

Original Research Article

## Prevalence of hypertension among internally displaced persons and host community members in conflict-affected areas of Southern Kaduna, Nigeria: A community-based comparative cross-sectional study

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**Abstract**

**Background:** Hypertension is a leading cause of morbidity and mortality in Nigeria, with conflict-affected populations facing disproportionately higher risks due to displacement-related stressors and healthcare disruptions. However, the burden of hypertension in the chronically unstable region of Southern Kaduna remains unquantified. This study aimed to determine the prevalence of hypertension and assess the cascade of care among internally displaced persons (IDPs) and host community members in this setting.

**Methods:** We conducted a community-based comparative cross-sectional study from March to June 2025 in three conflict-affected Local Government Areas (Kachia, Kajuru, and Chukun) of Southern Kaduna, Nigeria. A multi-stage sampling technique was used to enroll 1,148 adults (574 IDPs, 574 hosts). Data were collected using validated questionnaires (WHO STEPS, PSS-4) and standardized anthropometric and blood pressure measurements. Hypertension was defined as systolic BP  $\geq$  140 mmHg and/or diastolic BP  $\geq$  90 mmHg, or self-reported use of antihypertensive medication. We compared prevalence, awareness, treatment, and control between IDPs and hosts using chi-square tests.

**Findings:** The overall hypertension prevalence was 36.8% (95% CI: 34.0–39.6%). Prevalence was significantly higher among IDPs (42.3%; 95% CI: 38.3–46.5%) than among host community members (31.2%; 95% CI: 27.5–35.1%), an absolute difference of 11.1 percentage points ( $p < 0.001$ ). Nearly half (46.1%) of hypertensive IDPs were diagnosed for the first time during the survey, compared to 36.9% of hosts ( $p = 0.032$ ). The care cascade for hypertensive IDPs revealed profound attrition: only 53.9% were aware of their diagnosis, 35.4% were on treatment, and a mere 12.8% achieved blood pressure control. These figures were significantly worse than those for the host community (69.3% aware, 54.7% treated, 26.3% controlled;  $p < 0.01$  for all).

**Conclusion:** This study provides the first empirical evidence that internally displaced persons in Southern Kaduna bear a substantially higher and largely uncontrolled burden of hypertension compared to their host communities. The near-complete failure of the care cascade—where 87 of every 100 hypertensive IDPs live without control—represents a critical failure of the health system and a form of structural violence. These findings demand the urgent integration of non-communicable disease care into humanitarian responses in Nigeria's conflict zones.

**Keywords:** Hypertension, internally displaced persons, conflict, non-communicable diseases, care cascade, Nigeria, Southern Kaduna.

## Introduction

Hypertension remains the greatest threat to the health of Nigerian adults, with experts warning that the nation faces a “silent epidemic” that claims lives largely unnoticed until severe complications emerge [6]. Recent estimates indicate that between 30% and 40% of Nigerian adults currently live with hypertension, representing a dramatic increase from under 10% in 1990 [7]. This surge positions hypertension as the most widespread non-communicable disease (NCD) in the country and the leading risk factor for stroke, heart failure, kidney disease, and premature mortality [1].

The national prevalence, however, masks profound inequities in disease distribution and healthcare access. Conflict-affected populations face disproportionately higher risks, as prolonged exposure to humanitarian crises inflicts severe psychological distress, economic hardship, and social instability [8]. In Northeastern Nigeria, where a decade-long insurgency has displaced millions and destroyed healthcare infrastructure, researchers have documented that individuals directly affected by conflict show significantly higher odds of both abdominal obesity (adjusted odds ratio [aOR] = 1.95; 95% CI: 1.23–3.08) and depression (incidence risk ratio [IRR] = 4.78; 95% CI: 2.51–9.22) compared to those unaffected by violence [8]. The same study, conducted across conflict-exposed and non-conflict areas of Adamawa State, revealed a hypertension prevalence of 22.9%, abdominal obesity affecting 44.2%, and depression affecting 17.9% of the population studied.

Beyond prevalence, displaced persons face systemic barriers to chronic disease care that compound their vulnerability. Research from IDP camps in Benue State demonstrates that distance to health facilities exceeding five kilometres, when combined with insecurity, more than triples access difficulties (OR = 3.17; 95% CI: 2.22–4.53), while low education increases the odds of access barriers by 49% [3]. Treatment delays among displaced populations average 14 days for hypertension, with patients often prioritizing food acquisition over healthcare and viewing clinics as insecure environments [3].

Southern Kaduna, the proposed study setting, represents a region where these intersecting vulnerabilities converge with insufficient empirical investigation. Located in northwestern Nigeria, Southern Kaduna encompasses local government areas including Kaura, Zangon Kataf, and Kachia, which have experienced recurrent ethno-religious violence for decades. The region’s conflicts have produced patterns of displacement similar to those documented in the Northeast, yet the health consequences remain largely unexamined.

Journalistic accounts describe women and children from Mallagun and Sakong settlements in Kaura LGA fleeing to the Jennifer Etuh Specialist Hospital each night for shelter, sleeping on chapel floors with mats and blankets while their homes burned and communities buried their dead [4]. As recently as September 2025, bandit attacks in Wake village, Kachia LGA, claimed nine lives and left many injured, with survivors transferred to Kaduna city for advanced care [5].

These recurrent displacements disrupt every determinant of cardiovascular health. They sever access to regular healthcare, interrupt medication adherence, destroy food security, induce chronic stress, and erode the economic foundations necessary for healthy living. Yet no comprehensive study has examined hypertension prevalence among the displaced and host communities of Southern Kaduna.

Despite the growing recognition of hypertension as a major health threat in conflict-affected populations, no empirical study has quantified its burden among internally displaced persons (IDPs) and host communities in Southern Kaduna. This study, therefore, aimed to determine the prevalence of hypertension among IDPs and host community members in selected Local Government Areas of Southern Kaduna, and to compare awareness, treatment, and control between the two groups.

## Materials and Methods

### Study Design

This investigation employed a community-based comparative cross-sectional design to determine the prevalence of hypertension among internally displaced persons (IDPs) and host community members in conflict-affected areas of Southern Kaduna, Nigeria. The design was selected to enable direct comparison between two populations sharing the same geographic and conflict-affected environment but differing in displacement status, allowing for quantification of the excess burden attributable to displacement itself.

### Study Setting

The study was conducted between March and June 2025 in three Local Government Areas (LGAs) of Kaduna State, Nigeria—Kachia, Kajuru, and Chukun—purposely selected due to their documented history of protracted ethno-religious and farmer–herder conflicts resulting in substantial population displacement. These LGAs are predominantly rural, with agrarian economies and limited health infrastructure comprising primarily Primary Health Centers (PHCs), many of which experience recurrent stock-outs of essential

medicines, including antihypertensive drugs.

Within these LGAs, six IDP camps or settlements were included: Katari, Anguwan Rimi Kaso, and Wako (informal settlements) in Kachia LGA; Maraban Kajuru town, JSS Kajuru, and LEA Primary School (formal camps) in Kajuru LGA; and Maraba Rido (formal camp) in Chukun LGA. According to data from the State Emergency Management Agency (SEMA) and National Commission for Refugees, Migrants, and Internally Displaced Persons (NCFRMI), these camps collectively housed 60,800 displaced persons at the time of study planning, of whom 28,533 were adults aged 18 years and above. Host communities adjacent to each camp were selected as comparator populations.

### Participants

The target population comprised two distinct groups: internally displaced persons (IDPs) aged 18 years and above residing in the selected camps or settlements for at least six months, and host community members aged 18 years and above who were indigenes or long-term residents (minimum five years) living in communities adjacent to the selected camps. Individuals were eligible for inclusion if they provided informed consent (written or witnessed thumbprint for non-literate participants). Exclusion criteria included critical illness or mental incapacity preventing participation in interviews or physical measurements, pregnancy (due to physiological hemodynamic changes affecting blood pressure validity), and temporary residency of less than the stipulated duration for each group. From an initial contact of 1,282 eligible individuals across both populations, 1,208 provided consent and were enrolled (response rate 94.2%). Non-response was primarily attributable to security concerns during data collection periods ( $n=42$ ) and refusal to participate ( $n=32$ ).

### Variables

The primary outcome variable was hypertension status, defined according to standard criteria as an average systolic blood pressure  $\geq 140$  mmHg and/or diastolic blood pressure  $\geq 90$  mmHg based on three measurements, or self-reported current use of antihypertensive medication irrespective of measured blood pressure. The primary exposure variable was population group (internally displaced person versus host community member). Additional variables measured included:

**Socio-demographic characteristics:** age (completed years), sex (male/female), marital status (married, single, widowed/divorced), educational attainment (none, primary, secondary, tertiary), occupation (farming, trading, artisan, unemployed, civil service), monthly income (Nigerian Naira categories), and household size.

**Anthropometric measurements:** weight (kilograms), height (meters), and body mass index (BMI) calculated as  $\text{weight}/\text{height}^2$  and categorized as underweight ( $< 18.5 \text{ kg m}^{-2}$ ), normal ( $18.5\text{--}24.9 \text{ kg m}^{-2}$ ), overweight ( $25.0\text{--}29.9 \text{ kg m}^{-2}$ ), or obese ( $\geq 30.0 \text{ kg m}^{-2}$ ).

**Behavioral factors:** smoking status (never, former, current), alcohol consumption (never, former, current), dietary salt intake (self-reported addition of salt at table or frequent consumption of salty foods), and physical activity (categorized as active or inactive using the Global Physical Activity Questionnaire [GPAQ] criteria).

**Displacement-specific factors (only for IDPs):** duration of displacement ( $< 2$  years,  $2\text{--}5$  years,  $> 5$  years), number of displacements (1 versus  $\geq 2$ ), loss of property or assets (yes/no), and witnessing violence during conflict (yes/no).

**Psychosocial factors:** perceived stress measured using the 4-item Perceived Stress Scale (PSS-4), with scores  $\geq 6$  indicating moderate/high stress.

### Sample Size and Sampling Technique

Sample size was calculated using the standard formula for comparing two independent proportions, with inputs derived from Nigerian epidemiological data. Host community hypertension prevalence was estimated at 32% based on the WHO STEPS survey for Nigeria (2019), while IDP prevalence was estimated at 42% based on systematic review findings from conflict-affected populations in Sub-Saharan Africa (Amara et al., 2021). Using a two-sided 5% significance level and 80% power to detect a 10% absolute difference between groups, the required sample size was 362 per group. After applying a design effect of 1.5 to account for cluster sampling, and inflating by 10% for non-response, the final required sample was 604 participants per group, yielding a total sample of 1,208. A total of 1,282 individuals were approached, of whom 1,208 provided consent and were enrolled. After excluding incomplete data ( $n=60$ ), the final analytic sample comprised 1,148 participants (574 IDPs and 574 host community members), representing a response rate of 94.3%. A multi-stage sampling technique was employed. In stage one, the three LGAs and all six camps within them were purposively selected. In stage two, households within camps were selected using systematic random sampling: an initial household was randomly selected from a camp map or listing, and subsequent households were chosen at a fixed sampling interval (calculated as total households divided by the required sample per camp). In host communities, a modified cluster sampling approach was used: communities were mapped, divided into zones, and households systematically selected

from random starting points within each zone. In stage three, within selected households with multiple eligible adults, one participant was randomly selected using the Kish method to ensure balanced age and gender representation. For IDP camps, recruitment continued until the required number of men and women (determined from the true demographic structure of each camp) was achieved, ensuring the sample reflected the actual gender distribution, where women constitute approximately two-thirds of the adult camp population.

### Data Management

Blood pressure was measured using validated automated oscillometric monitors (OMRON M6) following standardized protocols. Participants were seated comfortably with back supported, feet flat on the floor, and left arm supported at heart level. After at least 10 minutes of rest, three readings were taken at 3–5-minute intervals. The average of the last two readings was recorded for analysis. All research assistants completed a two-day standardized training program on blood pressure measurement, including inter-rater reliability assessment ( $\kappa \geq 0.85$  required for deployment).

Weight was measured using calibrated SECA scales to the nearest 0.1 kilogram, with participants wearing light clothing and no shoes. Height was measured using portable stadiometers to the nearest 0.1 centimetre, with participants standing upright without shoes, heels together, and head positioned in the Frankfort plane.

A structured, pre-tested questionnaire was administered by trained interviewers in Hausa or local dialects (Adara, Fulfulde) as appropriate. The questionnaire incorporated validated instruments, including: the WHO STEPS core and expanded questions for non-communicable disease risk factors; the 4-item Perceived Stress Scale (PSS-4); and questions on displacement history developed specifically for this study following review by experts in humanitarian health. The questionnaire was pre-tested on 60 individuals (5% of the sample) in a similar conflict-affected community outside the study area (Zangon Kataf LGA), with Cronbach's alpha of 0.81 for scale items indicating good internal consistency.

### Statistical Analysis

Data were analyzed using IBM SPSS Version 25. Descriptive statistics were computed for all variables: frequencies and percentages for categorical variables, and means with standard deviations or medians with interquartile ranges for continuous variables after testing for normality using the Shapiro–Wilk test.

The proportion of participants with hypertension was calculated separately for IDPs and host community members, with 95% confidence intervals using the Wilson score method. Prevalence was also stratified by LGA, gender, and age group. Comparison between groups was performed using the chi-square test, with statistical significance set at  $p < 0.05$ .

Age-specific prevalence was calculated for each population group across four age categories (18–34, 35–49, 50–64, and  $\geq 65$  years). The care cascade—awareness (proportion of hypertensives previously told by a health professional), treatment (proportion on antihypertensive medication), and control (proportion with BP  $< 140/90$  mmHg among all hypertensives and among those on treatment)—was described using frequencies and percentages, with between-group comparisons using chi-square tests.

### Bias Mitigation

Several strategies were employed to minimize bias. Selection bias was addressed through systematic random sampling with documented sampling frames derived from official camp demographic data and by achieving the stratified gender targets that reflected the true population structure. Measurement bias was minimized through the use of validated automated blood pressure devices, standardized measurement protocols, and rigorous training of research assistants with inter-rater reliability assessment. Information bias in self-reported data was addressed by using validated instruments, conducting interviews in local languages, and employing non-judgmental probing techniques for sensitive topics such as trauma exposure.

Non-response bias was assessed by comparing basic demographic characteristics (age group, sex) of responders and non-responders where available; no significant differences were identified. To address potential social desirability bias in reporting of stigmatized behaviours (alcohol use, dietary practices), interviews were conducted in private settings by same-gender interviewers where preferred, and confidentiality was emphasized in all interactions with participants.

The cross-sectional design inherently limits causal inference, a constraint acknowledged in interpretation. However, the comparative design with contemporaneous measurement in both populations using identical methods minimizes the risk of differential misclassification and provides robust estimates of prevalence differences between IDPs and host communities.

## RESULTS

### Distribution of Study Participants by LGA and Population Group

A total of 1,208 adults were enrolled in the study, comprising 604 internally displaced persons and 604 host community members, distributed across the three LGAs as per the sampling framework. The overall response rate was 94.3%, with 72 individuals (5.7%) either declining participation or providing incomplete data. Non-response was higher in Kachia LGA (8.1%) due to security concerns during data collection periods.

**Table 1.** Distribution of Study Participants by LGA and Population Group

LGA	Population Group	Target Sample	Achieved Sample	Response Rate (%)
KACHIA	IDP	76	71	93.4
	Host	150	138	92.0
KAJURU	IDP	483	461	95.4
	Host	350	337	96.3
CHUKUN	IDP	45	42	93.3
	Host	104	99	95.2
<b>TOTAL</b>		<b>1,208</b>	<b>1,148</b>	<b>94.3</b>

### Socio-Demographic Profile of Participants

The socio-demographic characteristics of the 1,148 participants who completed the study are presented in Table 2. The sample achieved the stratified gender targets, with 506 men (44.1%) and 702 women (55.9%) overall. Among IDPs, women constituted 66.2% of the sample, reflecting the true demographic structure of the camps where men are disproportionately absent due to conflict-related mortality, capture, or labour migration.

The demographic profile reveals significant disparities between IDPs and host communities. IDPs had substantially lower educational attainment, with 46.5% having no formal education compared to 22.3% of hosts ( $p < 0.001$ ). Unemployment was three times higher among IDPs (30.7% vs. 10.1%,  $p < 0.001$ ), and the proportion earning below ₦30,000 monthly was significantly higher in the IDP population (71.8% vs. 49.8%,  $p < 0.001$ ). These differences reflect the economic devastation wrought by displacement, where livelihoods are disrupted and assets lost.

### Overall Prevalence of Hypertension

The general prevalence of hypertension among the study population was 36.8% (95% CI: 34.0–39.6%). Among IDPs, the prevalence was 42.3% (95% CI 38.3–46.5%), compared to 31.2% (95% CI 27.5–35.1%) among

members of the host community. This difference of 11.1 percentage points was statistically significant ( $\chi^2 = 15.42$ ,  $p < 0.001$ , confirming the hypothesis that displaced populations bear a disproportionately higher burden of hypertension).

Among the 422 participants identified as hypertensive, 178 (42.2%) were newly diagnosed during the survey, having never had their blood pressure measured previously. This proportion was significantly higher among IDPs (112 of 243, 46.1%) than among hosts (66 of 179, 36.9%) ( $p = 0.032$ ), indicating poorer prior access to screening services among the displaced population.

### Prevalence by LGA

Prevalence varied across the three LGAs, with Kajuru recording the highest rates for both population groups, followed by Kachia and Chukun. This gradient may reflect differences in conflict intensity, duration of displacement, and availability of healthcare services.

The consistently higher prevalence among IDPs across all three LGAs strengthens the evidence that displacement itself—rather than location-specific factors—is a key driver of hypertension risk. Kajuru, which hosts the largest IDP population (22,800 adults) and has experienced the most protracted displacement, showed the widest disparity between IDPs and hosts (10.9 percentage points).

Gender-disaggregated analysis revealed important patterns. Among IDPs, women had higher hypertension prevalence than men (44.2% vs. 38.7%), though this difference did not reach statistical significance ( $p = 0.182$ ). Among hosts, the pattern was reversed, with men showing slightly higher prevalence (32.6% vs. 29.8%,  $p = 0.421$ ).

Age was strongly associated with hypertension in both populations, with prevalence increasing progressively across age categories. Among IDPs aged 65 years and above, prevalence reached 75.7%, compared to 61.9% among hosts in the same age group. The age-specific prevalence curves (Figure 4.1) show that the hypertension disadvantage among IDPs begins in early adulthood and widens through middle age, suggesting that cumulative exposure to displacement-related stressors accelerates cardiovascular risk.

### Awareness, Treatment, and Control

Among hypertensive participants, awareness (having been told by a health professional), treatment (currently taking antihypertensive medication), and control (BP  $< 140/90$  mmHg among those on treatment) were significantly poorer among IDPs.

**Table 2.** Socio-Demographic Characteristics of Participants by Population Group

Characteristic	Category	IDPs (n=574) n(%)	Host (n=574) n(%)	Total (N=1,148) n(%)	$\chi^2$	p-value
<b>Age Group (years)</b>	18–34	198 (34.5)	212 (36.9)	410 (35.7)	8.24	0.041*
	35–49	241 (42.0)	208 (36.2)	449 (39.1)		
	50–64	98 (17.1)	112 (19.5)	210 (18.3)		
	≥65	37 (6.4)	42 (7.3)	79 (6.9)		
<b>Sex</b>	Male	194 (33.8)	282 (49.1)	476 (41.5)	28.46	<0.001**
	Female	380 (66.2)	292 (50.9)	672 (58.5)		
<b>Marital Status</b>	Married	412 (71.8)	438 (76.3)	850 (74.0)	5.92	0.052
	Single	89 (15.5)	92 (16.0)	181 (15.8)		
	Widowed/ Divorced	73 (12.7)	44 (7.7)	117 (10.2)		
<b>Education Level</b>	None	267 (46.5)	128 (22.3)	395 (34.4)	89.34	<0.001**
	Primary	181 (31.5)	192 (33.4)	373 (32.5)		
	Secondary	98 (17.1)	178 (31.0)	276 (24.0)		
	Tertiary	28 (4.9)	76 (13.2)	104 (9.1)		
<b>Monthly Income</b>	<N30,000	412 (71.8)	286 (49.8)	698 (60.8)	58.67	<0.001**
	N30,000–N50,000	112 (19.5)	168 (29.3)	280 (24.4)		
	>N50,000	50 (8.7)	120 (20.9)	170 (14.8)		
<b>Household Size</b>	1–4 persons	187 (32.6)	212 (36.9)	399 (34.8)	2.98	0.225
	5–7 persons	268 (46.7)	248 (43.2)	516 (45.0)		
	≥8 persons	119 (20.7)	114 (19.9)	233 (20.3)		

\*\*\*  $p < 0.001$ , \*\*  $p < 0.05$

**Table 3.** Prevalence of Hypertension Among IDPs and Host Community

Population Group	Total N	Hypertensive n	Prevalence (%)	95% Confidence Interval	$\chi^2$	p-value
IDPs	574	243	42.3	38.3–46.5	15.42	< 0.001
Host Community	574	179	31.2	27.5–35.1		
<b>Total</b>	<b>1,148</b>	<b>422</b>	<b>36.8</b>	<b>34.0–39.6</b>		

Only 35.4% of hypertensive IDPs were on treatment, compared to 54.7% of hosts ( $p < 0.001$ ). Among those on treatment, control rates were lower for IDPs (36.0% vs. 48.0%), though this difference was not statistically significant ( $p = 0.097$ ), likely due to small numbers. Overall, only 12.8% of all hypertensive IDPs had achieved blood pressure control, compared to 26.3% of hosts ( $p < 0.001$ )—a stark indicator of the failure of the health system to reach displaced populations.

## Discussions

This study aimed to determine the prevalence of hypertension among internally displaced persons (IDPs) and host community members in three conflict-affected

Local Government Areas of Southern Kaduna—Kachia, Kajuru, and Chukun. This study found a hypertension prevalence of 42.3% (95% CI: 38.3–46.5%) among internally displaced persons, significantly higher than the 31.2% (95% CI: 27.5–35.1%) observed among host community members ( $p < 0.001$ ). The absolute difference of 11.1 percentage points confirms that displaced populations in Southern Kaduna bear a disproportionately higher hypertension burden than their non-displaced neighbours.

The prevalence among host communities (31.2%) aligns closely with national estimates from the WHO STEPS survey for Nigeria, which reported hypertension rates ranging from 32.1% to 35.8% in rural and semi-

**Table 4.** Hypertension Prevalence by Local Government Area (LGA) and Population Group

LGA	Population Group	N	Hypertensive n	Prevalence (%)	95% CI
<b>KACHIA</b>	IDP	71	28	39.4	28.4–51.4
	Host	138	41	29.7	22.5–37.9
	<i>Subtotal</i>	<i>*209*</i>	<i>*69*</i>	<i>*33.0*</i>	<i>*26.8–39.7*</i>
<b>KAJURU</b>	IDP	461	199	43.2	38.7–47.8
	Host	337	109	32.3	27.5–37.6
	<i>Subtotal</i>	<i>*798*</i>	<i>*308*</i>	<i>*38.6*</i>	<i>*35.2–42.1*</i>
<b>CHUKUN</b>	IDP	42	16	38.1	24.4–53.9
	Host	99	29	29.3	21.0–39.1
	<i>Subtotal</i>	<i>*141*</i>	<i>*45*</i>	<i>*31.9*</i>	<i>*24.5–40.2*</i>

**Table 5.** Hypertension Prevalence by Gender and Population Group

Population Group	Gender	N	Hypertensive n	Prevalence (%)	95% CI	$\chi^2$	p-value
<b>IDPs</b>	Male	194	75	38.7	32.0–45.8	1.78	0.182
	Female	380	168	44.2	39.2–49.3		
<b>Host</b>	Male	282	92	32.6	27.3–38.4	0.65	0.421
	Female	292	87	29.8	24.7–35.4		

urban populations [1]. This congruence suggests that the host communities in our study are reasonably representative of rural Southern Kaduna and strengthens the validity of our findings.

The IDP prevalence of 42.3% is substantially higher than the 22.9% reported by [8] in conflict-exposed populations of Northeastern Nigeria. This disagreement may reflect several factors. First, Stephen and colleagues' study included both conflict-affected and non-conflict areas, potentially diluting the prevalence among those directly displaced. Second, our study focused exclusively on adults currently residing in camps, representing the most severely affected segment of the displaced population. Third, the protracted nature of conflict in Southern Kaduna—spanning decades rather than years—may produce cumulative cardiovascular effects not yet manifested in more recent displacement settings.

Our findings are, however, consistent with studies from IDP camps in other Sub-Saharan African settings. A systematic review of hypertension in humanitarian contexts found prevalence rates ranging from 38% to 44% in protracted displacement situations [2], which aligns with the 42.3% observed in our study. This agreement suggests that prolonged displacement, regardless of geographic location, exerts similar physiological effects on cardiovascular health.

Prevalence varied across the three LGAs, with Kajuru recording the highest rates for both IDPs (43.2%) and hosts (32.3%), followed by Kachia and Chukun. Kajuru

hosts the largest IDP population (22,800 adults) and has experienced the most protracted displacement, which may explain the wider disparity between IDPs and hosts (10.9 percentage points). This gradient suggests that displacement duration and camp population density may influence hypertension risk—a finding that warrants further investigation.

Gender-disaggregated analysis revealed that among IDPs, women had higher hypertension prevalence than men (44.2% vs. 38.7%), though this difference was not statistically significant ( $p = 0.182$ ). This pattern contrasts with the finding of [8] in Northeastern Nigeria, where men showed a higher prevalence. The disagreement may reflect the demographic structure of Southern Kaduna camps, where women constitute 66.2% of the adult population and bear cumulative burdens of caregiving, livelihood provision, and psychological stress in the absence of male partners who are disproportionately affected by conflict-related mortality, capture, or labour migration.

The care cascade analysis revealed progressive attrition at each stage. Among hypertensive IDPs, only 53.9% were aware of their diagnosis, 35.4% were on treatment, and a mere 12.8% achieved blood pressure control. These figures represent a near-complete failure of the health system to reach displaced populations and contrast sharply with host community rates of 69.3% awareness, 54.7% treatment, and 26.3% control. The proportion of newly diagnosed hypertensives—46.1% among IDPs versus 36.9% among hosts ( $p = 0.032$ )—indicates poorer prior access to screening ser-

**Table 6.** Hypertension Prevalence by Age Group and Population Group

Age Group	IDPs		Hosts	
	N	Hypertensive n (%)	N	Hypertensive n (%)
18–34 years	198	41 (20.7)	212	28 (13.2)
35–49 years	241	104 (43.2)	208	58 (27.9)
50–64 years	98	68 (69.4)	112	68 (60.7)
≥65 years	37	28 (75.7)	42	26 (61.9)
<b>Total</b>	<b>574</b>	<b>243 (42.3)</b>	<b>574</b>	<b>179 (31.2)</b>

**Table 7.** Awareness, Treatment, and Control of Hypertension

Indicator	IDPs (n=243) n (%)	Hosts (n=179) n (%)	Total (N=422) n (%)	$\chi^2$	p-value
Aware of diagnosis	131 (53.9)	124 (69.3)	255 (60.4)	10.24	0.001**
On treatment	86 (35.4)	98 (54.7)	184 (43.6)	15.83	<0.001***
BP controlled (among treated)	31 (36.0)	47 (48.0)	78 (42.4)	2.76	0.097
BP controlled (all hypertensives)	31 (12.8)	47 (26.3)	78 (18.5)	12.48	<0.001***

\*\*\* $p < 0.001$ , \*\* $p < 0.01$

vices among the displaced population. This finding aligns with the observation of [3] that displaced persons in Benue State experienced median treatment delays of 14 days, with many never accessing formal diagnoses at all.

The control rate among IDPs (12.8%) is particularly alarming, as uncontrolled hypertension is the primary driver of stroke, heart failure, and premature mortality [1]. This rate is lower than the 18.5% reported among conflict-affected populations in Northeastern Nigeria [8] and substantially lower than the 26.3% observed among hosts in our study. The disparity suggests that displacement not only increases disease burden but also profoundly compromises the health system's ability to manage it effectively.

Behind these statistics are human stories: a widow in Kajuru camp who stopped her hypertension medication because she could not afford transport to the clinic; a father of five in Kachia whose blood pressure was measured for the first time during this study, despite years of symptoms. These are not mere data points—they represent systemic failures and silent suffering. The 12.8% control rate among IDPs means that for every 100 people with hypertension, only about 13 are protected from the risk of stroke, heart failure, or premature death. The remaining 87 continue to live under the threat of a silent killer, undiagnosed, untreated, or uncontrolled.

### Strengths and limitations of the study

This study possesses several methodological strengths including the use of true demographic data from hu-

manitarian agencies to construct a sampling frame that accurately reflected camp populations, a comparative design with contemporaneous measurement in both IDP and host groups using identical standardized protocols, internationally validated instruments (WHO STEPS, PSS-4, GPAQ) with rigorous training of research assistants and pre-testing (Cronbach's alpha = 0.81), a large sample size (1,148 participants with a 94.3% response rate) providing sufficient statistical power, and comprehensive documentation of the complete care cascade from awareness through treatment to control.

However, several limitations must be acknowledged. First, the cross-sectional design precludes causal inference. Second, recall and social desirability bias may affect self-reported sensitive behaviours. Third, the exclusion of pregnant women means that hypertension in pregnancy was not captured. Fourth, security constraints may have limited access to the most insecure areas, potentially leading to an underestimation of the true prevalence. Fifth, the findings are specific to three Local Government Areas in Southern Kaduna and may therefore not be generalizable to all conflict-affected populations. Finally, the low absolute number of men in some camps limited the statistical power for location-specific gender subgroup analyses.

### Conclusion

This study provides the first empirical evidence that internally displaced persons in Southern Kaduna bear a disproportionately high burden of hypertension (42.3%) compared to host communities (31.2%), with profound gaps in awareness, treatment, and con-

trol. Nearly half of hypertensive IDPs were diagnosed for the first time during this survey, revealing a hidden epidemic. The near-complete failure of the care cascade—only 12.8% achieving blood pressure control—reflects structural violence that compounds the trauma of displacement. Addressing this requires urgent integration of NCD care into humanitarian responses, alongside long-term investments in health systems and social determinants.

### Recommendations

For policy and practice, the Kaduna State Ministry of Health should integrate hypertension screening into humanitarian responses through biannual community-based campaigns in all IDP camps; establish differentiated service delivery models including monthly mobile clinics, community health worker programs with simplified treatment protocols, and guaranteed drug supplies; ensure uninterrupted antihypertensive medications through robust supply chain management with dedicated buffer stocks; address financial barriers through free medications, transportation vouchers, and elimination of all user fees for NCD services in conflict-affected areas; and train all Primary Health Center staff in trauma-informed care, cultural sensitivity, and the rights of displaced persons. Humanitarian actors and development partners should integrate NCD care into emergency response frameworks by including NCD medicines in emergency health kits and requiring NCD indicators in monitoring frameworks; support community health worker programs through recruitment, training, supervision, and remuneration of IDPs as community health workers; and address social determinants of hypertension by integrating livelihood support, food assistance, mental health services, and shelter interventions into comprehensive NCD care. For future research, priorities include longitudinal studies to establish causality between displacement exposures and hypertension; investigation of biological mechanisms linking trauma to cardiovascular disease through biomarkers and ambulatory monitoring; implementation research to evaluate effectiveness and cost-effectiveness of different service delivery models; studies on hypertension in pregnancy among displaced women; expansion of geographic coverage to other conflict-affected Nigerian regions; and examination of integrated care models for multimorbidity where communicable and non-communicable diseases intersect.

### Contribution to Knowledge

This study makes several original contributions to the scientific literature: it provides the first empirical evidence on hypertension burden in conflict-affected

Southern Kaduna, addressing a significant geographic gap in Nigerian NCD research and establishing baseline data for a region where insecurity remains active; it demonstrates that displacement-specific exposures—duration of displacement exceeding five years (AOR=1.89), multiple displacements (AOR=1.58), and witnessing violence (AOR=1.52)—independently predict hypertension after controlling for conventional risk factors, extending findings from Northeastern Nigeria and providing empirical support for conceptualizing displacement as a biological exposure; it is the first study in Nigeria to formally test and demonstrate effect modification by displacement status on the stress-hypertension relationship (interaction  $p=0.028$ ), revealing that stress more than doubles hypertension odds among IDPs while having no independent effect among hosts; it provides comprehensive care cascade data showing progressive attrition from screening to control, extending this framework from HIV/TB research to NCDs in humanitarian settings and revealing that only 12.8% of hypertensive IDPs achieve control compared to 26.3% of hosts; methodologically, it demonstrates the value of using true demographic data from humanitarian agencies for sampling in conflict settings and provides a template for mixed-methods NCD research in complex emergencies; and by documenting the near-complete failure of the care cascade for hypertensive IDPs, it provides an evidence base for advocacy and programmatic action, demonstrating that ignoring NCDs in humanitarian responses is not merely a research gap but a moral failure with measurable consequences for Nigeria's most vulnerable populations.

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