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ORIGINAL ARTICLE

Prevalence of Hypertension and Diabetes Mellitus in a Health District of Lagos, Nigeria.

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Keywords

Hypertension,
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ABSTRACT

Background: Non-communicable diseases (NCDs) such as hypertension and diabetes mellitus pose increasing public health challenges in developing countries. This study assessed the burden of hypertension and diabetes mellitus across three local government areas (LGAs) within the largest district of Lagos in south western Nigeria.

Methods: A cross-sectional survey was conducted consecutively among 2,060 consenting residents from the three LGAs (Agege, Alimosho, and Ifako-Ijaiye) in Lagos State's largest district in November 2023. Health information officers collected data using a questionnaire during an outreach program. Pre-hypertension and hypertension were defined using the JNC-7 criteria, while the diagnosis of diabetes mellitus was based on the American Diabetes Association classification.

Results: Among 2,060 participants, the mean age was 48.15 years; 78.3% were female, 70.4% self-employed, and 85% lacked health insurance. Prehypertension and hypertension prevalence were 34.4% and 39.5%, while 2.5% of the participants had diabetes and 7.5% had impaired blood glucose. The peak age group for hypertension was 40-59 years and above 60 years, for diabetes. Participants less than 40 years old were 5.8 times more likely to have normal BP than those over 40 years of age. Similarly, individuals with normal blood glucose were 3.87 times more likely to have normal blood pressure.

Conclusion: This study revealed a high prevalence of hypertension and diabetes mellitus in Lagos Health District 1, emphasizing a major public health concern. The results underscore the urgent necessity for health interventions focused on preventing, early detection, and treatment of the increasing rates of these conditions among the population.

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INTRODUCTION

Hypertension, or elevated blood pressure (BP), represents a significant cause of preventable cardiovascular disability and premature death in less-developed countries with poorly resourced healthcare systems.^{1,2} High blood pressure is a considerable risk factor for cardiovascular diseases, the leading non-communicable diseases (NCDs).³ Reports from the WHO indicate that it is one of the primary risk factors for mortality worldwide and a major contributor to the increasing burden of NCDs in low- and middle-income countries.⁴ In developing nations, healthcare resources are stretched by the dual burden of communicable diseases such as malaria, HIV/AIDS, and tuberculosis, alongside non-communicable diseases like hypertension and diabetes mellitus.^{5,6} Despite this dual burden, a disproportionate share of health resources is allocated to combat and prevent infectious diseases, leaving scant investment in interventions aimed at preventing non-communicable diseases.⁷

Hypertension is responsible for 13% of global deaths and three-quarters of the world's hypertensive population reside in low- and middle-income countries, with the projection of a 30% increase in worldwide prevalence of this condition by the year 2025 and for its pivotal role in the rising global burden of disease and disability, hypertension has become one of the most challenging concerns for world public health.^{8,9} Hypertension accounts for nearly half of stroke and ischemic heart disease worldwide.^{3,10} Moreover, increased blood pressure can be a marker for other non-communicable disease (NCD) risk factors such as increasing body weight, dyslipidaemia, glucose intolerance, and metabolic syndrome.^{11–13} Diabetes mellitus (DM) is regarded as a chronic disease with high incidence, and one of

the conditions of public health importance. It was among the five significant global mortality risks. It has been shown that 80% of deaths by diabetes occur in low and middle-income countries, and by 2030, diabetes mellitus will be recorded as the seventh leading cause of death. Furthermore, studies have reported the prevalence of DM in urban centres like Lagos and Sokoto States to be 34.7% and 4.3% respectively.^{14,15} Another study conducted in Delta State in 2020 reported the prevalence of DM as 25.46% and that urban dwelling was identified as a risk factor.⁵ Thus, it has been suggested that DM could be classified as a disease for high-income or urban dwellers.^{14,16,17} Tackling this emerging disease in Nigeria would require continuous monitoring and assessment. Many surveys on NCDs in Nigeria have been largely hospital-based and only a few community surveys exist.^{5,16,17} Measuring hypertension and diabetes mellitus prevalence in Nigerian cities like Lagos State is important because it can guide the development of essential control measures, which can be adapted to other parts of the country. This study assessed the burden of hypertension and diabetes mellitus in three local government areas: Agege, Alimosho, and Ifako-Ijaiye, situated in the largest district of the Lagos metropolis in Nigeria.

Methodology

Study Area

Lagos State Health District 1 (LSHD1) is one of the six newly established health districts in Lagos State. LSHD1 includes 68 PHCs and 63 wards within three local government areas: Agege, Alimosho, and Ifako-Ijaiye. According to the Lagos State Local Government Statistics 2016, the estimated population was 6,495,195. The survey was conducted in 20 primary health facilities throughout the district.

Table 1: Distribution of Socio-Demographic Characteristics of Respondents.

Variable	Frequency n=2060	Percentage (%)
Age Group (years)		
10-19	37	1.8
20-29	125	6.1
30-39	338	16.4
40-49	625	30.3
50-59	548	26.6
>=60	387	18.8
Mean+ SD	48.15+ 13.39	
Sex		
Male	446	21.7
Female	1614	78.3
Work Status		
Unemployed	168	8.2
Students	53	2.6
Employee	361	17.5
Self-employed	1450	70.4
Retired	28	1.3
Monthly Income (Naira ₦)		
No Income	235	11.4
<50,000	1232	59.8
50,000-100,000	557	27.0
>100,000	36	1.8

Study Design

This descriptive cross-sectional survey involved 2,060 consecutively recruited, consenting residents from three local government areas (LGAs)—Agege, Alimosho, and Ifako-Ijaiye—in Lagos State, who agreed to participate during a medical outreach program aimed at screening and treating communicable and non-communicable diseases in November 2023. The Health Management Information System (HMIS) Department of Lagos State Health District 1 developed a questionnaire

administered by interviewers for this survey. Respondents were recruited consecutively through WhatsApp platforms and community mobilizers. The Health Information Officers administered the questionnaire and collected data over three days (November 27-29, 2023) while nurses performed blood pressure measurements using a calibrated digital monitor following a standardized protocol for blood pressure measurement. A self-reported history of hypertension, diabetes, and use of antihypertensive medications was obtained from

the participants. Two readings were taken at intervals, and the average reading was used to assess participants' blood pressure.

The recorded blood pressure was categorized according to the blood pressure classification provided in the 7th Report of the Joint National Commission: normal (<120/80 mmHg), pre-hypertension (SBP 120-139 and/or DBP 80-89 mmHg), stage 1 hypertension (SBP 140-159

and/or DBP 90-99 mmHg), and stage 2 hypertension (SBP >160 mmHg and/or DBP > 100mmHg).^{18,19} Random blood glucose was measured using finger-prick blood samples with a glucometer. The diagnosis of diabetes was based on the American Diabetes Association classification: normal blood glucose <140 mg/dl, impaired blood glucose 140-199 mg/dl, diabetes > 200mg/dl.²⁰

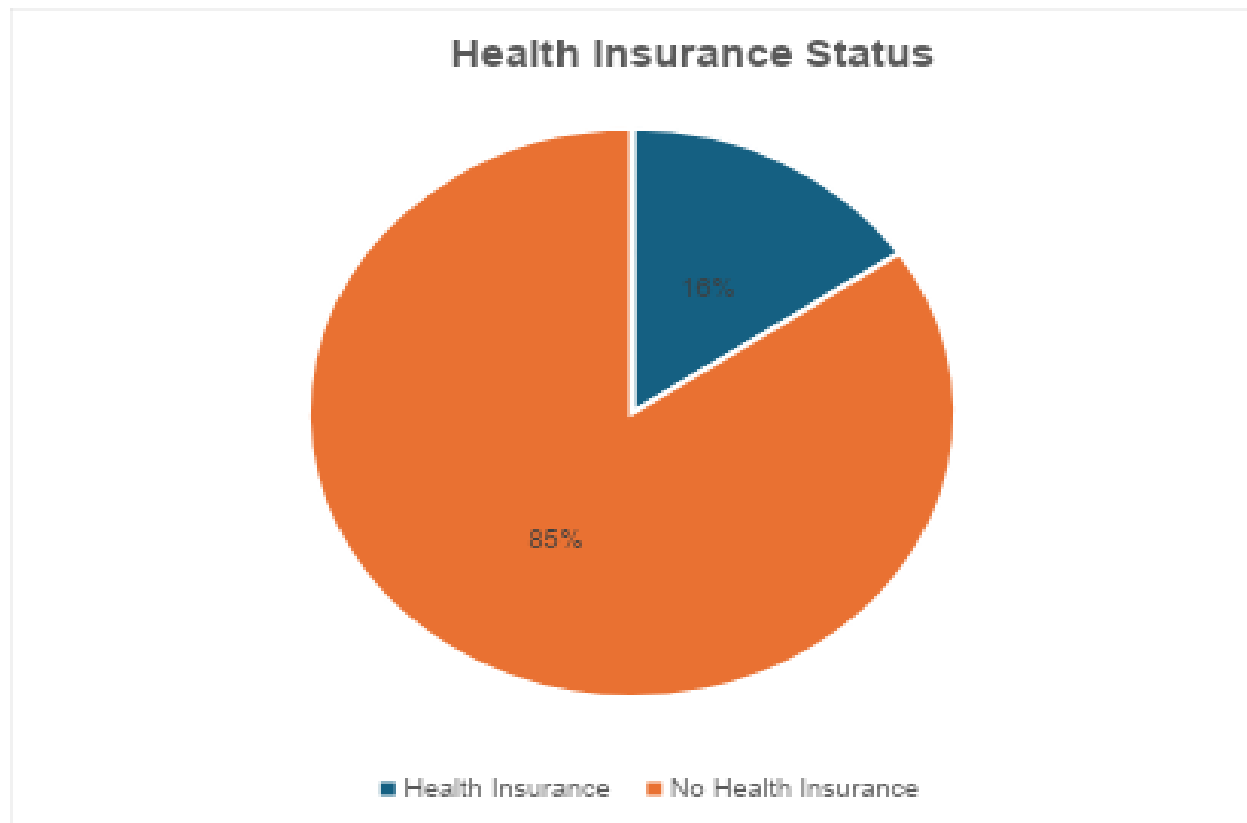


Fig 1: Health Insurance Status of the Participants

Data Management and Analysis

The data was cleaned and analyzed using SPSS Version 21 and normality of the data was determined using the Shapiro-Wilk test. Proportions were summarized for categorical data, while continuous variables were described as mean and standard deviation as appropriate.

The prevalence of hypertension and diabetes was determined, and the association between these conditions and socio-demographic factors was evaluated using chi-square tests. A p-value of less than 0.05 was regarded as statistically significant.

Ethical Considerations

Ethical clearance was obtained from the Health Research Ethics Committee of Lagos State University Teaching Hospital (LREC/06/10/2878). Informed consent was obtained from the study participants, while confidentiality of information was maintained throughout the study.

RESULTS

Most respondents (30.3%) were aged 40 and 49 years, with a mean age of 48.15 ± 13.39 years. Most participants were female (78.3%), self-employed (70.4%), and over half (59.8%) of

the participants earned less than 50,000 naira (₦) monthly. (Table 1)

Additionally, 85.0% of participants did not have health insurance. (Figure 1).

Table 2 shows blood pressure and blood glucose levels in the study population. Systolic blood pressure ranged from 76 to 281 mmHg, with a mean of 131.29 ± 23.89 mmHg. Diastolic ranged from 49 to 150 mmHg, with a mean of 81.38 ± 13.89 mmHg. Blood glucose levels ranged from 51 to 488 mg/dl, with a mean of 107.19 ± 33.9 mg/dl.

Table 2: Distribution of Blood Pressure and Blood Glucose of the Participants

Variable	Range	Min	Max	Mean
Systolic BP >140mmhg n=2014	205	76	281	131.29 $\pm$ 23.89
Diastolic BP >90mmhg n=2014	101	49	150	81.38 $\pm$ 13.98
Blood glucose n=1979	437	51	488	107.19 $\pm$ 33.9

Over a third (39.5%) of participants had hypertension, while 26.1% had normal BP and 34.4% had prehypertension. Approximately 91.8% of participants had normal blood glucose levels. The study found that 2.5% had diabetes, while 5.7% exhibited impaired blood glucose (Figures 2 and 3). No statistically significant association was observed between sex, income, work status, and blood pressure ($p > 0.05$). However, there was a significant association between age and blood pressure ($p < 0.001$), and between blood glucose levels and blood pressure ($p < 0.001$). Table 3.

There was no statistically significant association between sex of participants, monthly income, work status, and blood glucose ($p > 0.05$). However, an association was noted between participants' age and blood glucose readings ($p < 0.001$). Table 4. Multinomial logistic regression examined how age and blood glucose categories relate to blood pressure categories, using Stage 2 Hypertension as the baseline (Reference). Results showed individuals under 40 are 5.8 times more likely to have normal BP than those over 40 (CI: 3.917-8.573, $p < 0.001$; Table 5). Participants with normal blood glucose are 3.87 times more likely to have normal BP and 2 times

more likely to have prehypertension than those with diabetes. (CI 1.097 - 5.405, $p = 0.029$). Also, participants under 40 were 1.6 times more likely to be in stage 1 hypertension than stage 2 ($p < 0.036$). Table 6 displays the results of a multinomial logistic regression examining the

effect of age on blood glucose categories. Individuals under 40 years have 5 times higher odds of being in the normal blood sugar group than those with diabetes, compared to those over 40 years. CI (1.601-16.707, $p < 0.005$).

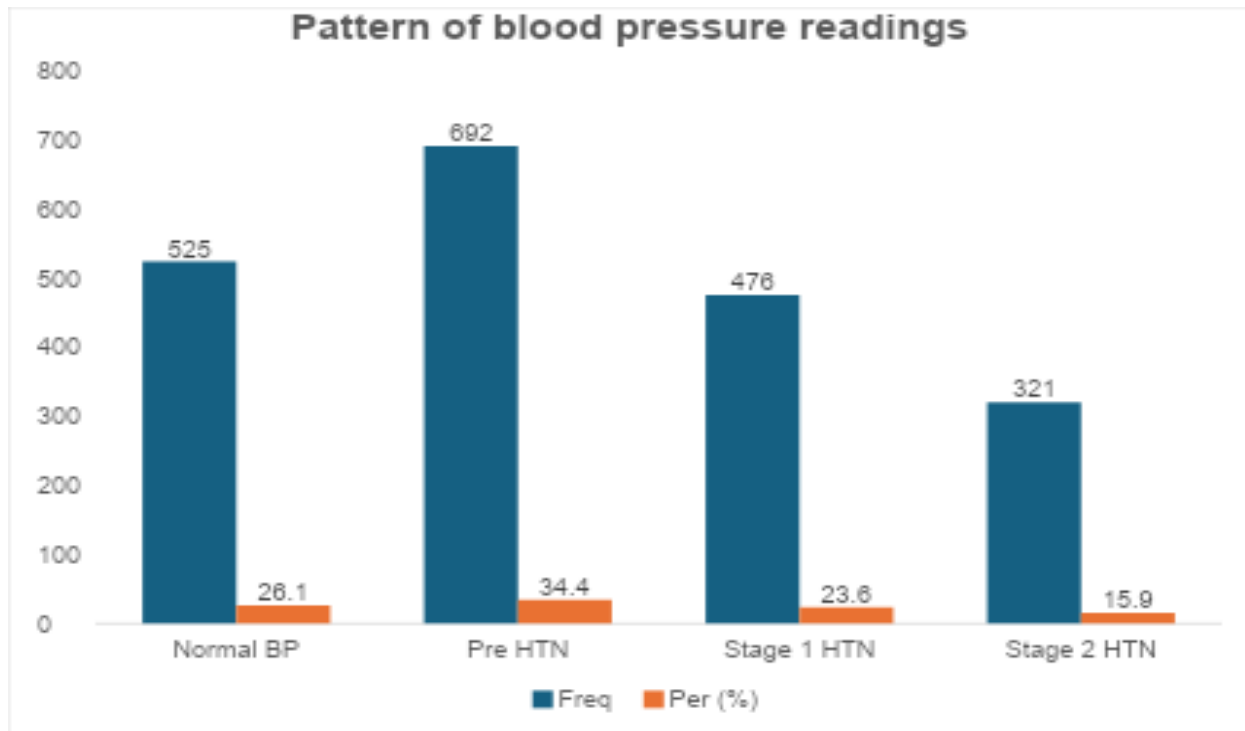


Fig 2: Pattern of the Blood Pressure readings among Participants

DISCUSSION

A total of 2060 respondents aged 10 to 90 years were studied. The mean age of the respondents was 48.15 ± 13.39 years. This was similar to 42.9 ± 15.7 years found in a survey on hypertension prevalence in Delta State and Ghana.^{2,18} The sex distribution among participants was 21.7% male and 78.3% female, indicating a clear predominance of females. This pattern corresponds with findings from a hypertension survey conducted in Osun State and Ethiopia.^{3,19} The high number of female participants in these studies likely indicates women's greater engagement in community

medical outreach programs and their more proactive stance on health issues and behaviors. The study found that 39.6% of participants had hypertension, with a prevalence of 42.8% in males and 38.7% in females. The higher rates in males could be linked to lifestyle habits that increase their risk of hypertension, possibly making them more vulnerable than females, especially since men often fulfil the role of family breadwinners. Nevertheless, no statistically significant relationship was identified between participants' sex and hypertension.

In this study, the overall prevalence of hypertension was higher than that found in previous research from Enugu, Ghana, Ethiopia, and India, which reported prevalence rates of 27.3%, 21.4%, 18.9%, and 30.7%, respectively.^{2,3,20,21} However, it was lower than the rates identified in a population-based study in Osun State (44.7%) and the UK (55.8%).^{8,22} Variations in the average ages of the participants in the study populations might explain these differences. With pooled mean SBP and DBP values of 131 mmHg and 81 mmHg, respectively, the findings of this study suggest

that a significant number of residents in Lagos State Health District 1 are in the pre-hypertensive stage. While pre-hypertension does not necessarily lead to hypertension, research has consistently demonstrated that pre-hypertension increases the likelihood of developing hypertension, cardiovascular complications, and target organ damage by 30% if lifestyle changes or treatments are not implemented.^{9,11} These results align with a systematic review of hypertension prevalence, awareness, treatment, and control in Nigeria between 1995 and 2020.⁶

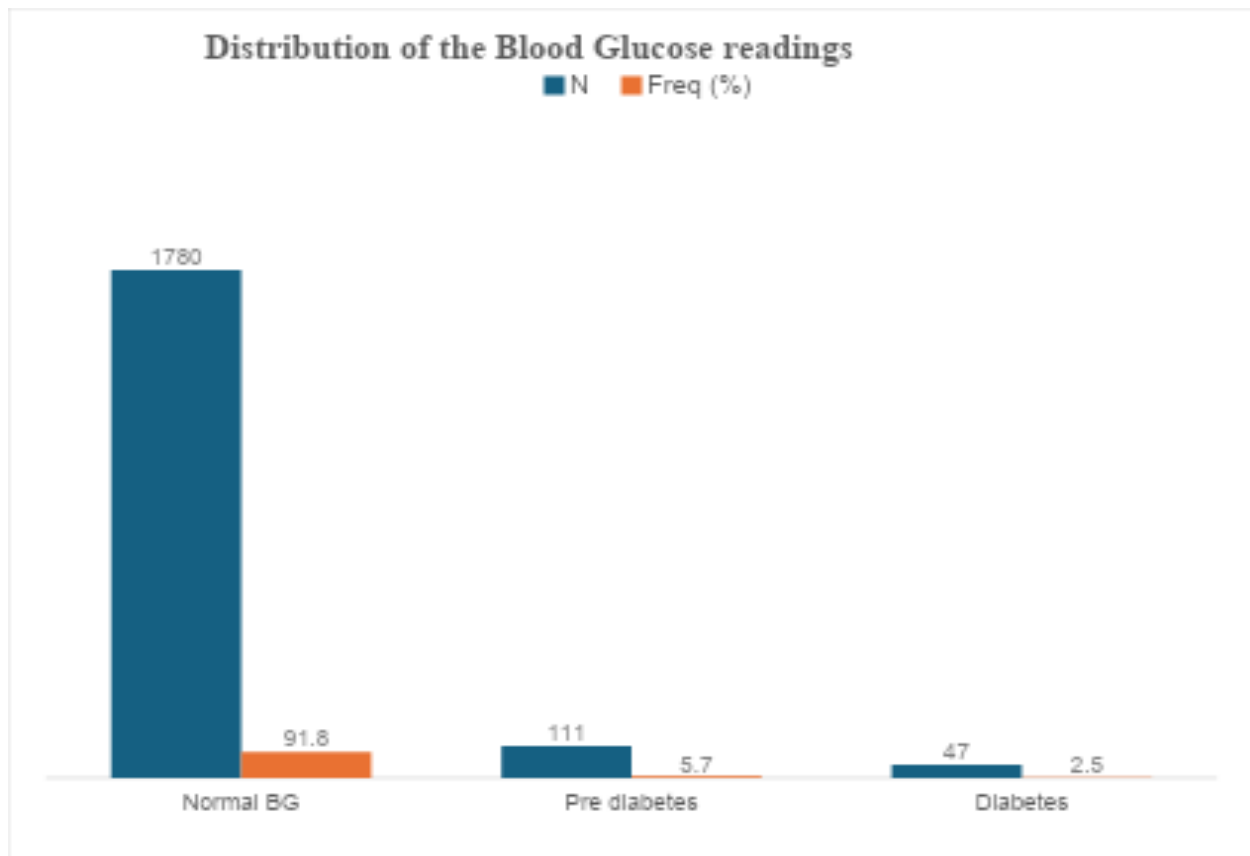


Fig 3: Distribution of the Blood Glucose readings among Participants

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and India, which reported prevalence rates of 27.3%, 21.4%, 18.9%, and 30.7%, respectively.^{2,3,20,21} However, it was lower than the rates

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not necessarily lead to hypertension, research has consistently demonstrated that pre-hypertension increases the likelihood of developing hypertension, cardiovascular complications, and target organ damage by 30% if lifestyle changes or treatments are not implemented.^{9,11} These results align with a systematic review of hypertension prevalence, awareness, treatment, and control in Nigeria between 1995 and 2020.

Table 3: Bivariate analysis between Sociodemographic /Blood glucose categories and Blood pressure readings of the Participants

Variable	Normal BP Frequency (%)	Prehypertension Frequency (%)	Stage 1 Frequency (%)	Stage 2 Frequency (%)	X ² / P value
Age (n=2014)					
<40 years n=486	218 (44.8)	156 (32.1)	77 (15.8)	35 (7.2)	76.615/0.000
>40 years n=1528	307 (20.1)	536 (35.1)	399 (26.1)	286 (18.7)	
Gender					
Male (435)	102 (23.4)	147 (33.8)	117 (26.9)	69 (15.9)	4.012/0.26
Female (1579)	423(26.8)	545 (34.5)	359 (22.7)	252 (16.0)	
Work Status (n=2011)					
Unemployed (214)	47 (22.0)	59(36.4)	56 (26.2)	33 (15.4)	9.627/0.649
Employed (1769)	468(26.5)	604(34.1)	410(23.2)	287(16.2)	
Retired (28)	8 (28.6)	10 (35.7)	9 (32.1)	1 (3.6)	
Monthly income					
No income (n=228)	50 (21.9)	84 (36.8)	59 (25.9)	35 (15.4)	7.837/ 0.551
Less than 50,000 naira (n=1209)	327 (27.0)	402 (33.3)	282 (23.3)	198 (16.4)	
Greater than 50,000-naira n=574	146 (25.4)	206 (35.8)	134 (23.3)	88 (15.3)	
Blood glucose categories					
Normal blood glucose n=1780	484(27.3)	609 (34.3)	413 (23.3)	271(15.3)	16.882/0.00
Impaired blood glucose n=111	14 (12.6)	40 (36.0)	31 (27.9)	26 (23.4)	
Diabetes n=47	6 (12.8)	12 (25.5)	16 (34.0)	13 (27.7)	

Table 4: Bivariate Analysis between Sociodemographic and Blood Glucose Categories of the Participants

Variable n=1979	Normal BG Frequency (%)	Impaired BG Frequency (%)	DM Frequency (%)	χ^2 / P value
Age				
<40 years n=478	459 (96.0)	16 (3.3)	3 (0.0006)	25.696/0.000
>40 years n=1501	307 (20.1)	536 (35.1)	399 (26.1)	
Gender				
Male (430)	391 (90.9)	26 (6.0)	13 (3.0)	0.784/0.676
Female (1549)	1425 (92.0)	88(5.7)	36 (2.3)	
Work Status				
Unemployed (210)	188 (89.5)	17 (8.1)	5 (2.4)	1.699/0.192
Employed (1741)	1600(91.9)	97(5.6)	44(2.5)	
Retired (28)	28 (100.0)	0 (0.0)	0 (0.0)	
Monthly income				
No income (n=224)	202 (90.2)	17 (7.6)	5 (2.2)	0.169/0.681
< ₦ 50,000 (n=1187)	1095 (92.2)	60 (5.1)	32 (2.7)	
> ₦ 50,000 N=568	519 (91.4)	37 (6.5)	12 (2.1)	

The study revealed that the incidence of hypertension increases with respondents' ages. This is consistent with research conducted in Enugu, Osun, and other areas of Ethiopia.^{3,8,20} Age is considered a non-modifiable risk factor for hypertension, as rising blood pressure is mainly associated with increased arterial stiffness that accompanies ageing. Since hypertension is frequently called a silent killer, it is vital to create a system for early detection and monitoring within older demographic groups. The study found an overall diabetes prevalence of 2.5%, while prediabetes was reported at 5.7%. When compared to findings from other regions, the diabetes prevalence observed in this study was lower than that reported in Delta (25.0%),⁵ South Africa (22.0%), and Bangladesh (7.8%),²⁴ yet higher than the 0.0% prevalence documented in a rural community in Gombe.^{5, 23, 24} Higher prevalence rates in urban populations are often

linked to a more sedentary lifestyle as well as contributing factors like high-calorie diets, smoking, and excessive alcohol consumption.

Assessing and quantifying non-communicable diseases like hypertension and diabetes within communities is essential for promoting public health and well-being. In addition, early detection and regular monitoring of these conditions enable timely interventions that can significantly reduce complications and prevent long-term health issues. By understanding the prevalence and risk factors specific to a community, healthcare systems can tailor prevention strategies, allocate resources effectively, and empower individuals to make informed health decisions. Ultimately, a proactive approach to assessing and managing hypertension and diabetes can improve individual quality of life as well as contribute to

the overall sustainability of healthcare systems and the resilience of communities.

Table 5: Multinomial logistic regression of Age and Blood Glucose Categories on Different Blood Pressure (BP) Categories

Multinomial logistic regression					
Blood pressure (Dependent variable)	Independent variables	p-value	OR	95% CI	
				Lower	Upper
Normal BP					
	Less than 40 years	0.000	5.795	3.917	8.573
	40 years and above	0 ^b			
	Normal BG	0.007	3.870	1.454	10.29
	Pre DM	0.795	1.167	0.364	3.741
	Diabetes	0 ^b			
Prehypertension					
	Less than 40 years	0.000	2.378	1.604	3.526
	40 years and above	0 ^b			
	Normal BG	0.029	2.435	1.097	5.405
	Pre DM	0.280	1.667	0.660	4.212
	Diabetes				
Stage 1 hypertension					
	Less than 40 years	0.036	1.581	1.031	2.424
	40 years and above				
	Normal BG	0.575	1.238	0.568	2.615
	Pre DM	0.945	0.969	0.394	2.379
	Diabetes	0 ^b			
The reference category is Stage 2 hypertension. 0 ^b : Baseline for comparison					

The reference category is Stage 2 hypertension, 0^b Baseline for [comparison](#)

Strengths and Limitations

The sample size for this study was large, which constituted a major strength. The cross-sectional study design does not provide sufficient scientific evidence for causality; however, it can serve as a baseline for future research. The study was limited to the information available in the questionnaire and was presented accordingly.

Conclusion

This study revealed a high prevalence of hypertension, prehypertension, prediabetes, and DM in the district. It underscores the urgent

need to raise awareness and implement interventions for preventing and detecting hypertension and diabetes mellitus through regular health screenings and promoting a healthy lifestyle.

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Conflicts of interest: None to declare

Authors' contributions: MA and OB: study design and data collection, OO and OW: analysis, interpretation, writing the manuscript,

and critical review of the manuscript by all authors.

Table 6: Multinomial logistic regression of Age on Blood Glucose Categories

Multinomial logistic regression				95%CI	
Blood glucose (Dependent variable)	Independent variables	p-value	OR	Lower	Upper
Normal BG					
	Less than 40 years	0.005	5.171	3.917	8.573
	40 years and above	0 ^b			
Impaired blood glucose					
	Less than 40 years	0.161	2.503	0.695	9.021
	40 years and above	0 ^b			
The reference category is DM, 0 ^b Baseline for comparison					

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