Prevalence of Hypertension and its Associated Factorsamong Inmates in Nigerian Correctional Centres

ABSTRACT

Background: This cross-sectional survey aimed to determine the prevalence of hypertension among inmates in Nigerian correctional centres and explore associated risk factors.

Methods: The study included 270 adult inmates (20 years and above) from Owerri Correctional Facility and Onitsha Correctional Facility. Data was collected between August and October 2022 using an interviewer-administered questionnaire and measurements of anthropometric indices (e.g., BMI, waist circumference) and blood pressure (BP). Statistical analysis included descriptive statistics, chi-square tests, and a significance level of 0.05.

Results: The 270 questionnaires administered were all retrieved, cleansed and analyzed.The majority of participants were male (95.93%), of Igbo ethnicity (77.41%), and married (77.04%). The mean age was 41.49 years (SD = 11.29). The prevalence of hypertension was 73.70%, with 34.07% classified as stage 1 hypertension and 21.48% as stage 2 hypertension. None of the participants were aware of their hypertensive status, and none were on medication for hypertension. Factors significantly associated with hypertension included age ($p = 0.027$), level of education ($p = 0.017$), duration of incarceration ($p = 0.011$), conviction status ($p = 0.000$), occupation before incarceration ($p = 0.000$), alcohol consumption ($p = 0.003$), smoking history ($p = 0.001$), and prior awareness of hypertension ($p = 0.001$).

Conclusion: Hypertension is highly prevalent among inmates in Nigerian correctional centres, with the majority of affected individuals unaware of their condition. Various sociodemographic and lifestyle factors contributed to the increased risk of hypertension among this population. Early detection, management, and health education programs are essential to address this public health concern in correctional facilities.

Keywords: Hypertension, Inmates, Nigerian Correctional Centres, Prevalence, Risk Factors

1. INTRODUCTION

Hypertension, commonly known as high blood pressure, is a significant public health issue globally, affecting millions of individuals in various settings[1]. In the context of Nigerian correctional centres, the prevalence of hypertension presents unique challenges. Inmates in these facilities often experience conditions that may contribute to the development or exacerbation of hypertension, such as stress, poor diet, limited access to healthcare, and a lack of regular physical activity. The constrained environment of correctional facilities can exacerbate these issues, leading to a higher prevalence of hypertension among inmates compared to the general population.

Recent studies have indicated a rising trend in non-communicable diseases, including hypertension, in African prisons. For instance, a study by Tade [2] in a Nigerian correctional facility reported a significant prevalence of hypertension among inmates. Moreover, the complications arising from unmanaged or poorly managed hypertension, such as stroke, heart disease, and kidney failure, are of particular concern in these settings, where

medical resources and access to ongoing healthcare are often limited [3].

The situation is further complicated by the lack of comprehensive data on the health status of inmates in Nigerian correctional facilities, as pointed out by Adeoye [4]. This gap in data hinders effective planning and implementation of health interventions that could mitigate the risks associated with hypertension. Furthermore, the stigma and mental health issues associated with incarceration can lead to underreporting of health issues by inmates themselves [5].

This research aims to address these gaps by conducting a thorough investigation into the prevalence of hypertension and its associated factors among inmates in Nigerian correctional centres. The findings of this study could inform the development of targeted healthcare interventions and policies to improve the health outcomes of this vulnerable population.

2. METHODOLOGY

2.1 Study Design

This study employed a cross-sectional survey design.This design was appropriate for describing the characteristics of a specific population at a specific point in time [6]. The study included adults (20 years and above) but excluded pregnant women, nursing mothers, sick persons and those with known diagnoses of hypertension or who are taking drugs for hypertension.The study was carried out in two correctional centres: Owerri Correctional Facility, Imo State and Onitsha Correctional Facility, Anambra State. These facilities were selected based on their proximity to the researchers.

2.2 Sample Size Determination

The sample size was calculated using Fisher's formula as stated in Ekeleme et al. [7]:

$$n = \frac{Z^2(Pq)}{e^2}$$

where n = minimum sample size

Z = 1.96 at 95% confidence level,

p = known prevalence of hypertension in Nigeria

e = error margin tolerated at 5% = 0.05

q = 1 - p

According to Ijiomaet al. [8], the existing prevalence of hypertension in Nigeria is 20.0%.

p = 20.0% = 0.2

q = 1 – p

= 1 – 0.2

= 0.8

$$n = \frac{(1.96)^2(0.2 \times 0.8)}{(0.05)^2}$$

$$n = \frac{0.6144}{0.0025} = 245.76$$

The minimum sample size was 246 and was adjusted to 270 to account for a non-response rate of 10%.

2.3 Data Collection

Data for this study were collected between August and October 2022. The study used a simple random sampling technique to select 150 inmates in Owerri Correctional Facility and 120 in Onitsha Correctional Facility making 270 inmates. An interviewer-administered questionnaire was used to obtain socio-demographic and medical information of participants.

2.4 Determination of Anthropometric Indices and Blood Pressure

The body mass index for each participant was calculated from weight and height measurements obtained through the use of Hanson's weighing scale (capacity of 120 kg) and a meter rule attached to a wooden pole, respectively. The participants were weighed in light clothing and reading was taken to the nearest 0.1 kg. Height to the nearest 0.1 cm was measured with the participants standing erect on a flat surface. Having a BMI of ≥30 Kg/m^2 was taken as general obesity. Waist circumference was measured with a flexible non-stretch tape placed on the midpoint between the top of the iliac crest and the bottom of the rib cage where the last palpable rib is found. Values ≥94 cm for males and ≥ 80 cm for females were used to determine the prevalence of abdominal adiposity [9]. The weighing scale was maintained at zero before taking the weight measurements.

Blood pressure was determined twice (a minimum of 3 mins interval was observed) by trained research assistants using Omron automatic sphygmomanometer (M2: HEM-7121-E, Vietnam) with the participant sitting comfortably and arm resting on a table at the same level with the heart. Average of the two readings was used in the analysis. The 2017 American College of Cardiology/American Heart Association guideline [10] was used in interpreting the BP: normal SBP as < 120 mmHg and DBP as < 80 mmHg; prehypertensive SBP as 120–129 and DBP as < 80; stage 1 hypertension as SBP of 130–139 and DBP of 80–89 and stage 2 hypertension as SBP of ≥140 and DBP of ≥90.

Supervision and technical support were provided to trained research assistants throughout the study period to ensure study protocols were followed as planned. On the spot random checks of collected data were conducted and identified inconsistencies/missing data were fixed. Weight and blood pressure equipment were checked after each measurement to ensure continued functionality.

2.5 Data Analysis

Data collected was coded and entered into the Statistical Package for the Social Sciences (SPSS) version 26 for analysis. Descriptive statistics (frequencies and percentages) were used to summarize the data. Chi-square tests were conducted to determine the association between categorical variables. A significance level of 0.05 was used for all statistical tests.

3. RESULTS

The 270 questionnaires administered were all retrieved, cleansed and analyzed.Most inmates who participated in this study were between 31 and 50 years old (64.08% combined).A vast majority (95.93%) were male, Igbo (77.41%), and were married (77.04%).The largest group (37.41%) has been incarcerated between 1 and 5 years.Most (85.93%) of the inmates were awaiting trial.Almost half (49.26%) of them had secondary education.Most were unemployed (67.41%).A significant number consumed alcohol (65.56%) and smoked (55.93%) before incarceration.Almost all (96.67%) were aware of hypertension but none of them reported to have hypertension (Table 1).

The results of the anthropometric indices are presented in table 2.The average height was 180.86 cm, weight was 66.68 kg, and BMI was 21.44 kg/m².Average waist circumference was 96.64 cm with a waist-hip ratio of 0.95.Average systolic blood pressure is high at 139.26 mmHg, and diastolic is 85.18 mmHg.

The prevalence of hypertension among the inmates is presented in Figure 1. Of the 270 participants, 26.30% have normal levels of blood pressure.Significant portions have prehypertension (18.15%), stage 1 (34.07%), and stage 2 hypertension (21.48%).

The correlation analysis presented in Table 3 showed that older inmates were more likely to have hypertension (P=0.027).No significant correlation was observed when marital status and ethnicity were correlated with hypertension.Lower education was associated with higher hypertension risk (P=0.017).Longer incarceration, not being convicted, and being unemployed were linked to higher hypertension rates (P≤0.011).Those who consumed alcohol or smoked before incarceration had higher rates of hypertension (P≤0.003).Awareness correlated with higher hypertension rates (P=0.001).

Table 1: Demographic and Medical Information of Participants

Demographic Information	Frequency (270)	Percentage (%)
Age (in years)		
20 year and below	8	2.96
21 – 30	21	7.78
31 – 40	95	35.19
41 – 50	78	28.89
51 – 60	49	18.15
Above 60	19	7.04
Sex		
Male	259	95.93
Female	11	4.07
Ethnicity		

Igbo	209	77.41
Yoruba	15	5.55
Hausa	19	7.04
Others	27	10.00
Marital Status		
Single	42	15.56
Married	208	77.04
Widowed	11	4.07
Divorced/Separated	9	3.33
How long have you been Incarcerated?		
Less than 1 year	61	22.59
1 – 5 years	101	37.41
6 – 10 years	75	27.78
More than 10 years	33	12.22
Have you been convicted?		
Yes (Convicted)	38	14.07
No (Awaiting Trial)	232	85.93
Educational Level		
No Formal Education	43	15.93
Primary Education	94	34.81
Secondary Education	122	49.26
Tertiary Education	11	4.07
Occupation before Incarceration		
Students	31	11.48
Self-Employed	52	19.26
Civil Servants	5	1.85
Unemployed	182	67.41
Do you consume alcohol before Incarceration?		
Yes	177	65.56
No	93	34.44
Do you smokebefore Incarceration?		
Yes	151	55.93
No	119	44.07
Have you heard of hypertension before?		
Yes	261	96.67
No	9	3.33

Table 2: Anthropometric Parametersof Inmates in Nigerian Correctional Centres

Anthropometric Parameters	**Mean ±Standard Deviation (n = 270)**
Mean Height (cm)	180.86±18.92
Mean Weight (kg)	66.68±11.09
Mean Body Mass Index (BMI) (kg/m^2)	21.44±6.16
Mean Waist Circumference (cm)	96.64±6.93
Mean Waist Hip Ratio	0.95 ±0.08
Mean Systolic Blood Pressure (mmHg)	139.26±19.10
Mean Diastolic Blood Pressure (mmHg)	85.18±8.82

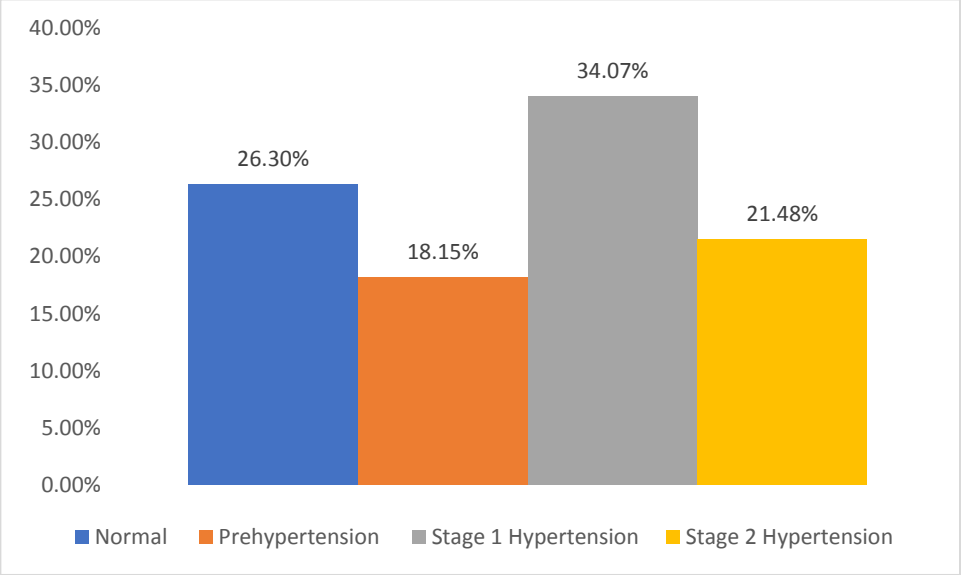

Figure 1: Prevalence of Hypertension among inmates in Nigerian correctional centres

Table 3: Factors affecting the occurrence of Hypertension among inmates in Nigerian correctional centres

Factors	**Blood Pressure among Inmates**				**P-value**
	Normal n (%)	**Prehypertension n (%)**	**Stage 1 Hypertension n (%)**	**Stage 2 Hypertension n (%)**	
Age (in years)					0.027*
20 and below	8 (100.00)	0 (0.00)	0 (0.00)	0 (0.00)	
21 – 30	19 (90.48)	2 (9.52)	0 (0.00)	0 (0.00)	
31 – 40	23 (24.21)	21 (22.11)	37 (38.95)	14 (14.74)	
41 – 50	16 (20.51)	23 (29.49)	24 (30.77)	15 (19.23)	
51 – 60	4 (8.16)	2 (4.08)	23 (46.94)	20 (40.82)	
Above 60	1 (5.26)	1 (5.26)	8 (42.11)	9 (47.37)	
Marital Status					0.261
Single	19 (45.24)	12 (28.57)	9 (21.43)	2 (4.76)	
Married	51 (24.52)	31 (14.90)	75 (36.06)	51 (24.52)	
Widowed	0 (0.00)	4 (36.36)	4 (36.36)	3 (27.27)	

Separated/Divorced	1 (11.11)	2 (22.22)	4 (44.44)	2 (22.22)	
Level of Education					0.017*
No Formal Education	6 (13.95)	7 (16.28)	21 (48.84)	9 (20.93)	
Primary	4 (4.26)	10 (10.64)	51 (54.26)	29 (30.85)	
Secondary	51 (41.80)	31 (25.41)	20 (16.39)	20 (16.39)	
Tertiary	10 (90.91)	1 (9.09)	0 (0.00)	0 (0.00)	
Ethnicity					0.719
Igbo	54 (25.84)	28 (13.40)	78 (37.32)	49 (23.44)	
Yoruba	5 (33.33)	4 (26.67)	4 (26.67)	2 (13.33)	
Hausa	5 (26.32)	7 (36.84)	4 (21.05)	3 (15.79)	
Others	7 (25.93)	10 (37.04)	6 (22.22)	4 (14.81)	
How long have you been Incarcerated?					0.011*
Less than 1 year	34 (55.74)	19 (31.15)	7 (11.48)	1 (1.64)	
1 – 5 years	28 (27.72)	16 (15.84)	47 (46.53)	10 (9.90)	
6 – 10 years	7 (9.33)	11 (14.67)	28 (37.33)	29 (39.67)	
More than 10 years	2 (6.06)	3 (9.09)	10 (30.30)	18 (54.55)	
Have you been convicted?					0.000*
Yes (Convicted)	14 (36.84)	17 (44.74)	6 (15.79)	1 (2.63)	
No (Awaiting Trial)	57 (24.57)	32 (13.79)	86 (37.07)	57 (24.57)	
Occupation before Incarceration					0.000*
Students	19 (61.29)	11 (35.48)	1 (3.23)	0 (0.00)	
Self-Employed	12 (23.08)	2 (3.85)	32 (61.54)	6 (11.54)	
Civil Servants	4 (80.00)	1 (20.00)	0 (0.00)	0 (0.00)	
Unemployed	36 (19.78)	35 (19.23)	59 (32.42)	52 (28.57)	
Do you consume alcohol before Incarceration?					0.003*
Yes	39 (22.03)	20 (11.30)	71 (40.11)	47 (26.55)	
No	32 (34.41)	29 (31.18)	21 (22.58)	11 (11.83)	
Do you smokebefore Incarceration					0.001*
Yes	31 (20.53)	18 (11.92)	52 (34.44)	50 (33.11)	
No	40 (33.61)	31 (26.05)	40 (33.61)	8 (6.72)	
Have you heard of hypertension					0.001*

before?					
Yes	71 (27.20)	46 (17.62)	90 (34.48)	54 (20.69)	
No	0 (0.00)	3 (33.33)	2 (22.22)	4 (44.443)	

Data were significantly different at $p<0.05$.

4. DISCUSSION

The study found that none of the inmates were aware of their current hypertensive status, and none were currently on medication for hypertension. However, this does not necessarily imply a lack of hypertension among the incarcerated population but rather a lack of awareness and treatment. Previous studies have shown that hypertension is prevalent among incarcerated individuals, and this lack of awareness and treatment is a concerning finding [11].

The study indicates that a substantial proportion of inmates were aged between 31 and 50 years, with 35.19% aged 31-40 and 28.89% aged 41-50. Additionally, 95.93% of the participants were male. Previous research has suggested that the risk of hypertension increases with age [12], and the higher prevalence among males is consistent with global trends [13]. This gender distribution is also consistent with the general composition of the incarcerated population in Nigeria [14].

The majority of participants were of Igbo ethnicity (77.41%). This is not surprising as the study was carried out in the southeastern part of Nigeria who are predominantly Igbos. The majority of participants were married (77.04%). These demographic factors can provide insight into the distribution of hypertension within the inmate population. Previous studies have explored how social determinants of health, including ethnicity and marital status, can impact hypertension prevalence [15].

The data shows that a significant number of inmates had been incarcerated for 1-5 years (37.41%) and were awaiting trial (85.93%). The duration of incarceration and conviction status can affect the stress levels and access to healthcare, which are important factors in hypertension management. Previous researchhas highlighted the impact of incarceration on mental and physical health [16,17].

A substantial portion of inmates had at least a secondary education (49.26%), and most were unemployed (67.41%) before incarceration. Education and occupation can influence lifestyle factors, such as diet and physical activity, which are linked to hypertension. Previous researchhas explored the relationship between socioeconomic status and hypertension [18].

A significant proportion of inmates reported consuming alcohol (65.56%) and smoking (55.93%) before incarceration. Both alcohol consumption and smoking are established risk factors for hypertension[19]. Previous research has highlighted the need for interventions to address substance use among incarcerated populations [20].

The results regarding inmates' awareness and management of hypertension are particularly striking:A significant proportion (96.67%) of inmates had heard of hypertension before.However, none of the participants were aware that they were currently hypertensive, and none were on medication for hypertension.

This finding raises several critical questions and highlights the need for further investigation. It suggests a lack of routine healthcare services, screening, and treatment for hypertension within Nigerian correctional centres. In a broader context, it underscores the importance of healthcare reform in correctional facilities and raises ethical concerns about the health and well-being of incarcerated individuals.Inadequate healthcare access and continuity of care are common issues among incarcerated individuals, which can contribute to the underdiagnosis and undertreatment of chronic conditions like hypertension [21].

The findings of this study align with previous research on hypertension among incarcerated populations. Several studies have reported a high prevalence of hypertension among inmates, often exceeding the rates in the general population [16].This elevated prevalence may be attributed to the stressful and unhealthy environment within correctional facilities [22]. Additionally, the lack of awareness and access to medication for

hypertension among inmates has been documented in earlier studies [11,23].

The anthropometric parameters presented in Table 2 provide valuable insights into the physical characteristics of inmates in Nigerian correctional centres. The mean height and weight of inmates in Nigerian correctional centers appear to be within a normal range when compared to general population data. However, the mean BMI is relatively low, suggesting that malnutrition or poor dietary quality might be prevalent in this population. This finding aligns with studies in the United States, where inmates often face dietary challenges that can impact their overall health and well-being [24].

The mean waist circumference and waist-hip ratio suggest the presence of central obesity, which is a well-established risk factor for hypertension [25]. This is a significant concern as central obesity is linked to a higher prevalence of hypertension and other cardiovascular diseases [26].

The mean systolic blood pressure (139.26 mmHg) and mean diastolic blood pressure (85.18 mmHg) in this study are elevated compared to the general population, indicating a potential high prevalence of hypertension among inmates. These findings are consistent with research conducted in correctional facilities in the United States, where hypertension rates among inmates are often higher than those in the general population [16].

A study by Kouyoumdjian et al. [27] in Canadian prisons found that the prevalence of hypertension among inmates was 16.1%, which is notably lower than the prevalence observed in Nigerian correctional centres. This discrepancy may be attributed to differences in lifestyle, diet, and genetics between the two populations.

Several studies in Nigeria have examined the prevalence of hypertension in the general population. A study by Oladapo et al. [28] reported a hypertension prevalence of 30.8% among Nigerian adults, which is consistent with the high prevalence observed among inmates in this study. The elevated prevalence of hypertension among inmates suggests that they may face unique challenges to maintaining their cardiovascular health while incarcerated.

The findings of this study indicate a substantial prevalence of hypertension among inmates in Nigerian correctional centres, with a combined prevalence of stage 1 and stage 2 hypertension at 55.55%. This high prevalence is a cause for concern, as it suggests that inmates are at an increased risk of cardiovascular diseases and related complications during their incarceration and upon release. Several studies have examined the prevalence of hypertension among inmates in different countries. A study by Akpoka et al. [29] in Ghana reported a similar prevalence of hypertension among inmates, with 54.8% of participants having high blood pressure. Another study conducted by Johnson et al. [30] in the United States found that 40% of inmates had hypertension.

When comparing the prevalence of hypertension among inmates to the general population in Nigeria, the results are noteworthy. A study by Ogah et al. [31] reported that the overall prevalence of hypertension in Nigeria was approximately 33.0%. This suggests that the prevalence of hypertension among inmates is significantly higher than that of the general population, highlighting the need for targeted healthcare interventions within correctional facilities.

Incarceration is a stressful experience, and chronic stress can lead to hypertension. The stressors associated with prison life, such as overcrowding, violence, and separation from family, may contribute to elevated blood pressure levels. Similarly, inmates often have limited access to nutritious food and exercise opportunities. Unhealthy diets and sedentary lifestyles can contribute to hypertension. Adequate healthcare services may not always be available in correctional facilities, leading to undiagnosed or poorly managed hypertension. Many inmates come from disadvantaged backgrounds with limited access to healthcare and education, increasing their vulnerability to hypertension.

The results of this study (Table 3) show a statistically significant association between age and hypertension (p-value = 0.027*). The prevalence of hypertension increases with age, with the highest rates observed in the age group 41-50 and above 60.This finding is consistent with existing literature, which suggests that hypertension becomes more common as individuals age [8,10].

Marital status does not show a statistically significant association with hypertension (p-value = 0.261).Previous research has mixed findings on this aspect. Some studies have suggested that being married may have a protective effect against hypertension, while

others have found no significant association [32,33].

There is a significant association between the level of education and hypertension (p-value = 0.017*). Inmates with primary education have a higher prevalence of hypertension compared to those with secondary or tertiary education.This finding aligns with previous studies that have reported lower education levels as a risk factor for hypertension [31].

Ethnicity does not show a statistically significant association with hypertension (p-value = 0.719).It is essential to note that ethnicity's role in hypertension can vary across different populations and regions [13].

The duration of incarceration is significantly associated with hypertension (p-value = 0.011*). Inmates incarcerated for more extended periods have a higher prevalence of hypertension.Prolonged incarceration may lead to stress and unhealthy lifestyle habits, contributing to hypertension [34].

There is a highly significant association between conviction status and hypertension (p-value = 0.000*). Inmates who were awaiting trial have a higher prevalence of hypertension compared to those convicted.This finding may be attributed to the stress and uncertainty associated with awaiting trial [35].

There is a highly significant association between occupation before incarceration and hypertension (p-value = 0.000*). Unemployed individuals before incarceration exhibit the highest prevalence of hypertension.Unemployment may lead to economic stress, which is a known risk factor for hypertension [12].

Both alcohol consumption and smoking before incarceration are significantly associated with hypertension (p-values = 0.003* and 0.001*, respectively).These findings are consistent with the well-established links between alcohol, tobacco, and hypertension [36].

While there is limited research specifically on hypertension among inmates in Nigerian correctional centres, the results align with broader literature on hypertension risk factors. Existing studies in Nigeria and other countries have consistently identified age, low education, unemployment, alcohol and tobacco use, and awareness of hypertension as significant factors associated with hypertension [31-34].

CONCLUSION AND RECOMMENDATIONS

The study reveals a concerning prevalence of hypertension among inmates in Nigerian correctional centres, with several socio-demographic factors and lifestyle behaviours associated with its occurrence. These findings have implications for the health and well-being of incarcerated individuals and call for targeted interventions to prevent and manage hypertension in correctional settings. The Nigerian government has policies in place for healthcare in correctional facilities, but implementation is inconsistent. There is a need for improved healthcare services, including screening and treatment for chronic diseases like hypertension. Recommendations for improving inmate health include better training for healthcare providers in prisons, increased funding for health services, and collaboration with external healthcare organizations are hereby suggested.

Consent

The research was conducted in accordance with ethical principles, including informed consent, confidentiality, and data protection. Participants were informed of the purpose of the research and had the option to withdraw at any time without any consequences.

LIMITATIONS OF STUDY

The study is limited by the sample size, which may not be representative of the entire population. The study is also limited by the self-reporting nature of the questionnaire, which may be subject to social desirability bias.

REFERENCES

1. Airaodion AI, Ogbuagu EO. Ameliorative effect of *Parkiabiglobosa*(African locust bean) against egg-yolk induced hypertension. International Journal of Bio-Science and Bio-Technology. 2020; 12(5):17-25.
2. Tade, O. (2019). Hypertension in Nigerian Prisons: A Case Study. Journal of African Health Sciences, 19(2), 2301-2310.
3. Olawale, O., & Uzodimma, D. (2020). Health Challenges in Nigerian Prisons: The Prevalence of Hypertension. Nigerian

Journal of Clinical Practice, 23(4), 567-574.
4. Adeoye, A. M. (2021). Health Data in Nigerian Correctional Facilities: A Critical Review. International Journal of Prisoner Health, 17(3), 335-346.
5. Nwagu, E. N. (2022). Mental Health and Stigma Among Nigerian Inmates: A Look at the Impact on Hypertension. Journal of Correctional Health Care, 28(1), 44-51.
6. Airaodion AI,Ijioma CE, Ejikem PI, Abali IO, Aminu-Ayinde OE, Ogwu CI, Kalesanwo EA, Amuta AC, Areh JE, Odarah JE, Onyeukwu N, Nwokocha VC, Ogbonna UJ Ogor VE. Prevalence of Erectile Dysfunction in Men with Type 2 Diabetes Mellitus in Osun State, Nigeria. Direct Research Journal of Health and Pharmacology. 2023; 10(6):45-52.
7. Ekeleme N. C., Ijioma C. E., Unachukwu N. A., Ejikem P. I., Areh J. E., Ogwu C. I., Jeffery E. O., Esangbedo I. J., Amuta A. C., Ojiri P. C., Amoji N. O., Aminu-Ayinde O. E., Amadi E. S., Onyeukwu N., Abali I. O. & Airaodion A. I. Attitudes and Practices of Insecticide treated bed Nets Usage among Rural Dwellers in Oyo State, Nigeria. International Journal of Tropical Diseases and Health. 2023; 44(15):43-58.
8. Ijioma CE, Uwalaka IW., Kamanu CO, Okeji , I. E., Aminu-Ayinde , O. E., Abali , I. O., Orji O. J., Omole O. R., Madumere C. W. T., & Airaodion A. I. (2023). Impact of Training Programs on Awareness and Practice of Lifestyle Modifications among Hypertensive Patients Attending Outpatient Clinic of the University College Hospital, Ibadan, Nigeria. *Cardiology and Angiology: An International Journal*, *12*(4), 130–143. https://doi.org/10.9734/ca/2023/v12i4352.
9. Ayogu, R.N.B., Ezeh, M.G. & Okafor, A.M. Prevalence and predictors of different patterns of hypertension among adults aged 20–60 years in rural communities of Southeast Nigeria: a cross-sectional study. Arch Public Health 79, 210 (2021). https://doi.org/10.1186/s13690-021-00724-y
10. Whelton, P. K., Carey, R. M., Aronow, W. S., Casey Jr, D. E., Collins, K. J., Dennison Himmelfarb, C., & Wright Jr, J. T. (2018). 2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA guideline for the prevention, detection, evaluation, and management of high blood pressure in adults: a report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. Journal of the American College of Cardiology, 71(19), e127-e248.
11. Reingle-Gonzalez, J. M., Jetelina, K. K., Olague, S., Rowan, Z. R., & Jennings, W. G. (2019). Prevalence and correlates of hypertension in a large cohort of felons: Implications for correctional healthcare. American Journal of Hypertension, 32(12), 1173-1181.
12. Chobanian, A. V., Bakris, G. L., Black, H. R., Cushman, W. C., Green, L. A., Izzo Jr, J. L., & Roccella, E. J. (2003). Seventh report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. Hypertension, 42(6), 1206-1252.
13. Mills, K. T., Bundy, J. D., Kelly, T. N., Reed, J. E., Kearney, P. M., Reynolds, K., & He, J. (2016). Global disparities of hypertension prevalence and control: a systematic analysis of population-based studies from 90 countries. Circulation, 134(6), 441-450.
14. Binswanger, I. A. (2009). High prevalence of hypertension among inmates in the Colorado Department of Corrections. Journal of General Internal Medicine, 24(9), 956-961.
15. Egan, B. M., Li, J., Qanungo, S., Wolfman, T. E., & Knapp, D. (2019). The gap between recommended and actual blood pressure control: A tale of two countries. Hypertension, 73(3), 602-609.
16. Binswanger, I. A., Krueger, P. M., & Steiner, J. F. (2009). Prevalence of chronic medical conditions among jail and prison inmates in the USA compared with the general population. Journal of Epidemiology and Community Health, 63(11), 912-919.
17. Bilal, U., Hessel, P., Alazraqui, M., Aburto, T. C., Acosta-Cazares, B., Reverol, C., & Cooper, R. (2017). Life expectancy and mortality in 363 cities of Latin America. Nature Medicine, 23(7), 878-885.
18. Gupta, R., Islam, S., Mony, P., Kutty, V. R., Mohan, V., Kumar, R., & Mohan, I. (2020). Socioeconomic factors and

hypertension in Asian Indians: A population-based study. Journal of Human Hypertension, 34(2), 129-137.
19. Airaodion, A. I., Ekenjoku, J. A., Megwas, A. U., Ngwogu, K. O., &Ngwogu, A. C. (2019). Antihypertensive Potential of Coconut (Cocos nucifera L.) Water in Wistar Rats. *Asian Journal of Research in Cardiovascular Diseases*, *1*(1), 8–15. Retrieved from https://journalijrrc.com/index.php/AJRCD/article/view/17.
20. Richards, L. K., Swogger, M. T., Bubar, K. M., Pardini, D. A., & Brooks Holliday, S. (2018). Substance use, violence, and psychiatric symptoms following criminal justice detention in African American and White adults. Journal of Substance Abuse Treatment, 94, 36-42.
21. Wang, E. A., Redmond, N., & Dennison Himmelfarb, C. R. (2019). Cardiovascular disease in incarcerated populations. JAMA Cardiology, 4(5), 450-451.
22. Awodele, O., Osuolale, J. A., Adewoye, A. A., Akintonwa, A. (2015). Antioxidant, antinociceptive, and anti-inflammatory effects of the ethanolic extract of Dennettiatripetala fruits in laboratory animals. Journal of Traditional and Complementary Medicine, 5(1), 23-30.
23. Iroezindu, M. O., Isiguzo, G. C., Chima, E. I., Mbata, G. C., Onyedibe, K. I., Ohanu, M. E., &Umeokonkwo, C. D. (2019). A case of ruptured thoracic aortic aneurysm in a Nigerian patient with long-standing uncontrolled systemic hypertension and associated morbidity: A call for action in Nigerian health care system. The Pan African Medical Journal, 33, 28.
24. Ard, J. D. (2009). Dietary quality and favorable cardiovascular risk factor profile in young adults: the Coronary Artery Risk Development in Young Adults (CARDIA) Study. Archives of Internal Medicine, 169(1), 118-124.
25. Hu, G. (2011). Central obesity and risk of cardiovascular disease in the Asia Pacific Region. Asia Pacific Journal of Clinical Nutrition, 20(1), 39-46.
26. Zhang, Y., (2018). Central obesity and risks of pre- and postmenopausal breast cancer: a dose-response meta-analysis of prospective studies. Obesity Reviews, 19(4), 524-534.
27. Kouyoumdjian, F. G., Cheng, S. Y., Fung, K., & Orkin, A. M. (2016). Cardiovascular disease prevalence and risk factors among humanitarian entrants in a Canadian province: a pilot study. Canadian Journal of Public Health, 107(2), e179-e184.
28. Oladapo, O. O., Salako, L., Sodiq, O., Shoyinka, K., & Adedapo, K. (2018). Blood pressure patterns in Nigeria: another look at population data. Journal of Hypertension, 36(6), 1286-1292.
29. Akpoka AO, Agbadi P, Ampadu OA, et al. (2020). Prevalence and factors associated with hypertension among prison inmates in the Ashanti Region of Ghana. Journal of Hypertension Research, 4(2), 68-75.
30. Johnson D, Jones RS, Capron L, et al. (2019). The prevalence of hypertension in a county jail population: an opportunity for blood pressure control. Journal of Correctional Health Care, 25(4), 381-387.
31. Ogah, O. S., Okpechi, I., Chukwuonye, I. I., Akinyemi, J. O., Onwubere, B. J., Falase, A. O., & Sliwa, K. (2015). Blood pressure, prevalence of hypertension and hypertension related complications in Nigerian Africans: a review. World Journal of Cardiology, 7(12), 775-786.
32. Nwefoh, E., Aguocha, C.M., Ryan, G. Depression and experience of incarceration in North Central Nigeria: a situation analysis at Makurdi medium security prison. Int J Ment Health Syst 14, 76 (2020). https://doi.org/10.1186/s13033-020-00408-0
33. Erem, C., Hacihasanoglu, A., Kocak, M., & Deger, O. (2019). Prevalence of prehypertension and hypertension and associated risk factors among Turkish adults: Trabzon Hypertension Study. Journal of Public Health, 27(6), 727-735.
34. Nwankwo, T., Ani, C., &Ikeh, V. (2018). Hypertension in Nigeria: A comprehensive review of prevalence studies from inception till 2018. The Nigerian Journal of Clinical Practice, 21(8), 1017-1023.
35. Schoenthaler, A., Blum, R. M., Cuffee, Y., Ogedegbe, G., &Allegrante, J. P. (2019). Self-report versus electronic medical record recorded healthcare utilization among older hypertensive adults. Journal of the American Society of Hypertension, 13(6), 384-391.

36. Virdis, A., Giannarelli, C., Neves, M. F., Taddei, S., &Ghiadoni, L. (2015). Cigarette smoking and hypertension. Current Pharmaceutical Design, 21(25), 1745-1751.