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Risk Factors of Hypertension and Association with Familial Factors among Patients attending a State Hospital in South-Western Nigeria

Ismaheel A. Azeez
University of Ibadan, kunleayilola14@gmail.com

Banke I. Yusuf
University of Ibadan, bitab19@yahoo.com

Magbagbeola D. Dairo
University of Ibadan, drdairo@yahoo.com

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Abstract

Purpose: This study aimed to assess the determinants of hypertension and its association with familiar factors among patients attending a specialist hospital in Nigeria. Methods: This was a cross-sectional study of 350 patients recruited from the general outpatient clinic of the hospital with computer-generated simple random sampling techniques. Data were analysed by SPSS version 23. Correlation analysis and chi-square tests were used to determine the association of relevant variables. Poisson regression was used to assess the predictors of the number of days of physical activities per week. Linear regression and logistic regressions were done to determine the determinants of hypertension. Results: Three hundred and fifty respondents were interviewed and the mean age of the respondents was 44.59(SD+_15.84) years. After adjusting for other variables, the predictors of the number of days of physical activities per week were the level of education and age. Subjects who were 34 years or less were about 1.4 times more likely to do physical activities than the subjects who were 55 years and above (OR=0.725; 95%CI= 0.600– 0.875). For every 1 unit increase in the degree of salt intake, there was a statistically significant increase in diastolic blood pressure by about 1.189 units (95% C.I equals 0.011 to 2.390, p-value= 0.006). In addition to salt intake, other predictors of diastolic blood pressure were family history, marital status, and family setting. Those who belonged to polygamous settings were about 1.9 times more likely to develop hypertension than those who belonged to monogamous settings (OR=1.878; 95%CI=1.138-3.10). After adjusting for other variables, the predictors of systolic blood pressure were family history, family settings, and marital status. Those with positive family history were about 2.6 times more likely to have systolic hypertension than those without (OR=0.387; 95%CI= 0.150 – 0.999). Conclusion: The determinants of hypertension in this study were marital status, family setting, family history of hypertension, and the degree of salt intake. Further genetic studies on the aetiology of hypertension might unravel more information on its causes.

Author Bio(s)

Ismaheel A Azeez, FWACP, MSc, MSc, MBBS is a Consultant Family Physician, University College Hospital, Ibadan, Nigeria.

Magbagbeola D Dairo, FMCPH, MSc, MSc, MBBS is a Consultant Community Physician and Associate Professor, Department of Epidemiology and Medical Statistics, Faculty of Public Health, College of Medicine, University of Ibadan, Nigeria.

Banke I Yusuf, MPH, BSc, is a PhD student of Department of Environmental Health Sciences, College of Medicine, University of Ibadan, Nigeria,

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Ismaheel A. Azeez
Magbagbeola D. Dairo
Banke I. Yusuf

University of Ibadan

Nigeria

ABSTRACT

Purpose: This study aimed to assess the determinants of hypertension and its association with familiar factors among patients attending a specialist hospital in Nigeria. **Methods:** This was a cross-sectional study of 350 patients recruited from the general outpatient clinic of the hospital with computer-generated simple random sampling techniques. Data were analysed by SPSS version 23. Correlation analysis and chi-square tests were used to determine the association of relevant variables. Poisson regression was used to assess the predictors of the number of days of physical activities per week. Linear regression and logistic regressions were done to determine the determinants of hypertension. **Results:** Three hundred and fifty respondents were interviewed and the mean age of the respondents was 44.59(SD+_15.84) years. After adjusting for other variables, the predictors of the number of days of physical activities per week were the level of education and age. Subjects who were 34 years or less were about 1.4 times more likely to do physical activities than the subjects who were 55 years and above (OR=0.725; 95%CI= 0.600– 0.875). For every 1 unit increase in the degree of salt intake, there was a statistically significant increase in diastolic blood pressure by about 1.189 units (95% C.I equals 0.011 to 2.390, p-value= 0.006). In addition to salt intake, other predictors of diastolic blood pressure were family history, marital status, and family setting. Those who belonged to polygamous settings were about 1.9 times more likely to develop hypertension than those who belonged to monogamous settings (OR=1.878; 95%CI=1.138-3.10). After adjusting for other variables, the predictors of systolic blood pressure were family history, family settings, and marital status. Those with positive family history were about 2.6 times more likely to have systolic hypertension than those without (OR=0.387; 95%CI= 0.150 – 0.999). **Conclusion:** The determinants of hypertension in this study were marital status, family setting, family history of hypertension, and the degree of salt intake. Further genetic studies on the aetiology of hypertension might unravel more information on its causes.

Keywords: familial factors, hypertension, risk factors

INTRODUCTION

Hypertension has remained a public health concern globally and the prevalence continues to increase due to lifestyle changes and other factors. This has been accompanied by worsening morbidities and mortalities. There is a paucity of studies on family factors in the aetiology of hypertension in Nigeria. In a prospective cohort study conducted in the Netherlands, it was reported that the actual parental blood pressure (BP) was a predictor of BP development from childhood into adulthood.[1] In a study conducted in Nigeria, the prevalence of hypertension was higher among married and widowed individuals. It was also found that the level of education was positively associated with hypertension.[2] Increasing body mass index and age were associated with hypertension in both rural and urban areas of Burkina Faso. Additionally, family history, sex, and low level of High-Density Lipoprotein (HDL) were associated with hypertension according to Sobeiga and colleagues.[3] In another study conducted in South-Eastern Nigeria, being married was associated with increasing Body Mass Index (BMI) and blood pressure. However, increased physical exercise was associated with reduced BMI and diastolic blood pressure.[4] The risk factors of hypertension were age, sex, obesity, and high cholesterol based on the findings of Osunkwo and colleagues in another study conducted in Benue State, Nigeria, on the prevalence of hypertension.[5] The prevalence of childhood hypertension was low (3.0%), and the associated factor was obesity in a study conducted in Ilorin, Nigeria. The socioeconomic statuses of the parents and the family history were not associated with hypertension.[6] Black men were reported to have higher blood pressure and higher prevalence of hypertension than men of other ethnic groups in the United States. Adverse childhood family living arrangement was associated with an increased prevalence of hypertension in adult blacks.[7] Raised blood pressure was associated with age and family history in a study conducted among long-standing drivers in South-South Nigeria.[8] This study aimed to assess the determinants of hypertension and its association with familiar factors among patients attending a General Outpatient Clinic in Southwestern Nigeria.

METHOD

Study Site

This study was conducted at the State Hospital, Oyo, a secondary health care centre in Nigeria. Oyo is a town located in Oyo State, South-Western zone of Nigeria. The study was conducted at the Hospital's General outpatient clinic which has about 170 beds with various specialities, including internal medicine, obstetrics, gynaecology, paediatrics, surgery, ophthalmology, pharmacy, physiotherapy, other paramedical and outpatient services.

Study Design

The study was a cross-sectional study of patients attending the general outpatient clinic. Respondents were recruited from February 1, 2016, to May 31, 2016. The study population was composed of consenting adults 18 years to 70 years old presenting with various complaints at the hospital. Patients are referred to the University College hospital from other hospitals around Oyo town.

Sample Size Estimation

Sample size was estimated using the formula[9]

$n = \frac{Z^2pq}{d^2}$ Quoting n= minimum sample size

Z_α=the standard normal deviate, usually set at 1.96, which corresponds to the 95% confidence level.

P = the prevalence of hypertension to be 22.7% for Nigeria.[10]

q=1.0- p

d = degree of accuracy desired usually set at 0.05.

$n = \frac{(1.96)^2(0.227)(1-0.227)}{(0.05)^2} = \frac{(3.84)(0.226)}{(0.05)^2}$

= 270

q= 1/1-f q is the adjustment factor f = non response rate, if f =20%

q = 1/0.8 =1.25

n = 1.25 x 270 = 338

For the purpose of this study, a minimum 338 patients were to be recruited

Z_α= the standard normal deviate, usually set at 1.96, which corresponds to the 95% confidence level. Zα is standard normal deviate corresponding to level of significance (usually 5%).

Sampling Techniques

The patients were recruited with simple random sampling techniques by the use of computer-generated random numbers. About 120 patients were expected to attend the general outpatient clinic daily and a total of 350 patients were recruited. The clinic is open five days per week and 40 days in two months. Randomisation was done between 1 and 120 to select the first nine numbers. The procedure was repeated at each clinic until 350 patients were recruited.

Inclusion Criteria
Inclusion criteria consisted of consenting respondents aged 18 to 70 years who presented at the clinic.

Exclusion Criteria
Exclusion criteria were patients who did not meet the inclusion criteria.

Data Collection and Study Tools. Pretested interviewer administered questionnaire on socio- demographic, socio-economic and lifestyle data was used to recruit subjects. Weighing machine, stadiometer and sphygmomanometer were used for measurements.

Blood Pressure Measurements
Hypertension was defined as systolic blood pressure ≥ 140mmHg and diastolic ≥ 90 mm Hg. Blood pressure was measured with Accoson Sphygmomanometer (Dekamet MK3, England) and Littman's stethoscope. Systolic blood pressure and diastolic blood pressure were taken as Korotkoff sound phases I and V respectively. Blood pressure was measured in mmHg with an adult cuff applied to the right arm of the patient in the seated position. Two BP readings were taken at intervals of ten minutes by trained health care workers and the means recorded. Patients found to have BP of ≥140/90 were requested to repeat BP measurements within one week and afterwards if ≥140/90 were commenced on treatment before being referred to the medical outpatient clinic for further management. Other patients on treatment for hypertension were also referred to the medical outpatient clinic for further management. However, those with BP of ≥180/110 were evaluated immediately and treated before being referred to medical outpatient clinic.

Data Analysis
Data were entered into the computer, cleaned, coded, and analyzed using SPSS software version 23. Frequency tables were used for relevant variables. Correlation analysis and chi-square tests were used to assess the association of relevant variables. Poisson regression was used to determine the predictors of the number of days of physical activities per week. Linear regression and logistic regressions were done to determine the predictors of hypertension. A p-value ≤ 0.05 was considered to indicate statistical significance.

Degree of Exercise
Exercise was assessed by asking the following questions. During the last 7 days, on how many days did you do physical activities such as brisk walking? On the days that you exercised, how many minutes did you usually spend exercising per day? The scoring was assessed with total scores ranging from 1-10. Statistical analysis showed the mean score to be 5. Scores were totalled and categorized into two groups. Respondents with scores less than 5 were classified as having poor exercise while those with scores of 5 and above were classified as having good exercise.

Degree of smoking
Smoking was assessed by asking the following questions. Does anybody from your family or work place smoke in your presence? Do you currently smoke cigarettes? How long have you been smoking? How many cigarettes did you smoke per day? The degree of Smoking was assessed with total scores ranging from 5-30. Statistical analysis showed the mean score to be 10. Scores were totalled and categorized into two groups. Respondents with scores less than 10 were classified as having high smoking exposure while those with scores of 10 and above were classified as having low smoking exposure.

Salt Intake.
Salt intake was assessed by asking the following questions: How often do you add salt to your food? How much salt do you think you consume? Do you do anything on a regular basis to control your salt intake? If your answer is "Yes". Specify what do you do to control your salt intake. The scoring was assessed with total scores ranging from 3-7. Statistical analysis showed the mean score to be 4. Scores were totalled and categorized into two groups. Respondents with scores less than 4 were classified as having high salt intake while those with scores of 4 and above were classified as having low salt intake.

Ethical Consideration
The approval of the Ethical Review Committee of Ministry of Health, Oyo State, Ibadan, Nigeria, was obtained. The Committee's reference number is AD 13/ 479. Then, the Medical Director of the secondary health care centre was informed about the study. Informed consents were obtained from eligible patients before the administration of the questionnaires, and examinations. Privacy and confidentiality of the respondents were guaranteed by the anonymity of respondents.

RESULTS

Three hundred and fifty respondents who met the criteria for recruitment were interviewed. The mean age of the respondents was 44.59(SD+_15.84) years. JNC 7 Classification of Blood Pressure[11] was used to determine the classification of a subject's blood pressure as normal, pre-hypertension, stage 1 hypertension, or stage 2 hypertension (Table 1).

Table1: JNC 7 Classification of Blood Pressure of the Respondents

	Frequency (n)	Percentage (%)
Systolic blood pressure		
≤ 119 (Normal)	91	25.8
120-139(Pre-hypertension)	141	40.4
140-159(Stage 1)	58	16.6
≥160(Stage 2)	60	17.2
Diastolic blood pressure		
≤ 79 (Normal)	101	28.7
80-89(Pre-hypertension)	147	42.1
90-99(Stage 1)	66	18.9
≥100(Stage 2)	36	10.3

Poisson Regression Analysis of the Number of days of Physical Activities per Week on Selected Variables

Table 2 shows the Poisson regression analysis of the number of days of physical activities per week on selected variables. After adjusting for other variables, the predictors of number of days of physical activities per week were the level of education and age of the respondent. Those who had tertiary education were about 1.3 times more likely to do physical activities than those who had primary education (OR=0.745; 95%CI= 0.615– 0.902). Also, subjects who were 34 years or less were about 1.4 times more likely to do Physical Activities than the subjects who were 55 years and above (OR=0.725; 95%CI= 0.600– 0.875).

Table 2: Poisson Regression Analysis of the Number of days of Physical Activities per Week on Selected Variables

Parameters	Odd Ratio	95% CI	p-value
Age in years			
≥55	0.725	0.600-0.875	0.001*
45-54	0.812	0.674-0.978	0.029*
35-44	0.867	0.726-1.035	0.114
≤ 34	1		
Education			
No education	0.753	0.623-0.909	0.003*
Primary	0.745	0.615-0.902	0.003*
Secondary	0.917	0.788-1.066	0.260
Tertiary	1		
Sex			
Female	0.913	0.795-1.048	0.196
Male	1		

**Significant at 5% level of significance*
Dependent variable: days of physical activities per week
Predictors: age,ILevel of education
Correlation of blood pressure levels with selected variables

The relationship of the degree of smoking with diastolic blood pressure was positive, weak in strength and statistically significant (r= 0.121 p-value=0.023). There was no relationship between blood pressure and the degree of exercise (Table 3).

Table 3: Correlation of Blood Pressure levels with selected variable**s**

	Systolic blood pressure	Diastolic blood pressure
Degree of exercise		
Pearson correlation		
p-value	0.043	0.055
	0.427	0.304

	Systolic blood pressure	Diastolic blood pressure
Degree of smoking Pearson correlation p-value	 -0.074 0.166	 0.121 0.023
Degree of salt intake Pearson correlation p-value	 0.064 0.229	 0.104 0.050

Correlation is significant at 5% level of significance (2-tailed)

Linear Regression for Diastolic Blood Pressure on Significant Variables

As shown in Table 4, for every 1 unit increase in the degree of salt intake, there was a statistically significant increase in diastolic blood pressure by about 1.189 units (95% C.I equals 0.011 to 2.390, p-value= 0.006).

Table 4: Linear regression for Diastolic Blood Pressure on Significant Variables

Variable	Regression coefficient(B)	Standard Error for B	95% CI for B	T	p-value
Degree of smoking	1.109	0.499	0.091 to-1.227	15.940	0.027*
Degree of salt intake	1.189	0.610	0.011 to 2.390	32.327	0.05*

**Significant at 5% level of significance*
Dependent variable: Diastolic blood pressure
Predictors: Degree of smoking, Degree of salt intake

Association of Systolic Blood Pressure with selected variables

A higher proportion of patients who were single 34(89.5%) and a higher proportion of patients who were married 177(66.0%) had systolic blood pressure <140. However, a smaller proportion of those who were single 4 (10.5%) and smaller proportion of respondents who were married 91 (34.0%) had systolic blood pressure ≥ 140 (Table 5). The association was statistically significant ($\chi^2 = 16.65$, p = 0.0001).

Table 5: Association of Systolic Blood Pressure with Selected Variables

Variable	< 140 (n)	≥ 140 (n)	x^2	p-value
Marital Status				
Single	34(89.5%)	4(10.5%)	16.65	0.0001*
Married	177(66.0%)	91(34.0%)		
Widowed	20(46.5%)	23(53.5%)		
Family history of hypertension				
Yes	9(45.0%)	11(55.0%)		0.037*
No	222(67.5%)	107(32.8%)		
Sex				
Male	55(62.5%)	33(37.5%)	15.83	0.398
Female	176(67.4%)	85(32.6%)		
Family Setting				
Monogamous	168(74.3%)	58(25.7%)	19.02	0.0001*
Polygamous	63(51.2%)	60(48.8%)		

**Significant at 5% level of significance*
** Fisher's Exact Test P-value is reported*

Logistic Regression Analysis of Systolic Blood Pressure on Selected Variables

Table 6 shows the Logistic regression analysis of systolic blood pressure on selected variables. After adjusting for other variables, the predictors of systolic blood pressure were family history, family setting and marital status. Those who had positive family history were about 2.6 times more likely to have systolic hypertension than those who did not (OR=0.387; 95%CI= 0.150 – 0.999).

Table 6: Logistic Regression Analysis of Systolic Blood Pressure on Selected Variables

Variable	Odds Ratio	95%CI	p-value
Family history of hypertension			
Yes	1	0.150- 0.999	0.05*
No	0.387		
Marital status			
Single	0.164	0.048- 0.562	0.004*
Married	0.611	0.307-1.213	0.159
Widowed	1		
Family setting			
Monogamous	1	0.562-8.335	0.0001*
Polygamous	2.49		

**Significant at 5% level of significance*
Dependent variable: Systolic blood pressure
Predictors: Family history, Marital status, Family setting

Association of Diastolic Blood Pressure with Selected Variables

A higher proportion of patients who were single 35 (92.1%) and a higher proportion of patients who were married 187(69.8%) had diastolic BP < 90. However, a lower proportion of those who were single 3(7.9%) and a lower proportion of married respondents 81 (30.2%) had BP of ≥ 90. The association was statistically significant ($\chi^2 = 11.81$, p = 0.003) (Table 7).

Table 7: Association of Diastolic Blood Pressure with Selected Variables

Variable	< 90 (n)	≥ 90 (n)	x^2	p-value
Marital Status				
Single	35(92.1%)	3(7.9%)	11.81	0.003*
Married	187(69.8%)	81(30.2%)		
Widowed	25(58.1%)	18(41.9%)		
Family history of hypertension				
Yes	10(50.0%)	10(50.0%)	4.43	0.035*
No	237(72.0%)	92(28.0%)		
Sex				
Male	58(65.9%)	30(34.1%)	1.35	0.246
Female	189(72.4%)	72(27.6%)		
Family Setting				
Monogamous	172(76.1%)	54(23.9%)	8.82	0.003*
Polygamous	75(61.0%)	48(39.0%)		

*Significant at 5% level of significance

Logistic Regression Analysis of Diastolic Blood Pressure on Selected Variables

Table 8 shows the Logistic regression analysis of Diastolic blood pressure on selected variables. After adjusting for other variables, the predictors of Diastolic blood pressure were family history, marital status, and family setting. Those who belonged to polygamous settings were about 1.9 times more likely to develop hypertension compared with those who belonged to monogamous settings (OR=1.878; 95%CI=1.138-3.10).

Table 8: Logistic Regression Analysis of Diastolic Blood Pressure on Selected Variables

Variabl	Odds Ratio	95%CI	p-value
Family history of hypertension			
Yes	1		
No	0.403	0.159-1.021	0.055
Marital status			
Single	0.173	0.045-0.673	0.011*
Married	0.764	0.382-1.528	0.447
Widowed	1		
Family setting			
Monogamous	1		
Polygamous	1.878	1.138-3.10	0.014*

**Significant at 5% level of significance*
Dependent variable: Diastolic blood pressure
Predictors: Marital status, Family setting

DISCUSSION

In this study, the degree of physical exercise depends on the age and the level of education of the patients. The younger the patients and the higher the level of education, the higher the degree of exercise. The determinants of diastolic blood pressure were salt intake, cigarette smoking, family setting and marital status. The predictors of systolic blood pressure were marital status, family setting, and family history of hypertension. In a case control study conducted in Lagos, Nigeria, the reported risk factors included obesity, smoking, high salt intake, family history of hypertension, and hypercholesterolaemia.[12] The results of a cross-sectional study conducted in China showed that the prevalence of hypertension was higher among participants with family history of hypertension. In addition, for those without hypertension, the blood pressure levels were higher among respondents with a family history of hypertension.[13] This was similar to the findings of this study in which a family history of hypertension was a risk factor for hypertension. Alcohol consumption, age, and obesity were associated with hypertension according to Banigbe and colleagues. The modifiable risk factors could be adjusted to reduce the risk of hypertension.[14]

In another study conducted in Nigeria, the prevalence of hypertension was 44.9%. Increase in age, urban residence, body mass index (BMI), and sex were independent risk factors. However, Kanuri people had the highest prevalence of 77.5% which showed that ethnicity could be a determinant of hypertension.[15] Further studies should investigate the high prevalence of hypertension in this tribe. In a rural community study in South-South Nigeria, BMI and increasing age were reported as determinants of hypertension. Additionally, marital status, occupation, and educational status were also related to hypertension.[16] Age, male sex, obesity, and unemployment were determinants of hypertension according to the outcome of a study conducted by Saka and colleagues in Kurdistan, Iraq. The prevalence of hypertension and the prevalence of undiagnosed hypertension were high in the population studied.[17] In a study conducted in Varanasi India, the prevalence of hypertension, prevalence of pre-hypertension was high while the control of hypertension was very low. Age, sex, marital status, socioeconomic status, and education were determinants of high blood pressure.[18] Marital status was also a determinant of hypertension in this study.

A review of 55 articles on the risk factors of hypertension in West Africa showed that the determinants of hypertension included increasing age, male sex, high socioeconomic status, obesity, alcohol consumption, serum glucose, and high salt intake.[19] Salt intake was found to be a predictor of hypertension in this study. In another study conducted in Edo State, Nigeria, the risk factors of hypertension were reported to be age, tobacco use, and obesity. Smoking was a modifiable risk factor of hypertension in this study.[20] Ajayi and colleagues reported that the prevalence of hypertension was high in the community studied in Ibadan, and the determinants of hypertension were age, being overweight, and obesity.[21] Overweight and obesity were not determinants of hypertension in this study. The prevalence of hypertension was high in Burkina Faso, and it was higher in urban than rural areas. The modifiable risk factors of high blood pressure were obesity and diets. Other risk factors were old age, sex and family history of hypertension.[22]

The family history of hypertension was a risk factor in this study. According to the results of a study conducted in Gadau, Bauchi State, Nigeria, the determinants of undiagnosed hypertension included obesity, sex, and family history. Obesity could be managed by lifestyle modifications, but family history and sex are non-modifiable risk factors.[23] Lower socioeconomic status was associated with higher prevalence of hypertension among female coastal Nigerian adolescents. Associated with lower socioeconomic status were poor nutrition, limited access to health care, and poor housing. All these could be stressors and associated with the risk factors of hypertension.[24] The prevalence of hypertension was higher in subjects with positive family history of hypertension.

Additionally, the family history of hypertension was associated with obesity and metabolic syndrome. Patients with family history of hypertension should be screened for metabolic syndrome to address problems of chronic diseases early.[25]

Recommendations for Future Research

This study has shown that familial factors could be determinants of hypertension, and genetic studies might open more channels in the aetiology of hypertension. In addition, psychosocial studies could reveal additional information about the causes of hypertension.

Limitations

The study was a hospital based cross-sectional study limiting causal relations; experimental studies would give further information about contributory relationships.

CONCLUSION

The risk factors of diastolic blood pressure were salt intake, cigarette smoking, family setting and marital status. The determinants of systolic blood pressure were marital status, family setting, and family history of hypertension. Further genetic studies on the aetiology of hypertension might unravel more information on its causes.

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