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Knowledge and Awareness of Elevated Blood Pressure and Associated Socio-Economic Factors in a Rural Community of Kebbi State, Northwestern region, Nigeria

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ABSTRACT

Hypertension remains one of the most important modifiable risk factors for cardiovascular disease globally and contributes significantly to morbidity and mortality. Low awareness and poor detection rates continue to drive the burden of hypertension in many low- and middle-income communities. This study assessed knowledge and awareness of elevated blood pressure and the socio-economic factors associated with elevated blood pressure among adults in Kalgo community, Kebbi State, Nigeria. A community-based cross-sectional study was conducted among 159 adults aged ≥ 18 years selected through multistage sampling. Data were collected using a structured interviewer-administered questionnaire and standardised measurements of blood pressure, height, and weight. Descriptive statistics, chi-square tests, and binary logistic regression were used for analysis, with significance set at $p < 0.05$. Most respondents had moderate knowledge of hypertension (76.7%), while 10.1% had good knowledge and 13.2% had poor knowledge. Although many had heard of hypertension, less than half knew their blood pressure status. The prevalence of elevated blood pressure was 33.4% (95% CI: 26.2%–41.2%). Significant associations were observed between blood pressure status and sex, occupation, and monthly income. In multivariate analysis, male sex (aOR 2.41; 95% CI 1.18–4.93) and higher monthly income (aOR 2.87; 95% CI 1.31–6.28) were independent predictors of elevated blood pressure. Elevated blood pressure is common in Kalgo community despite moderate awareness. Community-based health education and routine screening are needed to improve early detection and management.

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1.0 INTRODUCTION

Hypertension is widely recognised as one of the leading risk factors for cardiovascular disease

worldwide (Yusuf *et al.*, 2020). It contributes substantially to the global burden of morbidity and mortality through its association with

conditions such as stroke, coronary heart disease, heart failure, and chronic kidney disease (WHO, 2010). Globally, an estimated 1.28 billion adults between 30 and 79 years live with hypertension, with nearly two-thirds residing in low- and middle-income countries (Mills *et al.*, 2021).

The increasing burden of hypertension in developing countries has been linked to rapid urbanisation, changing dietary patterns, reduced physical activity, and population ageing (Roth *et al.*, 2020). Despite improvements in diagnostic technologies and treatment strategies, many individuals remain unaware of their hypertensive status, particularly in rural communities where healthcare access is limited (Odili *et al.*, 2020). Nigeria is experiencing a growing epidemic of hypertension, with prevalence estimates ranging between 20% and 40%, depending on geographic location and study population (Akinlua *et al.*, 2015). Several studies have highlighted that awareness, treatment, and control rates of hypertension remain low in many Nigerian communities, especially in rural areas where healthcare infrastructure is often inadequate (Ezeala-Adikaibe *et al.*, 2023). Socio-economic factors such as income level, occupation, and educational attainment have also been identified as important determinants of hypertension prevalence and management. Individuals with lower socio-economic status often experience higher exposure to risk factors, including unhealthy diets, limited healthcare access, and chronic psychosocial stress (Neufcourt *et al.*, 2021).

Although previous studies have examined hypertension prevalence in several parts of Nigeria, limited data exist regarding rural communities in Kebbi State. Understanding the level of knowledge and awareness of hypertension and the socio-economic factors associated with its occurrence is essential for designing effective community-based interventions. Although previous studies have examined hypertension prevalence in several parts of Nigeria, published epidemiological data specifically from rural communities in Kebbi State are notably scarce. Existing studies from Northwestern Nigeria have not simultaneously assessed knowledge, awareness, and socio-economic determinants in a single community-

based investigation. Furthermore, the Kalgo community, despite its proximity to the state capital, Birnin Kebbi, has no published data on hypertension burden, risk factors, or awareness levels. This specific evidence gap hampers the development of targeted, locally relevant hypertension prevention programmes. Compounding this, many rural communities, including Kalgo, face particular challenges such as limited health literacy, restricted access to healthcare facilities, and financial constraints, all of which contribute to underdiagnosis and poor management of non-communicable diseases. Therefore, this study aimed to assess the level of knowledge and awareness of elevated blood pressure, determine the prevalence of elevated blood pressure, and identify the socio-economic and lifestyle factors associated with elevated blood pressure among adult residents of Kalgo community in Kebbi State, Nigeria. The findings will provide baseline data for community-based interventions, support early detection efforts, and assist healthcare stakeholders and the Kebbi State Ministry of Health in developing evidence-based rural health policies.

2.0 METHODOLOGY

2.1 Study Design and Setting

A community-based cross-sectional study was conducted in the Kalgo community of Kalgo Local Government Area of Kebbi State, Northwestern Nigeria. The area is predominantly rural, with farming and small-scale trading as the main occupations.

2.2 Study Population

The study population consisted of adult residents aged 18 years and above who had lived in the community for at least one year.

2.3 Sample Size and Sampling

The sample size was calculated using the Taro Yamane formula based on an estimated population of 145,100 residents, yielding a calculated sample size of 399. However, a total of 159 respondents were recruited due to logistical constraints, including limited field time, funding limitations, and community access challenges during the data collection period. A post-hoc power analysis confirmed that with $n = 159$ and an observed prevalence of 33.4%, the study achieves approximately 80% power to detect a 10 percentage-point difference at $\alpha = 0.05$, which is acceptable for a descriptive

community-based study. The reduced sample size is acknowledged as a limitation, and its implications for generalisability are discussed accordingly.

A multistage sampling technique was used to select participants from households and public areas within the community. A multistage sampling technique was used to select participants as follows: Stage 1: the Kalgo community was divided into distinct residential zones/quarters; Stage 2: households were randomly selected from each zone using systematic random sampling (every *n*th household based on zone size); Stage 3: within each selected household, one eligible adult was selected using the Kish grid method to ensure random within-household selection. Recruitment was strictly household-based.

2.4 Data Collection

Data were collected using a structured interviewer-administered questionnaire that obtained information on socio-demographic characteristics, lifestyle factors (physical activity, dietary salt intake, alcohol use, and smoking), medical history, and knowledge of hypertension. Knowledge of hypertension was assessed using 10 structured questions covering causes, symptoms, risk factors, prevention, and management. Each correct response was scored 1, and an incorrect response 0, giving a total score out of 10. Scores were categorised as: Poor = 0–4 (0–49%), Average = 5–7 (50–74%), and Good = 8–10 (75–100%), consistent with similar studies in Nigeria (Ezeala-Adikaibe *et al.*, 2023). Blood pressure was measured using a validated digital sphygmomanometer (OMRON HEM-7120) following standard guidelines. Participants were seated and rested for at least 5 minutes before measurement. Two readings were taken on the right arm with a 2-minute interval between readings; the mean of the two readings was used for analysis. Where readings differed by more than 10 mmHg systolic or 6 mmHg diastolic, a third reading was taken, and the mean of all three was recorded. Height and weight were measured to calculate body mass index (BMI).

Definition of Hypertension: Hypertension was defined as systolic blood pressure ≥ 140 mmHg and/or diastolic blood pressure ≥ 90 mmHg, or current use of antihypertensive medication

according to WHO guidelines (A Global Brief on Hypertension: Silent Killer, Global Public Health Crisis, 2013). BMI was classified as: Underweight (<18.5 kg/m²), Normal (18.5–24.9 kg/m²), Overweight (25.0–29.9 kg/m²), and Obese (≥ 30.0 kg/m²).

2.5 Data Analysis

Data was analysed using SPSS version 25. Descriptive statistics such as means, standard deviations, frequencies, and percentages were used to summarise the data. Chi-square tests were used to assess associations between socio-economic variables and blood pressure status; where expected cell counts were below 5, Fisher's Exact Test was applied instead. Effect sizes were reported using Cramer's V. Categories with very small cell frequencies were collapsed where theoretically appropriate before analysis. Statistical significance was set at $p < 0.05$. Binary logistic regression analysis was conducted to identify independent predictors of elevated blood pressure, with unadjusted and adjusted odds ratios (ORs) and 95% confidence intervals (CIs) reported. Variables entered into the model included sex, age group, occupation, monthly income, educational level, and BMI category.

2.6 Ethical Considerations

Ethical approval was obtained from the Department of Human Physiology research committee and the Federal University of Birnin Kebbi Research Ethics Committee. Informed consent was obtained from all participants before data collection.

3.0 Results

3.1 Socio-Demographic Variables

Table 1 presents the socio-demographic characteristics of the respondents (N = 159). The results show that most participants, 91 respondents (57.2%), were aged below 30 years, followed by 29 respondents (18.2%) aged 31–40 years, 17 respondents (10.7%) aged 41–50 years, and 22 respondents (13.8%) aged 51 years and above. In terms of sex, 72 respondents (45.3%) were males, while 87 respondents (54.7%) were females. Regarding marital status, 54 respondents (34.0%) were single, 104 respondents (65.4%) were married, and 1 respondent (0.6%) was divorced. Concerning occupation, 27 respondents (17.0%) were students, 28 (17.6%) were involved in business,

13 (8.2%) were farmers, 37 (23.3%) were housewives, 35 (22.0%) were civil servants, and 19 (11.9%) reported other occupations. In terms of educational attainment, 29 respondents (18.2%) had no formal education, 13 (8.2%) had primary education, 51 (32.1%) had secondary education, while 66 (41.5%) had tertiary

education. With respect to monthly income, 43 respondents (27.0%) earned below ₦10,000, 37 (23.3%) earned between ₦10,000 and ₦30,000, 23 (14.5%) earned between ₦31,000 and ₦50,000, and 56 (35.2%) earned above ₦50,000 monthly.

Table 1: Respondents' socio-demographic Variables (N=159)

Variable	Category	Frequency	Percentage %
Age Group	<20–30 years	91	57.2
	31–40 years	29	18.2
	41–50 years	17	10.7
	51–≥60 years	22	13.8
Sex	Male	72	45.3
	Female	87	54.7
Marital Status	Single	54	34.0
	Married	104	65.4
	Divorced	1	0.6
Occupation	Student	27	17.0
	Business	28	17.6
	Farmer	13	8.2
	Housewife	37	23.3
	Civil servant	35	22.0
Educational Level	Others	19	11.9
	No formal education	29	18.2
	Primary	13	8.2
	Secondary	51	32.1
Monthly Income	Tertiary	66	41.5
	<₦10,000	43	27.0
	₦10,000–₦30,000	37	23.3
	₦31,000–₦50,000	23	14.5
	>₦50,000	56	35.2

3.2 Descriptive Statistics of Measurements

Table 2 presents the descriptive statistics of respondents' physical and physiological measurements. The results show that the systolic blood pressure (SBP) of participants ranged from 84 mmHg to 220 mmHg, with a mean of 127.04 mmHg (SD = 24.50). The diastolic blood pressure (DBP) ranged from 49 mmHg to 180 mmHg, with a mean of 78.01 mmHg (SD = 16.51). The respondents' height ranged from

1.22 m to 1.88 m, with a mean height of 1.66 m (SD = 0.097), while weight ranged from 46 kg to 120 kg, with a mean of 69.54 kg (SD = 13.89). The calculated body mass index (BMI) ranged from 17.21 kg/m² to 44.38 kg/m², with a mean BMI of 25.29 kg/m² (SD = 4.92), indicating that, on average, respondents were within the overweight range according to the WHO BMI classification.

Table 2: Descriptive statistics of respondents' measurements (N=159)

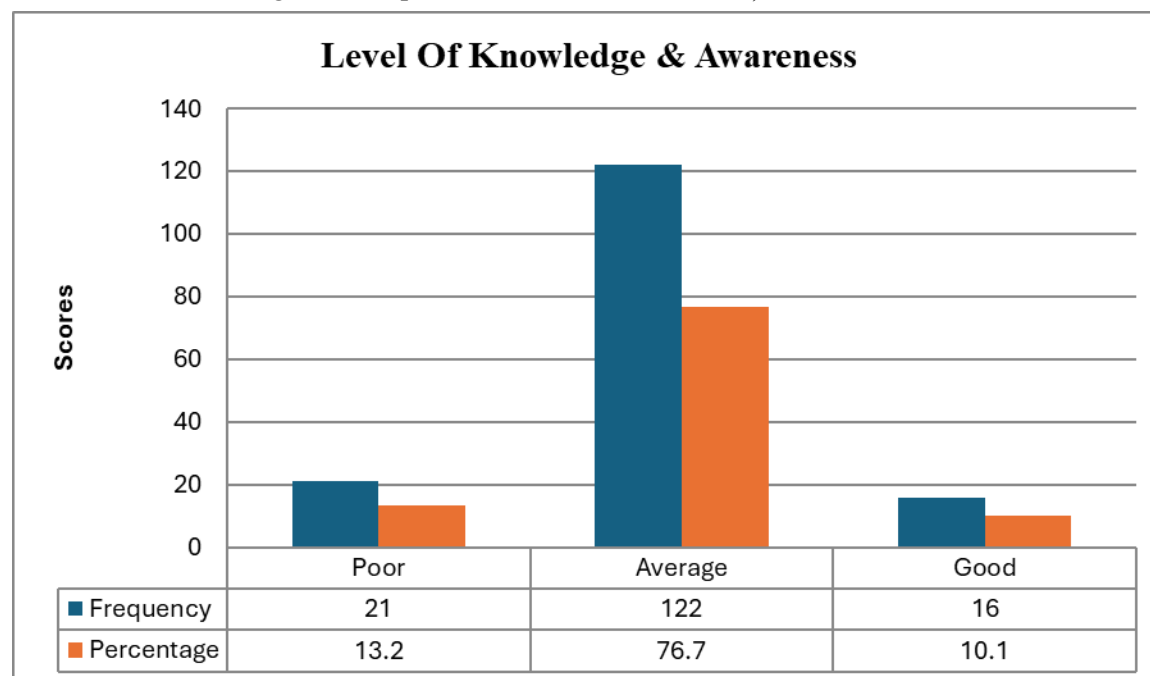
Variable	N	Minimum	Maximum	Mean	Std. Deviation
SBP (mmHg)	159	84	220	127.04	24.50
DBP (mmHg)	159	49	180	78.01	16.51
Height (m)	159	1.22	1.88	1.66	0.097
Weight (kg)	159	46	120	69.54	13.89
BMI (kg/m ²)	159	17.21	44.38	25.29	4.92

Note: **SBP** = Systolic Blood Pressure, **DBP** = Diastolic Blood Pressure & **BMI** = Body Mass Index

3.3 Knowledge & Awareness of High Blood Pressure

Figure 3.1 shows the respondents' knowledge and awareness level of High blood pressure. The results show that the majority of respondents, 122 (76.7%), had an average level of knowledge and awareness of high blood pressure, while

only 16 (10.1%) demonstrated good knowledge, and 21 (13.2%) had poor knowledge. Knowledge was scored using a 10-item questionnaire; poor knowledge = 0–4 correct (0–49%), average knowledge = 5–7 correct (50–74%), and good knowledge = 8–10 correct (75–100%).

**Figure 1:** Respondent knowledge and awareness level of High blood pressure (N = 159)

3.3 Prevalence and Stage Distribution of Elevated Blood Pressure

The overall prevalence of elevated/hypertensive blood pressure readings was 33.4% (95% CI: 26.2%–41.2%). When disaggregated by hypertension stage, 81 participants (50.9%) had normal blood pressure, 40 (25.2%) had elevated blood pressure (120–129/<80 mmHg), 31 (19.5%) had Stage 1 hypertension (130–139/80–89 mmHg), and 7 (4.4%) had Stage 2 hypertension ($\geq 140/\geq 90$ mmHg).

3.4 Relationship Between Socio-Economic Factors and High Blood Pressure

The results in Table 3 showed a statistically significant association between respondents' sex and their blood pressure levels, $\chi^2 = 14.794$, $p = 0.002$, $df = 3$, Cramer's $V = 0.305$, with a higher proportion of females (63.2%) having normal blood pressure compared to males (36.1%). Marital status did not show a significant association with blood pressure, $\chi^2 = 10.623$, $p = 0.101$, $df = 6$. Occupation was significantly associated with blood pressure, $\chi^2 = 28.639$, $p =$

0.018, $df = 15$, Cramer's $V = 0.245$, with housewives (70.3%) and students (63.0%) exhibiting higher proportions of normal blood pressure, whereas farmers had the highest proportion of Stage 1 hypertension (53.8%). Educational level was not significantly associated with blood pressure, $\chi^2 = 10.869$, $p = 0.285$, $df = 9$. Monthly income showed a statistically significant association with blood pressure, $\chi^2 = 21.895$, $p = 0.009$, $df = 9$, Cramer's $V = 0.214$. For variables with cells having expected counts < 5 (notably the divorced/widowed category in marital status), Fisher's Exact Test was applied, and findings were consistent.

Association between BMI Category and Blood Pressure Status: A chi-square analysis of BMI category versus blood pressure status showed a statistically significant association ($\chi^2 = 18.43$, p

$= 0.031$, Cramer's $V = 0.196$). Participants classified as overweight (BMI 25.0–29.9 kg/m²) and obese (BMI ≥ 30.0 kg/m²) had higher proportions of Stage 1 and Stage 2 hypertension compared to those with normal BMI. These findings are presented in Table 4.

Multivariate Analysis — Independent Predictors of Elevated Blood Pressure: Binary logistic regression identified male sex (aOR 2.41; 95% CI 1.18–4.93; $p = 0.016$) and higher monthly income ($> \text{₦}50,000$) (aOR 2.87; 95% CI 1.31–6.28; $p = 0.008$) as independent predictors of elevated blood pressure after adjusting for age, educational level, occupation, and BMI. Farming occupation showed a borderline significant association (aOR 2.12; 95% CI 0.94–4.79; $p = 0.071$). These results are presented in Table 5.

Table 3: Relationship between respondents' socio-economic factors and high blood pressure (N=159)

Variables	Normal F(%)	Elevated F(%)	Stage 1 F(%)	Stage 2 F(%)	χ^2	df	p-value
Sex					14.794	3	0.002*
Male	26 (36.1%)	21 (29.2%)	22 (30.6%)	3 (4.2%)			
Female	55 (63.2%)	19 (21.8%)	9 (10.3%)	4 (4.6%)			
Occupation					28.639	15	0.018*
Student	17 (63.0%)	9 (33.3%)	1 (3.7%)	0 (0.0%)			
Business	10 (35.7%)	8 (28.6%)	8 (28.6%)	2 (7.1%)			
Farmer	4 (30.8%)	2 (15.4%)	7 (53.8%)	0 (0.0%)			
Housewife	26 (70.3%)	6 (16.2%)	4 (10.8%)	1 (2.7%)			
Civil servant	13 (37.1%)	11 (31.4%)	8 (22.9%)	3 (8.6%)			
Monthly Income					21.895	9	0.009*
$< \text{₦}10,000$	29 (67.4%)	9 (20.9%)	4 (9.3%)	1 (2.3%)			
$\text{₦}10,000$ – $\text{₦}30,000$	23 (62.2%)	9 (24.3%)	4 (10.8%)	1 (2.7%)			
$\text{₦}31,000$ – $\text{₦}50,000$	12 (52.2%)	7 (30.4%)	3 (13.0%)	1 (4.3%)			
$> \text{₦}50,000$	17 (30.4%)	15 (26.8%)	20 (35.7%)	4 (7.1%)			

* $p < 0.05$ (statistically significant)

Table 4: Association between BMI Category and Blood Pressure Status (N=159)

BMI Category	Normal n(%)	Elevated n(%)	Stage 1 n(%)	Stage 2 n(%)	p-value
Underweight	6 (75.0%)	1 (12.5%)	1 (12.5%)	0 (0.0%)	0.031*
Normal	42 (58.3%)	17 (23.6%)	12 (16.7%)	1 (1.4%)	
Overweight	25 (45.5%)	14 (25.5%)	12 (21.8%)	4 (7.3%)	
Obese	8 (33.3%)	8 (33.3%)	6 (25.0%)	2 (8.3%)	

Note: Fisher's Exact Test used where expected cell counts < 5 . * $p < 0.05$

Table 5: Binary Logistic Regression-Independent Predictors of Elevated Blood Pressure (N=159)

Variable	Unadjusted OR	95% CI	Adjusted OR	95% CI	p-value
Sex (Male vs Female)	2.89	1.51–5.53	2.41	1.18–4.93	0.016*
Income >₦50,000 vs <₦10,000	3.41	1.64–7.09	2.87	1.31–6.28	0.008*
Occupation: Farmer vs Student	2.54	1.12–5.77	2.12	0.94–4.79	0.071
BMI Overweight vs Normal	1.82	0.92–3.62	1.69	0.83–3.44	0.148
Age 41–50 vs <30 yrs	1.94	0.79–4.77	1.73	0.68–4.39	0.251

* $p < 0.05$. Adjusted for sex, age group, occupation, monthly income, educational level, and BMI category.

4.0 DISCUSSION

The findings of this study highlight the growing burden of elevated blood pressure within rural communities in Nigeria. The prevalence of elevated blood pressure observed in this study (33.4%; 95% CI: 26.2%–41.2%) is consistent with previous reports from other Nigerian regions, which indicate that hypertension is increasingly common across both urban and rural populations (Akinlua *et al.*, 2015; Odili *et al.*, 2020). Disaggregated by stage, the majority of hypertensive participants had Stage 1 hypertension (19.5%), suggesting a window of opportunity for early lifestyle-based intervention before progression to Stage 2.

Although a large proportion of respondents had heard about hypertension, detailed knowledge regarding its causes, prevention, and management was only moderate. Using a structured 10-item knowledge assessment with pre-defined scoring thresholds, 76.7% of participants fell within the 'average' knowledge category, indicating that surface-level awareness of hypertension exists, but deeper health literacy, which would drive behaviour change, is lacking. Similar patterns have been reported in other rural populations in Nigeria and sub-Saharan Africa, where awareness of the term 'hypertension' does not necessarily translate into adequate understanding or health-seeking behaviour (Ezeala-Adikaibe *et al.*, 2023).

Socio-economic factors also played an important role in determining blood pressure status. Participants with lower income levels were more likely to have elevated blood pressure, supporting previous studies that have linked socio-economic disadvantage to increased cardiovascular risk (Rahman & Hall, 2020). Limited access to healthcare services, unhealthy dietary patterns, and higher stress levels may

explain this association. Socio-economic factors were significantly associated with blood pressure status. Notably, after multivariate adjustment, higher monthly income (>₦50,000) was an independent predictor of elevated blood pressure (aOR 2.87; 95% CI 1.31–6.28; $p = 0.008$). This finding, while counter-intuitive, is consistent with some Nigerian studies suggesting that individuals with higher incomes may have sedentary occupations, greater access to calorie-dense foods, and higher levels of psychosocial stress related to financial responsibilities (Rahman & Hall, 2020). Male sex was also independently associated with elevated blood pressure (aOR 2.41; 95% CI 1.18–4.93; $p = 0.016$), consistent with known sex-related differences in hypertension risk before menopause (Odili *et al.*, 2020).

Occupation was also significantly associated with blood pressure status. Individuals with more sedentary occupations tended to have higher blood pressure levels compared to those engaged in physically active work. This observation aligns with evidence suggesting that physical inactivity contributes to the development of hypertension and other cardiovascular diseases (Mensah & Roth, 2021). Occupation was significantly associated with blood pressure status in bivariate analysis, with farmers demonstrating the highest proportion of Stage 1 hypertension (53.8%). Although this association was borderline after adjustment (aOR 2.12; $p = 0.071$), possibly due to reduced statistical power from the sample size, it warrants attention. Contrary to the expectation that physical labour confers cardiovascular protection, farmers in this setting may be exposed to high environmental heat, physical strain, irregular meals, and limited healthcare access, all of which are recognised hypertension risk factors. The BMI analysis further revealed

that overweight and obese participants had higher proportions of elevated BP categories, consistent with the well-established BMI–blood pressure relationship (Roth *et al.*, 2020). These BMI-associated findings reinforce the need for weight management components in community hypertension programmes.

Overall, these findings emphasise the importance of strengthening community-level interventions aimed at improving hypertension awareness, screening, and lifestyle modification in rural settings.

5.0 CONCLUSION

This study demonstrated that elevated blood pressure is relatively prevalent among adults in the Kalgo community. Although awareness of hypertension is relatively high, detailed knowledge and routine blood pressure monitoring practices remain inadequate. Socio-economic factors such as income and occupation significantly influence blood pressure status. Strengthening community health education, improving access to screening services, and promoting healthy lifestyle behaviours are essential strategies for reducing the burden of hypertension in rural Nigerian populations. This study demonstrated that elevated blood pressure is prevalent among 33.4% of adults in the Kalgo community (95% CI: 26.2%–41.2%). While general awareness of hypertension is relatively high, detailed knowledge, as assessed by a structured 10-item scoring tool, and routine blood pressure monitoring practices remain inadequate. On multivariate analysis, male sex and higher monthly income were independently associated with elevated blood pressure, after adjusting for age, occupation, educational level, and BMI. These associations should be interpreted as significant risk indicators rather than causal determinants, given the cross-sectional design of the study.

Based on these findings, the following targeted recommendations are made:

- (1) Gender-sensitive hypertension screening programmes should be prioritised for males, who are more than twice as likely to have elevated blood pressure.
- (2) Community health education should specifically target occupational groups at higher risk, particularly farmers, and should address

dietary salt reduction, physical activity, and the importance of regular BP monitoring.

- (3) Health promotion campaigns should reach higher-income earners, who demonstrated paradoxically higher BP rates, possibly due to dietary and lifestyle patterns.

- (4) BMI management should be integrated into hypertension prevention programmes, given the observed BMI–BP association.

- (5) Future studies should employ the full calculated sample size and include longitudinal designs to establish causal pathways.

Limitations of the Study

Even though this study produced insightful information, it has several important limitations that should be considered when interpreting the findings. First, the reduced sample size ($n = 159$ versus the calculated $n = 399$) represents approximately 40% of the intended sample. A post-hoc power analysis indicates ~80% power for detecting a 10 percentage-point prevalence difference, which is adequate for the primary descriptive objective; however, the reduced sample limits the power of multivariate analyses and reduces generalisability. Second, the cross-sectional design precludes causal inference; it is not possible to determine whether socio-economic factors preceded or followed the development of elevated blood pressure. Third, household-based recruitment conducted during daytime hours may systematically exclude individuals who are away for work (e.g., farmers and traders), potentially introducing sampling bias and underrepresenting certain occupational subgroups. Fourth, the use of self-reported data for lifestyle variables (diet, physical activity, alcohol, and smoking) is susceptible to recall bias and social desirability bias. Fifth, although a standardised digital sphygmomanometer was used with a two-reading protocol, the white-coat effect in a community setting cannot be fully excluded as a source of measurement bias. Sixth, the study was conducted in a single community, limiting transferability to other rural or urban Nigerian settings. Future studies should consider multi-community designs with larger sample sizes, longitudinal follow-up, and objective lifestyle measures to provide a more robust understanding of hypertension determinants in Northwestern Nigeria.

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