 years of age [6]. Reference [7] in United States discovered a higher percentage of men age 18 to 29 years having hypertension than women at the ratio 5% to 1.5%. Similarly, Reference [5] found 29.5% and 25% hypertensive males and females respectively. Even though, men has a higher burden of hypertension, the awareness and treatment are lower when compared with women [8], [9].

Poor blood pressure control is a global challenge, and several factors were responsible for this negative trend which are social issues, health care factors and patients' factors [10]-

[12]. According to a study on worldwide trends in hypertension, BP control rate in the year 2019 was found to be 18% for men [11]. Reference [13] using 2017 ACC/AHA guideline found 22% prevalence of hypertension control among adult's males although the threshold of BP used was <130/80 mmHg. In a study involving nine European countries, office BP control (<140/90 mmHg) among male hypertensives was 31.5% [14]. Sub-Sahara Africa has been reported to have the highest number of individuals with uncontrolled hypertension [15], [16]. A cross-sectional study done in Addis Ababa done by [17] revealed the prevalence of uncontrolled hypertension to be 59.9%. In Nigeria too, poor BP control has been reported in several studies. In a nationwide survey done by [18], BP control among men was 12.5%. The percentages of controlled BP irrespective of gender in Nigeria ranges from 17.2 – 53.3% [19]-[23]. In Ilorin North-Central region, [24] discovered 35.7% prevalence of controlled hypertension although the value among male hypertensives was not captured in the study.

There are several demographic, clinical and laboratory factors associated with the prevalence of hypertension but there are few reports on association of these factors on BP control among hypertensives. Egan and his associates in United State identified obesity and diabetes as treatment resistant factors among their hypertensives [25]. Reference [26] discovered that overweight, the presence of diabetes and family history of diabetes are important factors for tight BP control in primary care. According to a study done in South-South Nigeria, gender was the only significant associated factor for BP control, females were twice more likely to have BP control than men [27]. It has been documented in literatures that health-seeking behavior among men is generally poor [28]. This is particularly important when considering hypertension, a “silent killer” which can be asymptomatic at an early stage and it may not be detected until the complications sets in [1]. Men may be vulnerable to diseases generally because they often see themselves as being resilient and brave and paying little attention to early signs of diseases [28]. Most studies in Nigeria and in this study, location have presented data on prevalence of awareness, treatment and control of hypertension among general population. However, to the authors' knowledge none has laid emphasis on male hypertensives and parameters associated with blood pressure control in this environment. The aim of this study was to determine the level of blood pressure control and to find the relationship between the demographic, clinical and laboratory parameters associated with blood pressure control among male hypertensives.

II. METHODS

A. Study Area and Population

The study was done at the Family Medicine Clinics of University of Ilorin Teaching Hospital in Ilorin-East local government area of Kwara State in North-Central geopolitical zone in Nigeria. The participants were adult male hypertensives aged 18 years and above attending clinics in last one year, who gave their consent while the exclusion criteria include patients who were too sick to participate and those with mental illness because of the possibility of inaccurate report.

B. Study Design and Duration

The study was a hospital based descriptive cross-sectional study and it was conducted over a period of 3 months.

C. Sample Size Determination

The required sample size was determined using Statistical Formula (Lesley Kish's formula) for estimating minimum sample size in health studies [29].

$$n = \frac{z^2 pq}{d^2} = \frac{1.96 \times 1.96 \times 0.295 \times 0.705}{0.05 \times 0.05} = 319.58$$

approximately 320

n = desired sample size when population is greater than 10,000

z = standard normal deviation, usually set at 1.96 which corresponds to 95% confidence level.

P = proportion of the target population estimated to have a particular character. Using a previous study done in Nigeria by [5] in which 29.5% of adult male hypertensives were found to have controlled hypertension. An estimate of 577 registered adult male hypertensives attended the clinic in the last one year. So, since the study population was less than 10,000, the sample size was adjusted using the formula stated below [29].

$$nf = \frac{n}{1} + \left(\frac{n}{N}\right) \frac{320}{1 + 320/577} = 205.8$$

nf = the desired sample size when population is less than 10,000.

n = as above

In order to take care of missing or incomplete data

The adjusted sample size (ns) is calculated using

$ns = n/r = 205.8/0.9 = 228.6$ approximately 229

Where ns = adjusted sample size for response rate

n = calculated sample size

r is the anticipated response rate. A response rate of 90% (0.9) is anticipated

ns = Thus, an approximate sample size of 229 was used for the study. Systematic sampling technique was used to select patients into the study and 4 participants were selected per day using the calculated sampling interval.

D. Data Collection Instruments

1) Proforma Questionnaire

This is a semi-structured questionnaire. It consists of 3 sections; Section A; Socio-demographic characteristics B; Medical History C; Clinical and laboratory measurement sections.

2) Clinical Measurements

a) Weight Measurement: Weight in kilograms was measured to the nearest 0.5 kg using the Hanson (R) bathroom scale.

b) Height Measurement: Height in meters (m) was measured to the nearest 0.01 m using a stadiometer.

c) Body Mass Index Calculation: Body mass index (BMI) of the patients was calculated from weight (kg)/ height² (m²).

d) Blood Pressure Measurement: The BP was measured by auscultatory method using standard mercury sphygmomanometer with adult sized cuff and a stethoscope and in keeping with recommended guidelines [30]. The

reading was approximated to the nearest 2 mmHg. The mean of the BP was categorized into 2 groups: controlled hypertension (systolic blood pressure (SBP)<140 and Diastolic blood pressure (DBP)<90 mmHg) and uncontrolled hypertension. (SBP≥140 and DBP≥90 mmHg).

E. Laboratory Investigations

Participants who have fasted for at least 8-10 hours prior to the interview, about 4 ml of venous blood sample was taken with a 5 ml syringe and 21G hypodermic needle, under aseptic conditions. This was used for fasting blood glucose (FBG) and fasting lipid profile (FLP) measurements. Participants who have not fasted for 8-10 hours prior to the interview had their blood samples collected next day after they have been instructed to fast for 8-10 hours, the researchers were responsible for cost of transportation to the hospital.

1) Fasting blood glucose measurement (FBS)

The FBG was measured using a standardized On call plus glucometer. A drop of blood from the syringe containing the fasting venous blood will be placed on the test well of the mounted glucometer test strip. For a typical test, the blood was automatically drawn into the test strip and as soon as enough blood had filled the confirmation window of the test strip, the result usually appear on the LCD panel and stored in the meter memory automatically. FBS levels of <6.1 mmol/l were categorized as normal fasting glucose, while levels 6.1-6.9 mmol/l was impaired fasting glucose and ≥7.0 mmol/l shall be categorized as elevated blood sugar [31].

2) Fasting Lipid Profile Measurement (FLP)

The 4 mls of fasting venous blood collected above was transferred into a lithium heparin bottle for lipid profile analysis to determine the following: Serum total cholesterol, High density lipoprotein (HDL – Cholesterol), Low density lipoprotein LDL-cholesterol and triglyceride.

Data Analysis – The analysis was done using the Version 20 software packages of the Statistical Package for Social Sciences (SPSS-20). Results were presented using frequency tables and charts. Multivariate analysis was used to access demographic, clinical and laboratory factors that were associated with blood pressure control among hypertensive males. The level of significance of this study was set at 5% (p<0.05).

III. RESULTS

In Table I, 229 male hypertensive patients participated in the study and the mean age of the respondents was 58 ± 11.58 years. Majority of them were Muslims 137(59.8%), married 226(98.7%), currently employed 188(82%) and Yoruba 203(88.7 %) by tribe. About two-thirds of the respondents had formal education 145 (63.3%) and almost half of the respondents were earning less than N30, 000 (41.4%) minimum wage.

Table II shows that almost half of the respondents were diagnosed as hypertensive within the interval of 1-5years 112(48.6%). The highest number of the respondents was on Thiazide and Beta blocker anti-hypertensive 42(18%). Table III shows that 48% of the respondents had control at BP ≤140/90mmHg, 34.9% at ≤130/80 and only 15.7% had optimum blood pressure control.

TABLE I: SOCIO-DEMOGRAPHIC CHARACTERISTICS OF RESPONDENTS

Variables	Frequency	Percentage
Age Groups		
≤ 40	14	6.1
41-50	46	20.1
51-60	80	34.9
≥61	89	38.9
Mean Age ± SD	58 ± 11.58	
Religion		
Christianity	92	40.2
Islam	137	59.8
Level of education		
No formal education	84	36.7
Primary	17	7.4
Secondary	58	25.3
Tertiary	70	30.6
Marital Status		
Married	226	98.7
Single	2	0.9
Widowed	1	0.4
Occupation		
Civil Servant	72	31.4
Professional	17	7.4
Artisan	36	15.7
Trading	63	27.5
Unemployed	15	6.6
Retired	26	11.4
Average monthly income		
<30000	95	41.4
>30001	119	52.0
No income	15	6.6
Ethnicity		
Yoruba	203	88.7
Hausa	6	2.6
Igbo	6	2.6
Others	14	6.1

TABLE II: SHOWING MEDICAL HISTORY OF THE RESPONDENTS N=229

Variables	Frequency (n)	Percentage (%)
Duration of HTN (Yrs)		
< 1	26	11.4
1 – 5	112	48.6
6 – 10	56	24.6
11 – 15	23	10.1
16 – 20	4	1.8
> 20	8	3.5
Types of anti-hypertensive		
Thiazide		
Beta blockers	17	7.5
ACEIs	14	6.1
ARBs	7	3.1
Calcium channel blockers	4	1.8
Centrally acting hypertensives	18	7.9
Combination	10	4.4
Thiazide and Beta blockers	42	18.0
Thiazide and ACEIs	16	7.0
Thiazide and ARBs	22	9.6
Thiazide and calcium channel blockers	9	3.9
Beta blockers and ARBs	30	13.2
ARB and calcium channel blockers	40	17.5

N = the total number of respondents

N = the number of respondents in each group and

% = the proportion of respondents in each group.

TABLE III: HYPERTENSION CONTROL STATUS

Status	Frequency	Percentage
140/90		
Controlled	109	48.0
Uncontrolled	120	52.0
130/80		
Controlled	80	34.9
Uncontrolled	149	65.1
120/80		
Controlled	36	15.7
Uncontrolled	193	84.3

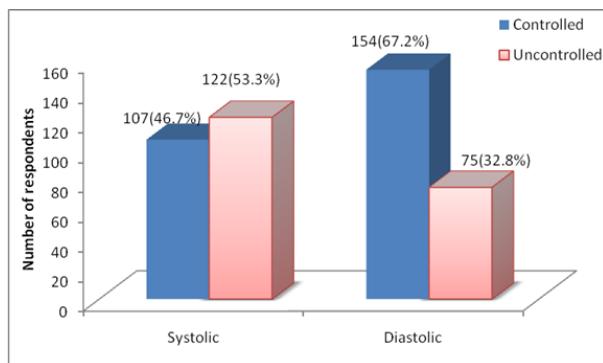


Fig. 1. Blood pressure control status for both systolic and diastolic measurement.

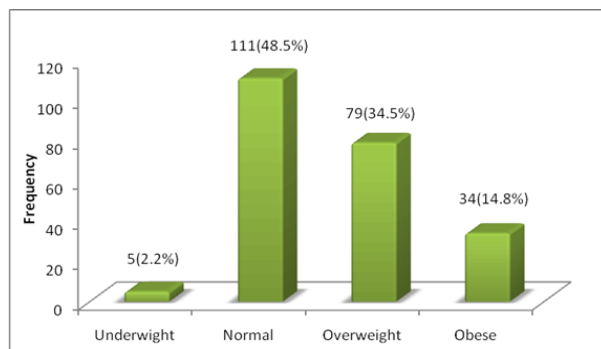


Fig. 2. Body mass index of the respondents.

TABLE IV: LABORATORY PARAMETERS OF RESPONDENTS

Variables	Frequency	Percentage
FBS		
Normal	167	72.9
Elevated	62	27.1
Total cholesterol		
Normal	181	79.0
High	48	21.0
HDL		
Low	118	51.5
Normal	111	48.5
LDL		
Normal	173	75.5
High	56	24.5
Triglyceride		
Normal	164	71.6
High	65	28.4

TABLE V: MULTIPLE REGRESSION ANALYSIS OF UNCONTROLLED HYPERTENSION AND OTHER PARAMETERS

Variables	B	t-test	p-value	95%CI
Increasing age	-0.255	-2.990	0.003	-0.018-0.004
Religion	-0.131	-1.844	0.067	-0.276-0.009
Low level of education	0.197	2.631	0.009	0.014-0.101
Marital status	0.042	0.608	0.544	-0.159-0.300
Occupation	0.134	1.767	0.079	-0.004-0.068
Income	-0.115	-1.397	0.164	-0.086-0.015
Ethnicity	-0.116	-1.673	0.096	-0.164-0.013
Duration	0.078	0.969	0.334	0.036-0.106
BMI	0.042	0.579	0.563	0.013-0.023
FBS	-0.015	-0.212	0.833	-0.024-0.019
TC	0.095	1.377	0.170	0.021-0.120
HDL	-0.026	-0.375	0.708	-0.143-0.097
LDL	-0.045	-0.641	0.522	-0.107-0.055
TG	0.073	1.075	0.284	-0.069-0.233

Fig. 1 cluster bar chart shows that the proportion of the respondents with DBP 154(67.2%) was higher than those with SBP control 107(46.7%). Fig. 2. bar chart shows that close to half of the respondents had normal BMI 111 (48.5%),

79(34.5%) were overweight and 34(14.8%) were obese. Only 5 (2.2%) of the respondents were underweight.

Table V shows that about a quarter of the respondents (27.1%)62 had elevated blood sugar and a little above half 118(51.5%) low HDL, a quarter (24.5%) had High LDL had with almost a third of them (28.4%)65 had high triglyceride.

Table V describes multiple regression analysis of different independent variables with uncontrolled blood pressure. It was only increasing age (P value = 0.003) and low level of education (P value = 0.009) that could predict the development of uncontrolled hypertension.

IV. DISCUSSION

Male hypertensives constitute an important group of patients that should be treated with utmost priority because previous studies have associated male gender with high prevalence of hypertension and poor BP control [5]-[7], [32]. Using the threshold of BP $\leq 140/90$ mmHg, the prevalence of controlled BP in this study was 48% that is about one in two hypertensive patients. Those with optimal BP control of $\leq 120/80$ were 36(15.7%) in this study. The prevalence rate of 48% (BP $\leq 140/90$ mmHg) was in keeping with the earlier statistics in Nigeria in which BP control ranges from 17.2-53.3% [19]-[23]. This value is on the average and slightly better some of the previously reported statistics in some western countries, 22% prevalence has been reported by [13] although a lower threshold of 130/90 mmHg was used for their measurement. Also, in a European study, 31.5% prevalence of controlled BP was discovered [14]. The lower level of BP control in western studies could result from other factors that can contribute to this trend such as diets and lifestyle. The finding in this index study was close to what [22] found, 42.5% of their respondents have controlled BP and it was lower than what [19] got, about two-third (61.8%) of their male patients had controlled hypertension. Also, a previous study done in this study location among male hypertensives but not in primary care revealed a prevalence of 54.5% which was slightly higher than the finding in this present study [23]. A significantly lower value of 27.3% has been reported by [33], but this could be due to a different study design, a retrospective study design used for [33]. Reference [34] also found the prevalence of controlled hypertension between 2.6% and 17.8% in Kenya and Tanzania respectively. Globally and locally, poor BP control is a major challenge that should be given special attention in order to avert its attendant cardiovascular morbidity and mortality. There is a wide variation in the prevalence of controlled hypertension across countries and from one region to another in Nigeria but generally majority of the values were $\leq 50\%$. Three major factors have been identified previously for this development and these are social, health care, patient factors. Some of the social reasons include urbanization, poverty, illiteracy, political will, gender, and racial discrimination. Health care factors include quality, access and availability of adequate resources. Finally, patient factors are related to drug adherence and compliance [10]-[12]. All these factors should be addressed in order to improve BP control globally.

Another important finding about BP control in this study was that the majority of the respondents had DBP control.

The proportion of respondents with DBP control 154(67.2%) was higher than those with SBP control 107(46.7%). This is a vital benefit because diastolic dysfunction has been associated with increased cardiovascular mortality [35]. This observation was similar to previously documented reports among hypertensives generally irrespective of their gender. According to a study in Monza Italy, it was discovered that both office and 24 hour –DBP controls were higher than SBP controls 41.5% versus 29.9% and 64.9% versus 50.8% respectively.

Reference [36] This was in agreement with more recent study done by [37] among Korean adults in which 87.4% DBP control was found when compared to 77.5% SBP control. In Nigeria, similar pattern was reported by [19] in South-West Nigeria, while hypertensive patients with DBP control was 78.6% and the SBP was slightly lower 73.8%. In North-Central Nigeria, [23] found 21.7% of male patients with controlled DBP with uncontrolled SBP and 3.3% of male patients with controlled SBP without DBP in a cardiology clinic.

It has been previously documented that some demographic, clinical and laboratory parameters were associated with BP control among hypertensives irrespective of their sex. In this study, of all the variables considered only increasing age and lower level of education can predict the occurrence of uncontrolled BP among male hypertensives. Age could be a factor for uncontrolled hypertension because of the tendency for poor anti-hypertensive drug adherence with advancing age. Previous study has affirmed that BP control rates are most likely worst among elderly population because it is more challenging to control among them [38]. In contrast, [39] discovered that older age was associated with good BP control.

In this study, low level of education is another predictor of uncontrolled hypertension and this is probably because education can enhance positive behavioral change in attitude thereby making it possible to achieve good BP control. There is paucity of literatures associating educational level with BP control among hypertensive patients. However, [40] in a nationwide cohort study in China, it was found that respondents with basic education have poorer BP control when compared with those with middle school and above. Other factors such as marital status, occupation, income, ethnicity, smoking, duration of hypertension, BMI, fasting blood sugar and fasting lipid profiles (TC, HDL, LDL and TG) were not found to predict the occurrence of uncontrolled hypertension in this study. This observation may be the peculiarity of male hypertensives. This may be similar to what [33] in the northern part of Nigeria reported, they did not find any significant difference in the demographic or clinical parameters of controlled and uncontrolled hypertensive patients. Although, in this study increasing age and low level of education were associated with poor control. Reference [25] in US identified obesity and diabetes as treatment resistant factors among their hypertensives. Reference [26] in China discovered that overweight, the presence of diabetes and family history of diabetes are important factors for tight BP control in primary care. Also, [19] in South-West region of Nigeria and [41] in the Middle East and discovered that BP control was significantly associated with the presence of diabetes. In Cameroon, High

body mass index, and physical inactivity were associated with poor control [32].

In conclusion, this study was in agreement with previous findings of poor blood pressure control among hypertensive patients generally irrespective of their gender. About one in two hypertensive male patients had uncontrolled BP and majority of them had DBP control. Among the parameters considered, increasing age and lower level of education predicted the occurrence of uncontrolled hypertension.

ETHICAL CONSIDERATION

Permission to undertake the study was obtained from the Head of Department of Family Medicine while ethical approval to undertake the study was obtained from Ethical Review Committee of University of Ilorin Teaching Hospital.

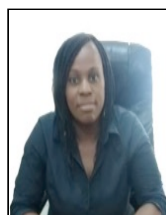
CONFLICT OF INTEREST

Authors declare that they do not have any conflict of interest.

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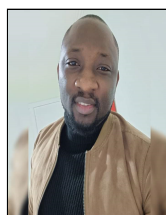
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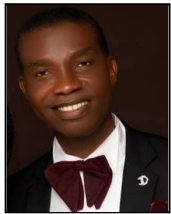


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