

Adherence to International Guidelines in Antihypertensive Prescriptions among National Health Insurance Enrollees in a Tertiary Hospital Located in Abuja, Nigeria

Grace Julcit Shedul¹, Sylvester Okhuelegbe Eraga^{2,*}, Valentine Uche Odili³, Dikejiunor Bevis Ojji⁴

¹Department of Pharmacy, University of Abuja Teaching Hospital, Gwagwalada, FCT, Abuja, NIGERIA.

²Department of Pharmaceutics and Pharmaceutical Technology, Faculty of Pharmacy, University of Benin, Benin City, NIGERIA.

³Department of Clinical Pharmacy and Pharmacy Practice, Faculty of Pharmacy, University of Benin, Benin City, NIGERIA.

⁴Department of Medicine, University of Abuja Teaching Hospital, Gwagwalada, FCT, Abuja, NIGERIA.

ABSTRACT

Background: Irrational prescription of antihypertensive drugs has become a major problem worldwide. The study aimed at investigating the conformity of antihypertensive prescriptions to current international guidelines among NHIS enrollees in a tertiary hospital and to determine the comorbidities among the patients. **Materials and Methods:** This was a descriptive and retrospective cross-sectional study. A total of 311 case notes of patients who accessed care from January 1st to December 31st, 2018 were retrieved from the Health Information Department of the Hospital. Information on antihypertensive drugs prescribed and their co-morbidities were retrieved. **Results:** Study participants mean age was 49.02 ± 9.16 with age groups of 40 - 59 and 20 - 39 years as the highest and lowest participants, respectively in the study population. Calcium channel blockers (32.44%) were the most prescribed of the antihypertensive drugs, followed by diuretics (13.93%). The majority (84.0%) of the study participants were on combined therapy. Amongst the combination therapies, the 2-drug therapy (28.97%) was most preferred. The commonly used combinations were CCB + ARB (92, 84.40%), CCB + ARB + Diuretic (30, 30.92% and CCB + ACEI + 2 Diuretics (22, 53.65%) for 2-, 3- and 4-drug, respectively. The common comorbidities found among the patients were diabetes mellitus followed by hypertensive heart disease then dyslipidaemia. Antihypertensive prescriptions conformed more with JNC 8 but partially to JNC 7 and ACC/AHA. **Conclusion:** Antihypertensive prescriptions among NHIS enrollees in the University of Abuja Teaching Hospital were in conformity with JNC 8 and adheres partially to other guidelines.

Keywords: Antihypertensives, Prescriptions, Conformity, International guidelines.

Received: 20-10-2022;

Revised: 10-11-2022;

Accepted: 19-12-2022.

DOI : 10.5530/097483261422

Address for
correspondence:

Dr. Sylvester Okhuelegbe
Eraga,

Associate Professor,
Department of Pharmaceutics
and Pharmaceutical Technology,
Faculty of Pharmacy,
University of Benin, Benin City,
300001, Edo State, NIGERIA.
Email id: eragaso@uniben.edu

INTRODUCTION

Hypertension is a disease of public health importance with an increasing burden in many developing countries which are transiting epidemiologically from transmissible diseases to non-transmissible diseases.¹ The trend is made worst by factors like increasing sedentary lifestyle, inadequate health care system and other non-modifiable risk factors.²⁻⁴ Hypertension accounts for an annual loss of about 4.0%

in the gross domestic product (GDP) of developing countries, amounting to the tune of 500 billion dollars.⁵ It is a major contributor to the global burden of diseases affecting over one billion adults worldwide with a projected increase in burden by 30% in the year 2025.⁴ It is the commonest cause of cardiovascular mortality among adults globally with 10.4 million deaths annually.² This disease is regarded as a silent killer because of the progressive target organ damage despite its asymptomatic nature



www.ijopp.org

during its clinical course.⁶

A reduced incidence of stroke, coronary heart disease and overall mortality has been associated with effective management of hypertension.⁷ International guidelines for the treatment of hypertension are available to guide clinicians on the choice and number of drugs in their prescriptions. In 2003, the Joint National Committee (JNC) on the management of hypertension, issued some guidelines known as JNC 7 and a revised version in 2013 (JNC 8).^{8,9} While JNC7 recommended the use of a diuretics alone (thiazide type) or in combination with other classes of drugs in uncomplicated essential hypertension, JNC 8 emphasized the control of both systolic and diastolic blood pressures with age and comorbidity specific treatments. Some recommendations were introduced by the new guidelines, such as the safer use of the angiotensin receptor blockers (ARBs) and the angiotensin converting enzyme inhibitors (ACEIs). In 2017, the American College of Cardiology, in conjunction with the American Heart Association issued an evidence-based guideline for the management of hypertension in adults.¹⁰ This newer guideline was an update of JNC 7, but eliminated prehypertension as a classification and grouped hypertension into two stages; an elevated blood pressure stage, with systolic blood pressure between 120 and 129 mmHg and a diastolic blood pressure less than 80 mmHg and a stage 1 hypertension with systolic blood pressure between 130 and 139 mmHg or a diastolic blood pressure of 80 to 89 mmHg.

Irrational prescription and use of medicines is a major problem globally.¹¹ Prescription of medicine in hypertension is complex and there are other factors such as poly pharmacy, compelling indications, pharmacokinetics, and pharmacodynamic variability and non-compliance that makes this group of patients a high risk as far as drug safety is concerned.¹² WHO has estimated that over half of all prescribed or dispensed medicines are sold inappropriately and about half of these prescribed medications are not taken or consumed by the patients.¹³ The irrational use of medicines leads to wastage of available limited resources and its becoming a general worldwide health challenge.¹⁴

WHO advocates the development of a universal health coverage, on the basis of improving health in the general population.¹⁵ In line with this policy, the Nigerian government have made some efforts through the Federal Ministry of Health since 1988 to reduce the burden of Non-Communicable Diseases (NCDs) in the country, among which include hypertension.¹⁶ The National Health Insurance Scheme (NHIS) was instituted by the Federal Government of Nigeria in 1999 by law

as a program with a goal of achieving universal health coverage using financial risk protection mechanism.¹⁷ The prevalence of hypertension in Nigeria ranges from a minimum of 12.4% to a maximum of 34.8% with rates as high as 32.7% in Abuja.^{18,19} With the high prevalence in this area and an increase in the number of antihypertensive prescriptions, there is the need for a survey of prescription patterns and their adherence to standard guidelines to ensure rational and optimum medical care. Hence, this study aimed to investigate the use of antihypertensive drugs among NHIS enrollees visiting the University of Abuja Teaching Hospital, Gwagwalada, Federal Capital Territory, Abuja, Nigeria, with a view to ascertain adherence to international guidelines and also to identify the common co-morbidity among the enrollees.

MATERIALS AND METHODS

Study design and area

This descriptive and cross-sectional retrospective study was carried out at the University of Abuja Teaching Hospital Gwagwalada, Federal Capital Territory (FCT), Abuja, located in north central part of Nigeria. The hospital has 350 beds and serves the entire area council in FCT, Abuja and other nearby communities and states such as Kaduna, Kogi, Nasarawa and Niger States. The hospital is also a referral centre for other states in different parts of Nigeria and a centre for undergraduate and postgraduate training in different specialties of medicine.

Study population/sample size

The study population includes hypertensive patients under the National Health Insurance Scheme. Employing the Kish Leslie equation for descriptive studies, the study sample size was derived.²⁰ With recourse to the meta-analysis results on the prevalence of hypertension in urban areas in Nigeria (30.6%),²¹ the minimum sample size was calculated to be 310 prescriptions with 99% level of confidence.

Inclusion criteria

The record of NHIS patients who are 18 years and above and are being managed for essential hypertension as defined by systolic BP \geq 140 mmHg and or diastolic BP \geq 90 mmHg.

Exclusion criteria

Records of hypertensive patients that are deficient in any of the inclusion criteria.

Ethical consideration

Ethical clearance and formal approval for the study protocol was granted by the Ethics Committee of the University of Abuja Teaching Hospital, Gwagwalada. FCT, Abuja. Approval number: UATH/HREC/PR/2019/002/043.

Data collection

A clinical data extraction worksheet was customized for this study and was used to extract information on patients who are on the NHIS scheme and treated for essential hypertension in the hospital from January 2018 to December 2018. The patients case files were selected and the following patient information were collected; age, gender, occupation, blood pressure measurements, co-morbid or compelling factors, number of drugs prescribed, antihypertensive agent as mono-therapy and various possible combinations or fixed dose combination drugs. These patients either attended the hospital on a weekly, fortnightly or monthly basis.

Data analysis

Statistical analysis of data was carried out with SPSS v. 21 (IBM Corporation, USA). Tables and bar charts were used to represent descriptive statistics data. Means \pm standard deviations were used to express continuous variables while proportions and percentages expressed categorical variables. Student's *t*-test was used to compare the means while Chi squared (X^2) test and Fisher's exact test was used to compare proportions of categorical variables. *P*-values less than 0.05 were considered significant.

RESULTS

Data were extracted from 311 case files of patients and assessed in the study. Socio-demographics of these patients are shown in Table 1. The mean age of the patients was 49.37 ± 10.12 years, range 18 - 79 years. Majority of the patients were females 177 (56.91%), skilled workers 101 (32.47%) and aged between 40 - 59 years 215 (69.13%). The average systolic and diastolic BP of the study participants was 140.03 ± 20.67 and 84.85 ± 12.73 mmHg, respectively. The weights and heights of the patients were not captured in their case files in the hospital.

The allotment of the prescribed antihypertensive drugs into various therapeutic groups is outlined in Table 2. Calcium channel blockers (CCB) were the most prescribed 223 (30.26%), followed by the diuretics 178 (24.15%) and angiotensin II receptor blockers (ARB)

132 (17.91%). The vasodilators 02 (0.27%) were the least prescribed class of drugs among the study group.

Mono-therapy was seen in 64 (20.58%) prescriptions while 247 (79.42%) prescriptions had two or more antihypertensive drug combinations. None of the patients received any form of non-drug therapy (Table 3). Of the combined therapy, the 2-drug combinations 109 (35.05%) was frequently encountered and 4-drug combinations 41 (31.18%), the least encountered. Among the 109 prescriptions that had two antihypertensive medications prescribed, the combination of CCB + ARB, 92 (84.40%) was most frequently prescribed (Table 4). The combination of CCB + ARB + Diuretic, 30 (30.92%) and CCB + ACEI + 2 Diuretics, 22 (53.65%) were the most frequently prescribed 3- and 4-drugs combinations, respectively.

Figure 1 shows the extent of comorbidities among the study population. Among the 195 patients with comorbid conditions, the most prevalent was diabetes mellitus 72 (23.20%), which was closely followed by hypertensive heart disease 63 (20.32%), while kidney disease 04 (1.30%) was least prevalent. Other co-morbidities 24 (7.71%) were osteoarthritis, bladder outlet obstruction, Parkinson's disease, rheumatic heart disease, seizures, depression, asthma and malaria.

DISCUSSION

In this study the mean age of the patients enrolled in the study was 49.37 ± 10.12 years. This finding was similar to a study carried out in Federal Capital Territory (FCT) where the mean age of the patients was 50.10 ± 6.98 .²² It was however different from the findings of another study from the same locality with mean age of 37.86 ± 11.53 .²³ The lower mean age from that study was attributed to the participants, reported to be almost 50% of school leavers. Also, this study showed more

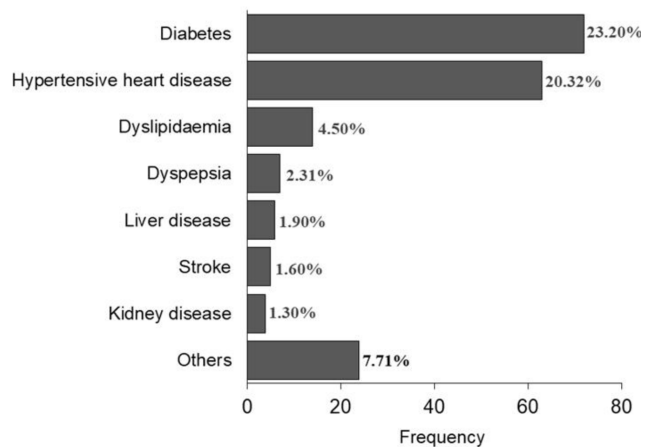


Figure 1: Co-morbidities among the hypertensive patients.

Table 1: Socio-demographic characteristics of the study group.

Characteristics	Number of patients (%)	
Age group	18 - 39	50 (16.08)
	40 - 59	215 (69.13)
	60 - 79	46 (14.79)
Gender	Male	134 (43.09)
	Female	177 (56.91)
Occupation	Professionals	77 (24.76)
	Skilled	101 (32.47)
	Semi-skilled	51 (16.40)
	Unskilled	82 (26.37)
Blood pressure	mmHg \pm SD	
Systolic BP	140.03 \pm 20.67	
Diastolic BP	84.85 \pm 12.73	

Professionals - Pharmacist, Doctors, Nurses, Lawyers, Teachers, Accountants

Skilled - Printers, Drivers, Tailors

Semi-skilled - Petty Traders

Unskilled - Vendors, Cleaners, Manual Labourers

Table 2: Frequency of prescription based on individual drugs.

Drug class	No. of drug encounters	% of drug encounters
Calcium channel blockers	223	30.26
Diuretics	178	24.15
Angiotensin II receptor blockers	132	17.91
Angiotensin converting enzyme inhibitors	106	14.38
Beta blockers	72	9.77
Centrally acting agent	24	3.26
Vasodilators	2	0.27
Total	737	100.00

Table 3: Number of antihypertensive drugs prescribed.

Drug therapy prescribed	No. of prescriptions	% of prescriptions
Single drug	64	20.58
Multi-drug		
2 drugs	109	35.05
3 drugs	97	31.19
4 or more drugs	41	13.18
Total	311	100.00
Non-drug therapy	0	0

prevalence of hypertension in females. This observation agrees with reports from related studies carried out in the same locality and elsewhere in Nigeria and other countries.^{18,19,22-24} Weight and height are important in the determination of body mass index (BMI) which is a parameter for determining obesity which has been known to predispose to hypertension,^{25,26} hence obesity may not

Table 4: Frequency of combination therapies.

Drug combinations	No. of drug combinations encountered	% of drug combinations encountered
CCB + ARB	92	84.40
CCB + BB	17	15.59
CCB + ARB + Diuretic	30	30.92
CCB + 2 Diuretics	29	29.89
ARB + 2 Diuretics	21	21.64
CCB + BB + Diuretic	17	17.52
CCB + ACEI + 2 Diuretics	22	53.65
CCB + ARB + ACEI + Diuretic	19	46.34

have been considered in the diagnosis as well as in the management of hypertension in the hospital.

The mean BP of the study population suggests adherence to the treatment goals of JNC 8. This treatment guideline emphasizes the need to evaluate the patients for possible co-morbidities before the commencement of drug treatment. It states that patients with no history of diabetes or chronic kidney disease and are 60 years or older, their blood pressure goal should be < 150/90 mmHg. While patients who are 18 to 59 years old and having no history of major comorbidities or patients who are 60 years or older with either diabetes or chronic kidney disease or both conditions, should have a blood pressure target of < 140/90 mmHg.⁹ With about 85% of the study population below 60 years of age and the level of comorbidities amongst them, the mean BP values obtained from the study suggests a reasonable control of the patient's blood pressure.²⁷

Good control of patients' blood pressure has been linked by a study to ready access to medications and good adherence to medication.²⁷ Patients from the study, by virtue of their health insurance coverage would have been able to afford their prescribed drugs under the insurance scheme and consequently maintain their medication regimen. With about three quarters of the patients being non-professionals, drug affordability may have been difficult due to their socio-economic status.²⁸

Based on the number and class of drugs most prescribed in the study centre, it was noticed that the physicians do follow some guidelines. The JNC 7 guidelines recommends thiazide diuretic as first line therapy in the management of uncomplicated hypertension and in combination with other agents for later line treatments.⁸ While JNC 8 limits the first-line treatment to 4 classes of drugs: thiazide diuretics, calcium channel blockers

(CCBs), ACEIs and ARBs, with their higher doses or their combinations as second and third line alternatives.⁹

Though the study showed a preference to the use of multi-drug therapy with only 64 (20.58%) patients on mono-therapy, the number and classes of drugs used seem to follow the JNC 8 guidelines. The study revealed that only 3 (1.0%) out of the 64 patients on monotherapy received a diuretic as first line and only drug, in line with JNC 7 and ACC/AHA guidelines,^{8,9} with the other patients being on only CCBs, ARB, ACEI or BB, in order of frequency. Also, the adherence to only 4 classes of drugs in the combinational therapies is in conformity with JNC 8.⁹

The CCBs remains the most commonly prescribed drug both in the mono and multi-drug therapies. This agrees with some studies carried out in Nigeria and other countries,^{29,30} but disagrees with others where diuretics,^{31,32} ACEI^{33,34} and BB³⁵ were the most commonly prescribed drugs. Also, the frequent prescribing of calcium channel blocker and diuretics in the 3- and 4-drugs combination, while in line with JNC 7, JNC 8 and ACC/AHA guidelines, could be influenced by the treatment guidelines or its better potency in blacks³⁶ and the factor of comorbidity with the prevalence of diabetes at 23.20%.

Another finding from the study was the combination of ARB and ACEI in the 4-drug therapy, against the JNC 8 and ACC/AHA guidelines. This combination is not recommended due to the risk of hyperkalemia but their use in this study may be due to their beneficial effects for patients with chronic kidney disease and heart failure.

The study revealed no documented non-pharmacological measures such as lifestyle modifications in the treatment of hypertension in the study centre. All guidelines recommend initial treatment that should include a healthy heart diet, weight loss, low salt diet, reduced alcohol intake, coupled with increased physical exercise or activity alone or with the first line drug. These lifestyle changes may have been communicated to the patients verbally without necessarily documenting them.

CONCLUSION

The result shows that prescribing pattern among hypertensive patients registered with the National Health Insurance Scheme of the University of Abuja Teaching Hospital complied with the JNC 8 guidelines but adheres partially to other guidelines in the management of hypertension. There is a need for both pharmacists and clinicians to keep updating themselves with the

recommended standard clinical guidelines in the management of chronic diseases for quality patient care.

ACKNOWLEDGEMENT

The authors acknowledge the support received from the staff of Records Department of University of Abuja Teaching Hospital, Gwagwalada, FCT, Abuja, Nigeria.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

ABBREVIATIONS

ACC/AHA: American College of Cardiology/American Heart Association; **ACEI:** Angiotensin Converting Enzyme Inhibitors; **ARB;** Angiotensin II Receptor Blocker; **BB:** Beta Blocker; **BMI:** Body Mass Index; **BP:** Blood Pressure; **CCB:** Calcium Channel Blocker; **FCT:** Federal Capital Territory; **JNC:** Joint National Committee; **NCD:** Non- Communicable Diseases; **NHIS:** National Health Insurance Scheme

SUMMARY

Irrational prescription and use of medicines is a major problem in Nigeria. In line with WHO advocating for a universal health coverage, the National Health Insurance Scheme (NHIS) was instituted by the Government of Nigeria with the goal of reducing the burden of diseases in the country, among which include hypertension. With the high prevalence of hypertension in Abuja and an increase in the number of antihypertensive prescriptions, there is the need for a survey of prescription patterns and their adherence to standard guidelines to ensure rational and optimum medical care. The study showed that prescribing pattern among NHIS hypertensive patients attending the University of Abuja Teaching Hospital complied with the JNC 8 guidelines but adheres partially to other guidelines in the management of hypertension. There is a need for both pharmacists and clinicians to keep updating themselves with the recommended standard clinical guidelines in the management of hypertension.

REFERENCES

- Gowshall M, Taylor-Robinson SD. The increasing prevalence of non-communicable diseases in low-middle income countries: The view from Malawi. *Int J Gen Med.* 2018;11:255-64. doi: 10.2147/IJGM.S157987, PMID 29988742.

2. World Health Organization. Global status report on non-communicable diseases 2014 [cited Aug 4 2022]. Available from: http://apps.who.int/iris/bitstream/handle/10665/148114/9789241564854_eng.pdf?sequence=1.
3. Poulter NR, Prabhakaran D, Caulfield M. Hypertension. *Lancet*. 2015;386(9995):801-12. doi: 10.1016/S0140-6736(14)61468-9, PMID 25832858.
4. Sarki AM, Nduka CU, Stranges S, Kandala NB, Uthman OA. Prevalence of hypertension in low- and middle-income countries: A systematic review and meta-analysis. *Medicine (Baltimore)*. 2015;94(50):e1959. doi: 10.1097/MD.0000000000001959, PMID 26683910.
5. Ojji DB, Mayosi B, Francis V, Badri M, Cornelius V, Smythe W, *et al.* Comparison of dual therapies for lowering blood pressure in black Africans. *N Engl J Med*. 2019;380(25):2429-39. doi: 10.1056/NEJMoa1901113, PMID 30883050.
6. Kumanan T, Guruparan M, Sreeharan N. Hypertension "the silent killer" a guide for primary care physicians and healthcare professionals. Colombo-Chennai: Kumaran Book House; 2018;1-3.
7. Adejumo O, Okaka E, Iyawe I. Prescription pattern of antihypertensive medications and blood pressure control among hypertensive outpatients at the University of Benin Teaching Hospital in Benin City, Nigeria. *Malawi Med J*. 2017;29(2):113-7. doi: 10.4314/mmj.v29i2.7, PMID: 28955417
8. Brotman DJ, Frost SD. The JNC 7 hypertension guidelines. *JAMA*. 2003;290(10):1313-4. doi: 10.1001/jama.290.10.1313-c, PMID 12966116.
9. James PA, Oparil S, Carter BL, Cushman WC, Dennison-Himmelfarb C, Handler J, *et al.* 2014 evidence-based guideline for the management of high blood pressure in adults: Report from the panel members appointed to the eighth joint national committee (JNC 8). *JAMA*. 2014;311(5):507-20. doi: 10.1001/jama.2013.284427, PMID 24352797.
10. Whelton PK, Carey RM, Aronow WS, Casey Jr DE, Collins KJ, Himmelfarb CD, *et al.* 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. *J Am Coll Cardiol*. 2018;71(19):e127-e248. doi: 10.1016/j.jacc.2017.11.006, PMID: 2914653.
11. Jain S, Upadhyaya P, Goyal J, Kumar A, Jain P, Seth V, *et al.* A systematic review of prescription pattern monitoring studies and their effectiveness in promoting rational use of medicines. *Perspect Clin Res*. 2015;6(2):86-90. doi: 10.4103/2229-3485.154005, PMID 25878953.
12. Romday R, Gupta AK, Bhamhani P. An assessment of antihypertensive drug prescription patterns and adherence to Joint National Committee-8 (JNC 8) hypertension treatment guidelines among hypertensive patients attending a tertiary care teaching hospital. *Int J Res Med Sci*. 2016;4:5125-33.
13. WHO Policy Perspectives on Medicines, No. 5. Promoting rational use of medicines: core components. World Health Organization, Geneva. 2002.
14. World Health Organization. Medicines use in primary care in developing and transitional countries: Fact book summarizing results from studies reported between 1990 and 2006. 2009 [cited Aug 4 2022]. Available from: <https://apps.who.int/iris/handle/10665/70032>.
15. World Health Organization. Regional office for the western Pacific. 2016: Manila. Universal health coverage: Moving towards better health: Action framework for the western Pacific Region [cited Aug 4 2022]. Available from: <https://apps.who.int/iris/handle/10665/246420>.
16. Federal Ministry of Health. National policy and strategic plan of Action on prevention and control of non-communicable diseases (NCDs). Abuja, Nigeria. 2013.
17. Onoka CA, Onwujekwe OE, Uzochukwu BS, Ezumah NN. Promoting universal financial protection: Constraints and enabling factors in scaling-up coverage with social health insurance in Nigeria. *Health Res Policy Syst*. 2013;11:20. doi: 10.1186/1478-4505-11-20, PMID 23764306.
18. Okubadejo NU, Ozoh OB, Ojo OO, Akinkugbe AO, Odeniyi IA, Adegoke O, *et al.* Prevalence of hypertension and blood pressure profile amongst urban-dwelling adults in Nigeria: A comparative analysis based on recent guideline recommendations. *Clin Hypertens*. 2019;25:7. doi: 10.1186/s40885-019-0112-1, PMID 31016027.
19. Adediran OS, Okpara IC, Adeniyi OS, Jimoh AK. Hypertension prevalence in an urban and rural area of Nigeria. *J Med Med Sci*. 2013;4(4):149-54.
20. Leslie K. Survey sampling. New York: John Wiley and Sons, Inc; 1965.
21. Adeloye D, Basquill C, Aderemi AV, Thompson JY, Obi FA. An estimate of the prevalence of hypertension in Nigeria: A systematic review and meta-analysis. *J Hypertens*. 2015;33(2):230-42. doi: 10.1097/HJH.0000000000000413, PMID 25380154.
22. Kazaure AZ, Abubakar AA, Ibrahim MS, Gidado S, Sabitu K, Nguku P. Factors for non-adherence to antihypertensive drugs among Federal Civil Servants attending health facilities-Abuja, FCT. *Sub-Saharan Afr J Med*. 2017;4(1):20-5. doi: 10.4103/ssajm.ssajm_46_16.
23. Orji IA, Ojji DB, Ikechukwu-Orji MU. Burden of hypertension and associated risk factors in rural communities of Abuja. *Texila Int J Public Health*. 2019;7(1):1-21. doi: 10.21522/TIJPH.2013.07.01.Art004.
24. Ekwunife OI, Aguwa CN. A meta-analysis of prevalence rate of hypertension in Nigerian populations. *J Public Health Epidemiol*. 2011;3(13):604-7.
25. Shihab HM, Meoni LA, Chu AY, Wang NY, Ford DEC, Liang KY, *et al.* Body mass index and risk of incident hypertension over the life course: The Johns Hopkins precursors study. *Circulation*. 2012;126(25):2983-9. doi: 10.1161/CIRCULATIONAHA.112.117333, PMID 23151344.
26. Akhabue E, Chan C, Greenland P, Allen NB. Racial differences in BMI and blood pressure in childhood and adolescence. *Circulation*. 2016;134:A20362.
27. Eboeime-Oikeh IO, Kporon U. Characteristics and predictors of controlled hypertension at a tertiary health facility in Nigeria. *Eur J Med Health Sci*. 2022;4(4):60-9. doi:10.24018/ejmed.2022.4.4.1354.
28. Harrison MA, Marfo AFA, Opare-Addo MNA, Ankrah DNA, Acheampong F, Nelson F, *et al.* Anti-hypertensive medication access and affordability and their association with blood pressure control at a teaching hospital in Ghana. *Pan Afr Med J*. 2021;39:184. doi: 10.11604/pamj.2021.39.184.27977, PMID: 34584609.
29. Odili VU, Oghagbon EK, Ugwa NA, Ochei UM, Aghomo OE. Adherence to international guidelines in the management of hypertension in a tertiary hospital in Nigeria. *Trop J Pharm Res*. 2008;7(2):945-52. doi: 10.4314/tjpr.v7i2.14608.
30. Sharma AK, Dahiya N, Kairi JK, Bharati SM. Prescription patterns of antihypertensive drugs in a tertiary care hospital in India. *Int J Basic Clin Pharmacol*. 2017;4(1):55-9.
31. Bakare OQ, Akinyinka MR, Goodman O, Kuyinu YA, Wright OK, Adeniran A, *et al.* Antihypertensive use, prescription patterns and cost of medications in a Teaching Hospital in Lagos, Nigeria. *Niger J Clin Pract*. 2016;19(5):668-72. doi: 10.4103/1119-3077.188709, PMID 27538558.
32. Abegaz TM, Tefera YG, Abebe TB. Antihypertensive drug prescription patterns and their impact on outcome of blood pressure in Ethiopia: A hospital-based cross-sectional study. *Integr Pharm Res Pract*. 2017;6:29-35. doi: 10.2147/IPRP.S124047, PMID 29354548.
33. Alba-Leonel A, Carvajal A, Fierro I, Castillo-Nájera F, Campos-Ramos O, Villa-Romero A, *et al.* Prescription patterns of antihypertensives in a community health centre in Mexico City: A drug utilization study. *Fundam Clin Pharmacol*. 2016;30(3):276-81. doi: 10.1111/fcp.12179, PMID 26787266.
34. Ibrahim DA, Ibrahim A, Saidu H. Anti-hypertensive prescription pattern among general medical practitioners in Kano, Northern Nigeria. *J Med Res*. 2017;3(5):225-8. doi: 10.31254/jmr.2017.3506.
35. Varakantham V, Sailoo AKK, Bharatraj DK. Antihypertensive prescription pattern and compliance to JNC 7 and JNC 8 at tertiary care government hospital, Hyderabad, India: A cross-sectional retrospective study. *Hosp Pharm*. 2017;53(2):107-12. doi: 10.1177/0018578717738080, PMID: 29581605.
36. Lackland DT. Racial differences in hypertension: Implications for high blood pressure management. *Am J Med Sci*. 2014;348(2):135-8. doi: 10.1097/MAJ.0000000000000308, PMID 24983758.