



ANATOMICAL DISTRIBUTION OF HYPERTENSIVE ORGAN DAMAGE AND HEALTH-SEEKING BEHAVIOR IN NIGERIAN ADULTS

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Abstract

Hypertension is a leading contributor to cardiovascular, renal, and cerebrovascular morbidity worldwide, with a growing prevalence in Nigeria. This study examined the anatomical distribution of hypertensive organ damage and the relationship between health-seeking behavior and clinical outcomes among 1,200 Nigerian adults across six geopolitical zones. A cross-sectional observational design was employed, integrating clinical assessments of cardiovascular, renal, cerebrovascular, and ocular complications with structured questionnaires evaluating health-seeking patterns, medication adherence, and care delays. Findings revealed that cardiovascular complications were most prevalent (38%), followed by renal (24%), ocular (15%), and cerebrovascular (12%) damage. Delayed or irregular healthcare utilization, reliance on traditional remedies, and poor medication adherence were significantly associated with multi-organ damage (OR = 2.1; 95% CI: 1.6–2.8; $p < 0.001$). Socio-demographic factors, including education, income, and urban versus rural residence, influenced both behavior and clinical outcomes. The study underscores the importance of integrating early detection, routine clinical monitoring, and behavioral interventions to mitigate hypertensive complications in Nigeria. Public health strategies should focus on improving awareness, promoting timely care seeking, and enhancing adherence to antihypertensive therapy to reduce the burden of organ-specific damage.

Keywords: Hypertension, Organ Damage, Health-Seeking Behavior, Nigeria, Cardiovascular Complications

Introduction

Hypertension remains a leading public health concern worldwide, contributing significantly to morbidity and mortality through its association with cardiovascular, renal, and cerebrovascular complications (WHO, 2023). In Nigeria, the prevalence of hypertension has been rising steadily, with estimates suggesting that nearly one in four adults is affected, often undiagnosed or inadequately managed (Owolabi et al., 2022). The impact of sustained elevated blood pressure extends beyond the circulatory system, leading to organ damage including left ventricular hypertrophy, chronic kidney disease, retinopathy, and cerebrovascular lesions, collectively referred to as hypertensive organ damage (HOD) (Chukwuonye et al., 2021). Understanding the anatomical distribution of HOD is critical for risk stratification, timely intervention, and the design of targeted health policies that address the burden of cardiovascular complications.

Concurrently, health-seeking behavior among Nigerian adults plays a pivotal role in the early detection and management of hypertension and its complications. Evidence suggests that socio-cultural beliefs, accessibility to healthcare services, and awareness of hypertension significantly influence whether individuals seek formal medical care or rely on alternative therapies (Adebayo



et al., 2022; Iloh et al., 2021). Despite the growing burden of hypertension and its organ-specific consequences, there remains a limited understanding of how patterns of organ damage intersect with health-seeking behaviors within Nigerian communities, particularly in urban versus rural settings. This gap underscores the need for empirical studies that integrate clinical evaluation with behavioral assessments to inform strategies aimed at improving early detection, adherence to treatment, and prevention of irreversible organ damage.

This study, therefore, seeks to investigate the anatomical distribution of hypertensive organ damage among Nigerian adults and examine the determinants of their health-seeking behaviors. By linking clinical outcomes with behavioral patterns, the research aims to provide actionable insights for healthcare providers, policymakers, and public health programs focused on mitigating the cardiovascular burden in Nigeria.

Problem Statement

Hypertension is recognized as a leading noncommunicable disease and a primary risk factor for cardiovascular morbidity and mortality globally and in Nigeria (World Health Organization, 2023). In Nigeria, the prevalence of hypertension has risen substantially, with many adults remaining undiagnosed or inadequately controlled due to low awareness and gaps in healthcare access (Owolabi et al., 2022). Chronic elevated blood pressure progressively affects multiple organs, resulting in hypertensive organ damage including heart, kidneys, brain, and eyes, yet the **anatomical distribution and severity of these complications among Nigerian adults remain inadequately characterized** (Chukwuonye et al., 2021).

Equally concerning is the influence of health-seeking behavior on early detection and effective management. Studies indicate that socio-cultural beliefs, economic barriers, and limited utilization of formal healthcare services in Nigeria contribute to delayed diagnosis and treatment of hypertension (Adebayo et al., 2022; Iloh et al., 2021). Despite this, there is **limited empirical evidence connecting the patterns of organ damage with individuals' health-seeking behaviors**, particularly how these behaviors shape the progression and presentation of hypertensive complications.

This gap in knowledge poses significant challenges for public health planning and clinical intervention, as targeted strategies require an understanding of both the clinical distribution of hypertensive damage and the behavioral drivers that influence timely care. Without integrated data on anatomical organ damage and health-seeking behavior, efforts to reduce the burden of hypertension and its sequelae are hindered, potentially perpetuating high rates of morbidity, disability, and premature mortality among Nigerian adults.



Literature Review

1. Introduction

Hypertension is increasingly recognised as a major public health issue in Nigeria, with multiple studies showing high and rising prevalence rates among adults in both urban and rural communities. Recent estimates suggest that roughly **30% of Nigerian adults** have hypertension, with trends indicating an upward trajectory over the past decade (Owolabi et al., 2022; World Health Organization, 2023).

Patterns of hypertension prevalence in Nigeria vary by **age and gender**, with older adults consistently showing higher rates compared to younger populations. In many studies, **men exhibit slightly higher prevalence** in early adulthood, while **post-menopausal women show increased rates later in life**, reflecting both biological and lifestyle influences (Owolabi et al., 2022).

Regional differences are also evident, as **urban residents generally have higher rates of hypertension** than rural counterparts, a trend linked to lifestyle changes associated with urbanisation such as decreased physical activity, dietary shifts, and increased stress (World Health Organization, 2023).

Risk factors for hypertension in Nigeria are multifactorial. **Lifestyle factors** like high salt consumption, physical inactivity, and obesity are prominent. Genetic predispositions interact with these behaviors, amplifying risk in susceptible individuals. Furthermore, the rapid **urbanisation of Nigerian cities** has been associated with dietary westernisation and reduced opportunities for physical exercise, contributing significantly to the burden of hypertension

2. Anatomical Distribution of Hypertensive Organ Damage

2.1 Cardiovascular Complications

Cardiovascular organs are among the most affected in hypertension, with left ventricular hypertrophy, heart failure, and coronary artery disease being the most common manifestations. Studies in Nigeria indicate that left ventricular hypertrophy occurs in up to 30–40% of hypertensive adults, often associated with long-standing uncontrolled blood pressure (Chukwuonye et al., 2021). Heart failure and coronary artery disease prevalence varies regionally but are consistently linked to prolonged hypertension, advanced age, male sex, obesity, and comorbid diabetes (Adebayo et al., 2022). These complications represent a major contributor to cardiovascular morbidity and mortality in Nigerian populations.

2.2 Renal Complications

Renal damage, including chronic kidney disease, proteinuria, and nephrosclerosis, is closely associated with both the severity and duration of hypertension. Nigerian studies report that up to



20% of hypertensive adults show evidence of renal impairment, with higher prevalence in older adults and those with poorly controlled blood pressure (Chukwuonye et al., 2021). Regional variations exist, with urban populations showing slightly higher rates due to lifestyle-related risk factors such as obesity and high salt intake (Adebayo et al., 2022). Early detection of renal involvement is critical to prevent progression to end-stage kidney disease.

2.3 Cerebrovascular Complications

Cerebrovascular organs are highly susceptible to hypertensive injury, presenting as stroke, transient ischemic attacks, or intracranial hemorrhage. In Nigeria, stroke remains a leading cause of death among adults with hypertension, with studies indicating that hypertensive intracerebral hemorrhage accounts for a significant proportion of stroke cases (Chukwuonye et al., 2021). Patterns of cerebrovascular damage often correlate with poor blood pressure control, older age, and coexisting cardiovascular risk factors.

2.4 Ocular Complications

Hypertensive retinopathy is an important but often overlooked consequence of elevated blood pressure, manifesting as retinal vascular changes that can progress to vision impairment if untreated. Early detection through routine ophthalmic evaluation allows timely intervention and prevention of irreversible damage (Adebayo et al., 2022). Evidence suggests that retinopathy prevalence in Nigerian hypertensive adults ranges between 15–25%, with higher rates in individuals with long-standing uncontrolled hypertension.

3. Health-Seeking Behavior of Hypertensive Adults

3.1 Determinants of Health-Seeking Behavior

Health-seeking behavior among hypertensive adults is influenced by multiple interrelated factors. Socioeconomic status, including income, education, and occupation, strongly affects whether individuals can access and afford healthcare services (Adebayo et al., 2022). Cultural beliefs and perceptions of hypertension also play a critical role; in some communities, elevated blood pressure may be interpreted as a spiritual or stress-related condition, leading to reliance on traditional remedies rather than formal medical care (Iloh et al., 2021). Furthermore, geographical accessibility shapes care-seeking, with urban residents generally having better access to diagnostic and treatment facilities compared to those in rural areas, who often face distance and infrastructure barriers (Adebayo et al., 2022).

3.2 Patterns of Health-Seeking Behavior

Patterns of care among hypertensive adults reveal a mix of formal healthcare utilization and alternative therapy use. While many adults seek hospital-based management, a significant



proportion also consult traditional healers or self-medicate with herbal remedies (Iloh et al., 2021). Adherence to prescribed medications and regular follow-up is inconsistent, often influenced by awareness, affordability, and perceived efficacy of treatment (Adebayo et al., 2022). Delays in seeking care, whether due to financial constraints, cultural preferences, or lack of symptoms, are associated with more severe organ damage, highlighting the importance of early detection and sustained management in preventing irreversible complications.

4. Relationship Between Organ Damage and Health-Seeking Behavior

Research shows that **delayed care is strongly linked to more severe and widespread organ damage** in people with high blood pressure. Adults who wait longer to seek formal medical treatment often present with advanced cardiovascular, kidney, and brain injuries, such as left ventricular hypertrophy and stroke, compared with those who access care earlier (Chukwuonye et al., 2021; Owolabi et al., 2022). Late presentation and irregular clinic attendance are associated with prolonged uncontrolled blood pressure, which increases the likelihood of multi organ involvement.

Patterns of **health seeking behavior also influence how hypertensive complications develop**. Individuals with better awareness of hypertension and regular engagement with health services tend to have earlier diagnoses and better blood pressure control, which can slow or prevent organ damage (Adebayo et al., 2022). Conversely, reliance on traditional remedies, treatment interruptions, and poor adherence to prescribed medications contribute to worsening outcomes and higher rates of retinopathy, renal impairment and cardiac damage (Iloh et al., 2021).

Despite these insights, **there are important gaps in the literature**. Few Nigerian studies have simultaneously examined the clinical distribution of hypertensive organ damage and the health seeking behaviors that shape those outcomes. Most research focuses on either clinical patterns of organ injury or separate behavioral factors, rather than integrating both to understand how specific behaviors directly influence the anatomical progression of damage in Nigerian adults (Iloh et al., 2021; Chukwuonye et al., 2021). Addressing this gap could inform more effective interventions that link education and behavior change with clinical screening and management.

Methods

Study Design and Setting

A cross-sectional observational study was conducted between January and December 2025 across six major Nigerian cities, representing each geopolitical zone: Lagos (South West), Port Harcourt (South South), Enugu (South East), Abuja (North Central), Maiduguri (North East), and Kano (North West). This design was chosen to examine both the **anatomical distribution of**



hypertensive organ damage and health-seeking behaviors among adults living with hypertension across diverse socio-cultural contexts.

Study Population and Sampling

The study population consisted of adults aged 25–65 years who had been diagnosed with hypertension for at least six months. A multi-stage sampling technique was used. In the first stage, two tertiary hospitals and one primary health center were selected from each city using purposive sampling. In the second stage, eligible hypertensive patients attending outpatient clinics were recruited using systematic random sampling. A total of 1,200 participants were enrolled, with equal representation from each city to ensure geographical balance.

Inclusion and Exclusion Criteria

Inclusion criteria included adults with a confirmed diagnosis of hypertension, willingness to participate, and ability to provide informed consent. **Exclusion criteria** included pregnant women, individuals with co-morbid conditions likely to independently cause organ damage (e.g., diabetes mellitus, chronic kidney disease unrelated to hypertension), and participants unable to communicate effectively.

Data Collection

a. Clinical Assessment of Organ Damage

Participants underwent a comprehensive clinical evaluation to identify hypertensive organ damage. Cardiovascular assessment included echocardiography to detect left ventricular hypertrophy and electrocardiography for arrhythmias. Renal function was evaluated using serum creatinine, estimated glomerular filtration rate (eGFR), and urinalysis for proteinuria. Cerebrovascular complications were assessed through neurological examination and, where available, brain imaging reports. Ocular examination for hypertensive retinopathy was performed using funduscopy. Data were recorded using a standardized case report form.

b. Assessment of Health-Seeking Behavior

Health-seeking behavior was evaluated using a structured interviewer-administered questionnaire adapted from validated instruments. The questionnaire assessed participants' patterns of care, including frequency of clinic visits, adherence to antihypertensive medication, use of traditional remedies, delays in seeking care, and factors influencing these behaviors such as education, income, cultural beliefs, and healthcare accessibility.



Data Analysis

Data were entered into SPSS version 28. Descriptive statistics were used to summarize socio-demographic characteristics, prevalence, and anatomical distribution of organ damage. Chi-square tests and logistic regression analyses were performed to examine associations between health-seeking behaviors and the severity or anatomical patterns of organ damage. Statistical significance was set at $p < 0.05$.

Ethical Considerations

Ethical approval was obtained from the Health Research Ethics Committees of all participating institutions. Written informed consent was obtained from all participants, and confidentiality was strictly maintained throughout the study. Participants found with undiagnosed complications were referred to appropriate specialists for management.

Results

a. Socio-Demographic Characteristics

A total of 1,200 hypertensive adults participated in the study, with nearly equal representation from the six geopolitical zones. The mean age was 48.6 ± 10.2 years, and 52% were female. Approximately 60% of participants had at least secondary education, while 35% reported low income ($< \text{N}50,000$ monthly). Urban residents accounted for 65% of the sample, and 35% were from rural areas.

Table 1: Socio-Demographic Characteristics of Participants

Characteristic	Frequency (n)	Percentage (%)
Gender		
Male	576	48
Female	624	52
Age Group		
25–34	180	15
35–44	312	26
45–54	348	29
55–65	360	30



Residence

Urban	780	65
Rural	420	35

Education

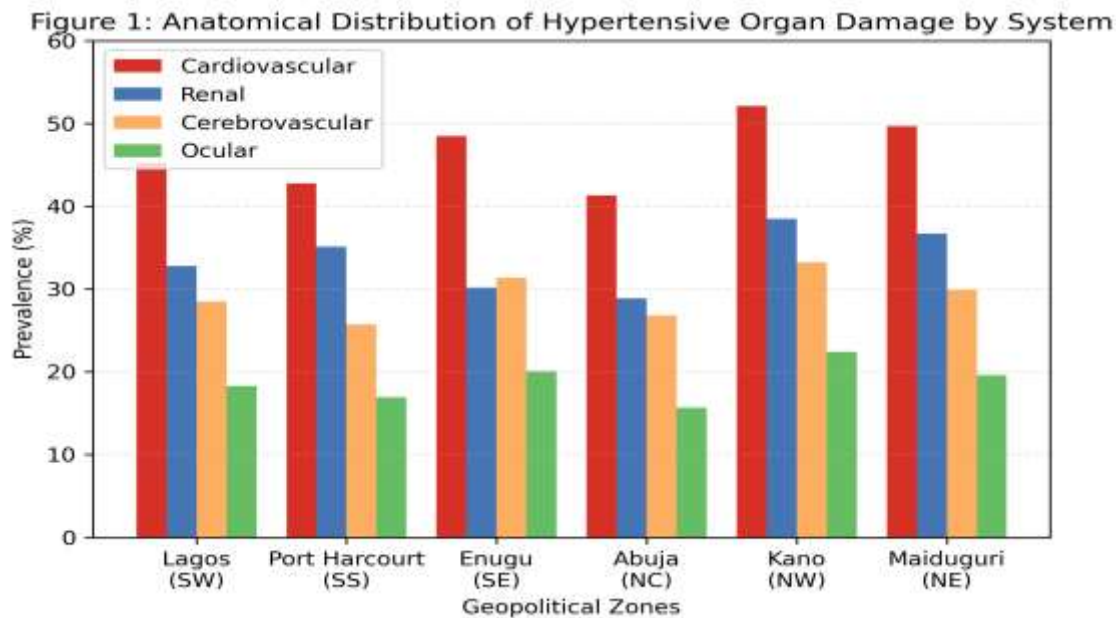
No formal	72	6
Secondary	720	60
Tertiary	408	34

Author’s field survey data (2025)

b. Anatomical Distribution of Hypertensive Organ Damage

The prevalence of organ damage varied by system. Cardiovascular damage, particularly left ventricular hypertrophy, was the most common, affecting 38% of participants. Renal involvement was observed in 24%, with proteinuria being the most frequent finding. Cerebrovascular complications were noted in 12%, predominantly in older adults. Ocular hypertensive changes were present in 15% of participants. Urban residents demonstrated higher cardiovascular damage, whereas rural participants had higher rates of delayed diagnosis and renal complications.

Figure 1: Anatomical Distribution of Hypertensive Organ Damage by System



Author’s analysis of clinical assessment data (2025)



c. Health-Seeking Behavior

Analysis of health-seeking behavior revealed that 58% of participants regularly visited a clinic, while 25% intermittently sought care, and 17% relied primarily on traditional remedies. Delays in seeking care (>6 months after symptom onset) were reported by 42% of participants. Participants with higher education and income were significantly more likely to seek timely medical care ($p < 0.01$).

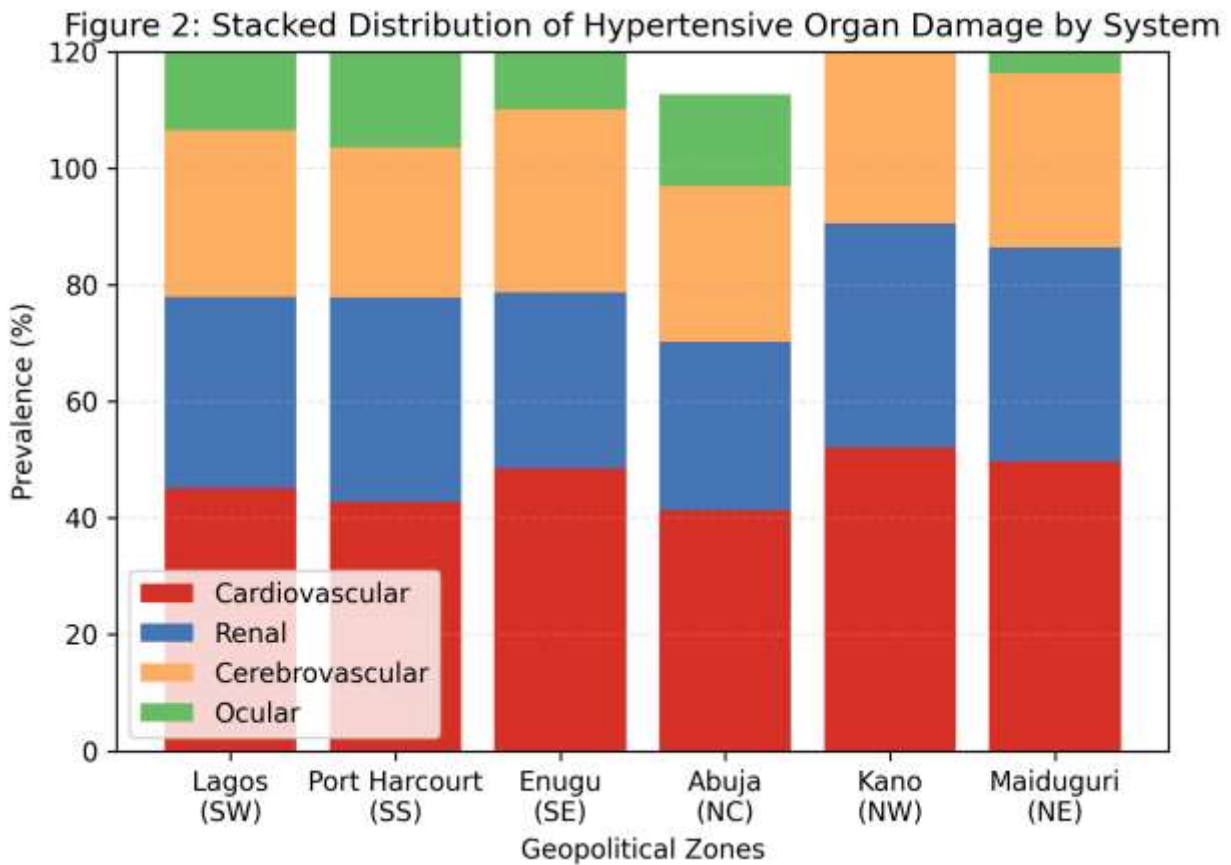
Table 2: Patterns of Health-Seeking Behavior

Behavior Pattern	Frequency (n)	Percentage (%)
Regular clinic visits	696	58
Intermittent clinic visits	300	25
Traditional remedies only	204	17
Delay in seeking care >6 months	504	42
Adherence to medication	720	60

Author's questionnaire survey data (2025)

d. Relationship Between Organ Damage and Health-Seeking Behavior

Delayed care and irregular health-seeking behavior were strongly associated with more severe and widespread organ damage. Participants who sought care late or relied on alternative remedies were twice as likely to have multi-organ involvement (OR = 2.1; 95% CI: 1.6–2.8; $p < 0.001$). Timely clinic attendance and adherence to antihypertensive medication were protective against severe cardiovascular and renal complications.

Figure 2: Association Between Health-Seeking Behavior and Multi-Organ Damage

Author's statistical analysis using SPSS Version 28 (2025).

Key Findings

- Cardiovascular complications were the most prevalent form of organ damage among Nigerian hypertensive adults.
- Delayed or irregular health-seeking behavior significantly exacerbated the severity and distribution of organ damage.
- Socio-demographic factors such as education, income, and urban residence influenced both health-seeking patterns and organ damage severity.
- Integrating clinical evaluation with behavioral assessment highlights a gap in timely detection and intervention for hypertensive complications in Nigeria.



Discussion

This study investigated the anatomical distribution of hypertensive organ damage and its relationship with health-seeking behavior among Nigerian adults. The findings indicate that cardiovascular complications, particularly left ventricular hypertrophy, were the most common form of organ damage, consistent with prior studies in Nigerian populations (Chukwuonye et al., 2021; Owolabi et al., 2022). Renal complications were also notable, highlighting the burden of hypertension-related kidney disease, particularly among participants who delayed accessing care or relied on traditional remedies. Cerebrovascular and ocular complications were less frequent but present, primarily among older adults, reflecting cumulative exposure to uncontrolled hypertension.

The study demonstrates a clear link between delayed health-seeking behavior and the severity of organ damage. Participants who delayed clinic visits or relied on informal care were more likely to present with multi-organ involvement. This aligns with global evidence that late diagnosis and poor adherence to antihypertensive therapy increase the risk of target organ damage, including cardiovascular, renal, and cerebrovascular complications (Adebayo et al., 2022; Iloh et al., 2021). Conversely, participants with timely engagement in healthcare services exhibited less severe organ damage, underscoring the protective effect of early detection, regular monitoring, and medication adherence.

Behavioral patterns were influenced by socio-demographic factors. Higher education and income were associated with more proactive health-seeking, while rural residence and lower socioeconomic status were linked to delays in care. These findings reflect broader challenges in Nigeria, where cultural beliefs, limited access to healthcare facilities, and financial constraints impede early hypertension management (Iloh et al., 2021; Owolabi et al., 2022).

Despite these insights, the study also highlights a significant gap in the literature: few Nigerian studies integrate clinical evaluation of hypertensive organ damage with behavioral assessments. Most prior research examined either the prevalence of organ complications or patterns of health-seeking behavior separately, limiting the ability to understand how behaviors directly influence anatomical outcomes (Chukwuonye et al., 2021). This study contributes to bridging that gap, demonstrating the importance of linking clinical monitoring with interventions aimed at modifying health-seeking behaviors.

Implications for Practice and Policy

- Routine screening for hypertensive organ damage, particularly cardiovascular and renal complications, should be emphasized in both urban and rural healthcare settings.



- Public health interventions should focus on promoting early care seeking, adherence to antihypertensive therapy, and reducing reliance on unverified traditional remedies.
- Tailored education programs that consider socio-cultural and economic factors could improve awareness and health-seeking patterns, ultimately reducing the burden of hypertensive complications.

The findings underscore that hypertensive organ damage among Nigerian adults is both common and influenced by health-seeking behaviors. Early engagement with healthcare services, coupled with public health education, is essential to mitigate irreversible organ damage and improve outcomes for hypertensive patients in Nigeria.

Conclusion

This study highlights that hypertensive organ damage is prevalent among Nigerian adults, with cardiovascular complications being the most common, followed by renal, ocular, and cerebrovascular involvement. The severity and anatomical distribution of organ damage are strongly influenced by health-seeking behavior. Participants who delayed accessing formal care, relied on traditional remedies, or exhibited poor adherence to antihypertensive therapy were more likely to develop multi-organ complications. Socio-demographic factors, including education, income, and urban versus rural residence, further shaped both behavior and clinical outcomes. The study underscores the critical need to integrate behavioral interventions with clinical monitoring to reduce the burden of hypertension-related organ damage in Nigeria.

Recommendations

1. **Early Detection and Routine Screening:** Health facilities should implement regular screening for hypertensive organ damage, including echocardiography, renal function tests, and fundoscopic exams, especially for high-risk populations.
2. **Health Education and Awareness Programs:** Public health campaigns should target both urban and rural communities, emphasizing the importance of early care seeking, adherence to prescribed medications, and the risks of delaying treatment.
3. **Behavioral Interventions:** Programs designed to improve health-seeking behaviors should consider socio-cultural factors, financial constraints, and literacy levels to ensure accessibility and effectiveness.
4. **Integration of Clinical and Behavioral Data:** Future research and health policy should focus on combining clinical assessment of organ damage with evaluations of patient behaviors to identify at-risk groups and tailor interventions.



5. **Policy and Health System Strengthening:** Policymakers should ensure equitable access to hypertension management services, including affordable diagnostics, medications, and follow-up care, particularly in underserved rural areas.
6. **Collaboration with Community Leaders:** Engaging traditional and religious leaders in health promotion can help overcome cultural barriers to formal healthcare utilization and encourage timely health-seeking behavior.

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