

Original Article

EVALUATION OF HYPERTENSION MANAGEMENT WITH REFERENCE TO STANDARD TREATMENT GUIDELINE AND RELATED FACTORS IN A TERTIARY HOSPITAL IN SOUTHEAST NIGERIA

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Abstract

Background: Hypertension is one of the top contributors to the global burden of disease, causing 9.4 million deaths annually, and accounting for a third of all preventable premature deaths.

Objectives: The study assessed patients' knowledge, attitude and adherence regarding hypertension and its management, and physicians' practice with reference to the standard treatment guidelines (STGs).

Materials and Methods: The study is a cross-sectional descriptive study. Data was analyzed with IBM SPSS Statistics version 23. A cut off above the mean score was used to assess "good" knowledge and "positive" attitude, while adherence was assessed using Morisky Medication Adherence Scale of 8-point questions, scored as low adherence (<6), medium adherence (6 to 8), and high adherence (=8). Therapeutic Adherence Scale for Hypertensive patients was used to assess physicians' hypertension management.

Results: Most of the patients (56.9%) had poor knowledge of hypertension. However, the mean knowledge score was 3.477 ± 2.069 . Most had negative attitude (83.8%) and low adherence (68.4%), with mean attitude score of 2.362 ± 1.098 and adherence score of 4.585 ± 1.524 . The most reported reasons for non-adherence were forgetfulness (46.2%), inability to stick to medication plans (47.7%) and stoppage of medications when they feel okay (42.3%). Physicians' adherence rating to STGs was 65%.

Conclusion: Physicians did not strictly adhere to STGs, knowledge of hypertension and attitude towards hypertension management is poor in majority of patients. Adherence to medication use in hypertension management is also poor due to forgetfulness, inability to stick to medication plan and stopping of medication when they feel okay.

Keywords: Hypertension, Adherence, Drug utilization, Standard treatment guidelines.

Cite this article: Okeke AI, Ogbonna BO, Nworakwe GA. Evaluation of hypertension management with reference to standard treatment guideline and related factors in a tertiary hospital in South-East Nigeria. *Yen Med J.* 2022;4(4):85–94.

INTRODUCTION

Hypertension is a crucial global health challenge because it is associated with a high risk of cardiovascular (CV) and kidney disease.¹ Hypertension is one of the top contributors to the global burden of disease, causing 9.4 million deaths annually.² Many published studies have

shown a high prevalence of hypertension in West African communities.³⁻⁵ Nigeria is the most populous African country, and the prevalence of hypertension contributes to the continent's disease burden. A higher prevalence was found in urban areas compared to rural settlements.⁶ The study conducted among African Americans⁷ and the study

done by Pirasath et al,⁸ in Northern Sri Lanka reported female predominance among hypertensive patients. Recent studies in Nigeria have reported the prevalence of hypertension in adults ranging from 26.8% to as high as 51.3%.⁹⁻¹²

Modifiable risk factors include unhealthy diet, physical inactivity, tobacco and alcohol use and being overweight or obese, while a family history of hypertension, age and co-morbidities such as diabetes or kidney disease are non-modifiable risk factors that contribute to high blood pressure.¹³⁻¹⁹ The tertiary care approach to hypertension therapy, based on regular hospital visits, needs to be complemented to effectively address the burden of hypertension. One of these avenues is the task-shifting strategy, which is a meaningful transfer of tasks in tertiary health care from physicians to non-physician health professionals.²⁰⁻²⁴ The study assessed patients' knowledge, attitude and adherence regarding hypertension and its management, and physicians' practice with reference to the standard treatment guidelines (STGs).

METHODS

Study design

The study was a cross-sectional descriptive study that included hypertensive participants who received treatment within the past six months and utilized medical records for background information on inclusion and exclusion criteria.

Study setting

The study took place in the Cardiology Unit (Special Outpatient Department) of Chukwumeka Odumegwu Ojukwu University Teaching Hospital (COOUTH), Awka.

Inclusion criteria

All patients diagnosed of hypertension, who have been receiving hypertensive care for the past six months, 18 years and above, who had given their informed consent to participate in the study. Physicians who gave their informed consent to participate in the study.

Sample size determination

Yamane²⁵ provided a simplified formula to calculate sample sizes. This formula was used to calculate the sample size as shown below:

$$n = \frac{N}{1+N(e)^2}$$

n= Sample size (unknown)

N= Population size

E= margin of error = 0.05

The value 171 was population size of hypertensive patients and 44 was the population size of physicians.

$$n \text{ (hypertensive patients)} = \frac{171}{1+171(0.05)^2} = 171/1.4275 = 119.789 + 10 \text{ (attrition)} = 130$$

n = 130 hypertensive patients

$$n \text{ (physicians)} = \frac{44}{1+44(0.05)^2} = 44/1.11 = 40$$

n = 40 physicians

Data collection tool and sampling procedure

A pilot study was conducted in COOUTH using 10 hypertensive patients to ensure that the data collection tool passes both face and content validation tests and amendments was made accordingly. The respondents who participated in the pilot study were excluded from the main study to avoid bias after ethical approval was obtained from the Research and Ethics Committee of COOUTH Awka. Previously identified patients and physicians who were eligible and gave their informed consent were consecutively recruited for the study.

Questionnaire design

The Section A contained the social demographics. Eight questions in the Section B for knowledge assessment and 6 questions in the Section C for assessment of patients' attitude were adapted from Bollampally *et al.*²⁶ The Section D of the questionnaire used for assessment of adherence was adapted from Pirasath *et al.*⁸

Physicians' hypertension management pattern with reference to a standard treatment guideline-based questionnaire

Questionnaire on physicians' hypertension management pattern was developed with reference to a standard treatment guideline incorporated from the Joint National Committee on Detection, Evaluation, and Treatment of High Blood Pressure (JNC 8, and JNC 7) and the American College of Cardiology Foundation and the American Heart Association (ACCF/ AHA), American

College of Obstetrician and Gynecologist and Lifestyle Work Group.²⁷

Data analysis

The data was analyzed with IBM SPSS Statistics version 23. Descriptive statistics such as frequency, mean, standard deviations and percentages was used to present the data. A cut-off above the mean score was used to assess “good” knowledge and “positive” attitude, while adherence was assessed using Morisky Medication Adherence Scale of 8-point questions. Scores for the scale range within low adherence (<6), medium adherence (6 to

8), and high adherence (=8). The therapeutic Adherence Scale for Hypertensive patients was used to assess physicians’ hypertension management. A 5 points Likert scale was used to score the therapeutic adherence scale for hypertensive patients with the least value 1 (never) to 5 points (all the time) assigned, respectively, and reverse scores are assigned for reverse questions. The scores ranged from 25 to 125 in which the highest scores indicated greater adherence. A cut-off score of 109 was used to distinguish satisfactory and low adherence behaviors. Scores were obtained, divided by 125 and multiplied by 100 to convert them to percentage.^{27,28,29}

RESULTS

Table 1: Sociodemographic characteristics of the patients

Variables	Class	Frequency N = 130	Percentage (%)
Gender	Male	54	41.5
	Female	76	58.5
Age (Year)	31-45	7	5.4
	46-64	62	47.7
	65 and above	61	46.9
Marital status	Single	7	5.4
	Married	95	73.1
	Widowed	28	21.5
Occupation	Civil servant	41	31.5
	Self employed	75	57.7
	Retired	14	10.8

Table 2: Patients’ responses to the knowledge of hypertension

Questions	Class	Frequency N = 130	Percentage (%)
How did you come to know about your hypertension?	Clinical	104	80
	Voluntary	26	20
History of hypertension?	Yes	61	46.9
	No	69	53.1
Knowledge about hypertension complications?	Yes	82	63.1
	No	48	36.9
Knowledge about normal level of blood pressure?	Yes	54	41.5
	No	76	58.8
Symptoms of hypertension?	Yes	81	62.3
	No	49	37.7
Can smoking and alcohol cause hypertension	Yes	55	42.3
	No	75	57.7
Is obesity associated with hypertension?	Yes	63	48.5
	No	67	51.5
Do you know the names of your prescribed drugs?	Yes	89	68.5
	No	41	31.5

Table 3: Patients' attitude towards hypertension management

Questions	Categories	Frequency N = 130	Percentage (%)
Regular medications will improve the disease?	Yes	110	84.6
	No	20	15.4
Medications alone will control hypertension?	Yes	102	78.5
	No	28	21.5
Avoiding extra salt?	Yes	56	43.1
	No	74	56.9
Regular physical exercise?	Yes	89	68.5
	No	41	31.5
Diet will improve the condition?	Yes	35	26.9
	No	95	73.1
Avoiding extra cooking oil?	Yes	74	56.9
	No	56	43.1

Table 4: Patients' adherence to medication use in hypertension management

Questions	Categories	Frequency N = 130	Percentage (%)
Forget to take medications?	Yes	60	46.2
	No	70	53.8
Miss medications for reasons other than forgetting?	Yes	40	30.8
	No	90	69.2
Stopped taking medications without informing the doctor?	Yes	55	42.3
	No	75	57.7
Stop taking medications when you travel?	Yes	21	16.2
	No	109	83.8
Took your medications yesterday?	Yes	102	78.5
	No	28	21.5
Sometimes stop taking medication when you feel okay?	Yes	55	42.3
	No	75	57.7
Feel hassled about sticking to treatment plan?	Yes	62	47.7
	No	68	52.3
Difficulty remembering to take medications?	Yes	35	26.9
	No	95	73.1

Table 5: Patients' knowledge, attitude and adherence Levels in hypertension management

Variables	Class	Frequency N = 130	Percentage (%)	Range	Mean	SD
Knowledge level	Good knowledge level	56	43.1	0-7	3.477	2.069
	Poor knowledge level	74	56.9			
Attitude	Positive attitude	21	16.2	0-4	2.362	1.098
	Negative attitude	109	83.8			
Adherence	Low adherence	89	68.4	2-7	4.585	1.524
	Moderate adherence	41	31.6			
	High adherence	0	0			

Table 6: Socio-Demographic characteristics of the doctors

Variables	Class	Frequency n = 40	Percentage (%)
Age	Under 30	8	20
	30-40	17	42.5
	Above 40	15	37.5
Gender	Male	23	57.5
	Female	17	42.5
Physician	Consultant	5	12.5
	Specialist	8	20
	Resident	17	42.5
	GP	10	25
Years of experience	Less than 5 years	13	32.5
	5-10 years	15	37.5
	Above 10 years	12	30.0

Table 7: Correct answers by doctors to questions on hypertension classification, management goal and drug combination

HTN classification, goal and drug combination	Frequency n = 40	Percentage (%)
Heard of JNC 8	39	97.5
Prehypertension	38	95
Stage 2 HTN	36	90
Goal of BP in elderly	29	72.5
Need drug combination in stage 2 HTN	26	65

Abbreviations: HTN = Hypertension, BP = Blood pressure

Table 8: Correct answers by doctors to questions on hypertensive patients with compelling indications

Compelling indication	Frequency n = 40	Percentage (%)
HF stage C	25	62.5
CKD	15	37.5
First line in pregnancy	31	77.5
CVA	27	67.5
DM	34	85
Post MI	25	62.5

Abbreviations: HF = Heart failure, CKD = Chronic Kidney disease, CVA = cerebrovascular accident, DM = Diabetics Mellitus, MI = Myocardial infarction.

Table 9: Correct answers by doctors to questions on lifestyle modifications in hypertension management

Lifestyle modification	Frequency n = 40	Percentage (%)
DASH	36	90
Moderate exercise	32	80
Reduce sodium intake	39	97.5
Weight loss	37	92.5

Abbreviations: DASH = Dietary approach to stop hypertension

Table 10: Correct answers by doctors to questions on ACEI and ARB combination as well as β blockers without compelling indication (n=40)

Drug recommendation question	Frequency n = 40	Percentage (%)
β -blockers without compelling indication.	26	65
ACEIs and ARBs should not be used as combination.	16	40

Abbreviations: ACEs = Angiotensin converting enzyme inhibitors; Arbs = Angiotensin receptor blocker.

DISCUSSION

Majority of the patients were females and similar to the study conducted among African Americans ⁷ and the study done by Pirasath, et al,⁸ in Northern Sri Lanka whom in their studies reported female predominance

among hypertensive patients. These findings may be attributed to the loss of estrogen during menopause and the fact that women have good health seeking behavior and are likely to be more diagnosed of the condition. The finding is contrary to the study by Akinlua et al,³⁰ who recorded a higher prevalence level in male. Most of the participants fell within the age range of 46-64 years. This agrees with the findings by Chimberengwa and Naidoo³¹ who reported the mean age of hypertensive patients to be 59 years. Most of the participants in this study were married and self-employed.

The knowledge of hypertension among hypertensive patients was low with about 56.9% of them having poor knowledge of hypertension. This agrees with the findings of most studies irrespective of the place it was carried out and may be due to inadequate educational programs.^{13,31-33} This study also recorded a high level of negative attitude towards hypertension management among the participants (83.8%) which is in line with the study conducted by Das et al in Kolkata, India.¹³ The study showed low level of adherence to medication use in hypertension management which is in line with the study done by Pirasath et al⁸ in Northern Sri Lanka who reported low adherence level. The results of this study showed that most of the physicians have heard about the guidelines of JNC 8 without necessarily reflecting on their utilization in practice. Regarding hypertension classification, management goal, and drug combinations, most of the participants knew the correct definition of the prehypertension stages. The outcome was higher compared to the study that was conducted in Jordan by Al-Azzam and his colleagues.³⁴ It is higher than the study conducted in Saudi Arabia by Al-Gelban, et al.³⁵

In hypertension with compelling indications, such as chronic kidney disease, diabetes mellitus, heart failure, ischemic heart disease, and cerebrovascular accident, specific antihypertensive medications classes are recommended to ameliorate disease progression and improve patient's outcome.^{36,37} However, in COOUTH, lesser proportion of the physicians agreed to use Angiotensin converting enzyme (ACE) inhibitors or Angiotensin receptor blocker (ArBs) as the first line therapy for the management of hypertension with renal impairment in cases without renal artery stenosis.

Physicians' management pattern in this study was similar to that of Jordanian physicians and lower than that of Saudi physicians.^{34,35} Again, the variation in the awareness between studies may be attributed, in part, to the time of releasing JNC 7 guidelines. In this study, the guidelines have been disseminated and adopted by COOUTH physicians since the JNC 7 report was released in 2003 compared with the Jordanian study, which was conducted two years after the release of the JNC 7 guidelines.

Most of the physicians (85%) agreed to use ACE inhibitors, ArBs, thiazide diuretics or calcium channel blockers as the first line therapy for this group of patients. Most physicians (74.3%) in Saudi Arabia agreed to use any of the above medications as first line in a hypertensive patient with diabetes, meaning that the recommendations of JNC 8 guidelines were well adopted by COOUTH physicians.³⁵ The use of ACE inhibitor, β -blockers, diuretics, and spironolactone as a standard combination for patients with heart failure in stage C has advantages such as slowing the progression of heart failure and remodeling, decreased mortality, and improved patient's quality of life.³⁸ Most of the physicians agreed to use this standard therapy in hypertensive patients with stage C heart failure. Previous studies showed that 40.1% of Jordanian physicians and 43% of Kuwaiti physicians correctly selected ACE inhibitors and ArBs, respectively, as the first line in a hypertensive patient with heart failure.^{34,39} Majority of the physicians agreed to use β -blockers with ACE inhibitors as a first line therapy in a patient who has myocardial infarction and hypertension. Only, 59.3% of the Jordanian physicians correctly selected β -blockers as a first line in a hypertensive patient with ischemic heart disease.³⁴

Labetalol is recommended as a first line agent in pregnant women with severe hypertension.⁴⁰ Several studies revealed that labetalol is a preferred antihypertensive agent in chronic hypertension during pregnancy, especially in severe cases since methyldopa has a mild effect on hypertension with slow onset and nifedipine has many adverse effects.^{40,41} β -blockers, according to JNC 8, are no longer recommended as first line agents to treat hypertension in patients without compelling indication owing to their association with greater risk of

This study suggested that the adherence of physicians to the STGs was moderate in COOUTH. Combination therapy of ACE inhibitors and ArBs during the management of hypertension patients should be avoided according to JNC 8. However, less than a half of the COOUTH physicians agreed not to combine ACE inhibitors with ArBs in a patient with hypertension, which is low compared to the result obtained from the Family and Internal Medicine Residents in Saudi Arabia, where most of them agreed not to use ACE inhibitors and ArBs together.⁴⁴ Majority of the participants recommended weight loss, moderate physical exercise, Dietary approach to stop hypertension (DASH), and reduction of sodium intake, respectively, as parts of lifestyle modifications for a patient with hypertension. Similar findings were obtained from another study conducted in Saudi Arabia.³⁵

CONCLUSION

The study indicated lack of strict adherence to the standard treatment guidelines by physicians. Majority of the patients had poor knowledge of hypertension and attitude towards hypertension management. Majority of the patients showed poor adherence to medication use in hypertension management due to forgetfulness, inability to stick to medication plan and stopping of medication when they feel okay. There is need for continuous medical education programs for physicians so that their practice will follow the National Standard Treatment guidelines always.

CONFLICT OF INTEREST

The authors have none to declare

FUNDING

The study did not receive funding from any organization.

ETHICAL APPROVAL

Ethical approval was obtained from the Research and Ethics Committee of Chukwuemeka Odumegwu Ojukwu University Teaching Hospital, Awka

REFERENCES

1. World Health Organization. A global brief on hypertension: silent killer, global public health crisis: World Health Day 2013. Available from:

- <https://www.who.int/publications/i/item/a-global-brief-on-hypertension-silent-killer-global-public-health-crisis-world-health-day-2013>. Accessed September 03, 2022.
2. Coccina F, Pierdomenico AM, Cucurullo C, Pizzicannella J, Madonna R, Trubiani O, et al. Prognostic value of masked uncontrolled hypertension defined by different ambulatory blood pressure criteria. *Am J Hypertens*. 2020;33(8):726-733.
 3. World Health Organization – Hypertension. Available from: <https://www.who.int/health-topics/hypertension>. Accessed September 10, 2022.
 4. Kaze AD, Schutte AE, Erqou S, Kengne AP, Echouffo-Tcheugui JB. Prevalence of hypertension in older people in Africa: a systematic review and meta-analysis. *J Hyperten*. 2017;35(7):1345–1352.
 5. Bosu WK. The prevalence, awareness, and control of hypertension among workers in West Africa: a systematic review. *Glob Health Action*. 2015;8:26227.
 6. Adeloye D, Owolabi EO, Ojji DB, et al. Prevalence, awareness, treatment, and control of hypertension in Nigeria in 1995 and 2020: A systematic analysis of current evidence. *J Clin Hypertens (Greenwich)*. 2021;23(5):963-977. doi:10.1111/jch.14220.
 7. Warren-Findlow, J, Seymour RB. Prevalence rates of hypertension self-care activities among African Americans. *J Natl Med Assoc*. 2011;103(6):503–512. [https://doi.org/10.1016/s0027-9684\(15\)30365-5](https://doi.org/10.1016/s0027-9684(15)30365-5).
 8. Pirasath S, Kumanan T, Guruparan MA. Study on Knowledge, Awareness, and Medication Adherence in Patients with Hypertension from a Tertiary Care Centre from Northern Sri Lanka. *Int. J. Hypertens*. 2017:9656450. <https://doi.org/10.1155/2017/9656450>.
 9. Ajayi IO, Sowemimo IO, Akpa OM, Ossai NE. Prevalence of hypertension and associated factors among residents of Ibadan-North Local Government Area of Nigeria. *Nig J Cardiol*. 2016;13:67-75.
 10. Wada OZ, Olawade DB, Afolalu TD, Oluwatofara AO, Akinwalere IG. Prevalence of Hypertension among Rural Adults and Availability of Management Services in Abimbola Community, Ayedaade Local Government Area, Osun State, Nigeria. *J Hypertens Manag*. 2020;6(1):046. doi.org/10.23937/2474-3690/1510046.
 11. Ebirim CIC, Udujih OG, Dozie UW, Agbaka CA, Orji SM, et al. Prevalence of Hypertension among adults aged 40 years and above in Ahiazu Mbaise, Imo State, Nigeria. *Arch Community Med Public Health*. 2018;4(1):013-016. DOI: <http://dx.doi.org/10.17352/2455-5479.000034>.
 12. Osunkwo, D., Mohammed, A., Kamateeka, M., Nguku, P., et al., Population-based Prevalence and Associated Risk Factors of Hypertension among Adults in Benue State, Nigeria. *Niger J Clin Pract*. 2020;23(7):944-949.
 13. Das AK, Lahiri G, Bose A, Sarkar DK. Assessment of Patients' Knowledge, Attitude and Practice regarding Hypertension in a Tertiary care Hospital. *Int J Community Med Public Health*. 2020;7(12):4967-4973.
 14. Basit A, Tanveer S, Fawwad A, Naeem N; NDSP Members. Prevalence and contributing risk factors for hypertension in urban and rural areas of Pakistan; a study from second National Diabetes Survey of Pakistan (NDSP) 2016-2017. *Clin Exp Hypertens*. 2020;42(3):218-224. doi:10.1080/10641963.2019.1619753.
 15. World Health Organization. Hypertension. Available from: <https://www.who.int/news-room/fact-sheets/detail/hypertension>. Accessed September 30, 2022.
 16. Bello M. Nigerians wake up to high blood pressure. *Bull world health organ*. 2013;91:242-243.
 17. Mezue K. The increasing burden of hypertension in Nigeria- can a dietary salt reduction strategy change the trend? *Perspect Public Health*. 2014;134(6):346-352.
 18. Unger T, Borghi C, Charchar F, Khan NA, Poulter NR, Prabhakaran D, et al. International Society of Hypertension Global Hypertension Practice Guidelines. *Hypertension*. 2020;75(6):1334–1357. <https://doi.org/10.1161/HYPERTENSIONAHA.120.15026>.
 19. Pugh D, Gallacher PJ, Dhaun N. Management of hypertension in chronic kidney disease. *Drugs*. 2019;79(4):365-379.

20. Burnier M, Egan BM. Adherence in hypertension: a review of prevalence, risk factors, impact, and management. *Circ Res.* 2019;124(7):1124-1140.
21. Khanna D, Zhao C, Saggarr R, et al. Long-Term Outcomes in Patients With Connective Tissue Disease-Associated Pulmonary Arterial Hypertension in the Modern Treatment Era: Meta-Analyses of Randomized, Controlled Trials and Observational Registries. *Arthritis Rheumatol.* 2021;73(5):837-847. doi:10.1002/art.41669.
22. Malik AO, Amin A, Kennedy K, et al. Patient-centered contrast thresholds to reduce acute kidney injury in high-risk patients undergoing percutaneous coronary intervention. *Am Heart J.* 2021;234:51-59. doi:10.1016/j.ahj.2020.12.013.
23. Desormais I, Amidou SA, Houehanou YC, et al. The prevalence, awareness, management and control of hypertension in men and women in Benin, West Africa: the TAHES study. *BMC Cardiovasc Disord.* 2019;19(1):303. doi:10.1186/s12872-019-01273-7.
24. World Health Organization. Noncommunicable diseases country profiles 2014. Available from: <https://apps.who.int/iris/handle/10665/128038>. Accessed October 16, 2022.
25. Yamane T. Statistics, An Introductory Analysis. 2nd ed. New York: Harper and Row; 1967.
26. Bollampally M, Chandershekhar P, Kumar KP, Surakasula A, Srikanth S, Reddy TRM. Assessment of patient's knowledge, attitude and practice regarding hypertension. *Int J Res Med Sci.* 2017;4(8):3299–3304. <https://doi.org/10.18203/2320-6012.ijrms20162283>.
27. Halboup AM, Othman GQ, Battah MM, Alzoubi KH, Sallom H. Awareness of Physicians in Yemen Toward High Blood Pressure Management According to the Eighth Joint National Committee (JNC 8) Guideline. *Int J Gen Med.* 2020;13:529-537. doi:10.2147/IJGM.S265118.
28. He W, Bonner A, Anderson D. Patient reported adherence to hypertension treatment: a revalidation study. *Eur J Cardiovasc Nurs.* 2016;15:150–156.
29. Pan J, Wu L, Wang H, et al. Determinants of hypertension treatment adherence among a Chinese population using the therapeutic adherence scale for hypertensive patients. *Medicine (Baltimore).* 2019;98(27):e16116. doi:10.1097/MD.00000000000016116.
30. Akinlua JT, Meakin R, Umar AM, Freemantle N. Current Prevalence Pattern of Hypertension in Nigeria: A Systematic Review. *PLoS One.* 2015;10(10):e0140021. doi:10.1371/journal.pone.0140021.
31. Chimberengwa PT, Naidoo M; cooperative inquiry group. Knowledge, attitudes and practices related to hypertension among residents of a disadvantaged rural community in southern Zimbabwe. *PLoS One.* 2019;14(6):e0215500. doi:10.1371/journal.pone.0215500.
32. Mohammadian Khonsari N, Shahrestanaki E, Ejtahed HS, Djalalinia S, Sheidaei A, Hakak-Zargar B, et al. Long-term Trends in Hypertension Prevalence, Awareness, Treatment, and Control Rate in the Middle East and North Africa: a Systematic Review and Meta-analysis of 178 Population-Based Studies. *Curr Hypertens Rep.* 2021;23(9):41. doi:10.1007/s11906-021-01159-0.
33. Pires JE, Sebastião YV, Langa AJ, Nery SV. Hypertension in Northern Angola: prevalence, associated factors, awareness, treatment and control. *BMC Public Health.* 2013;13:90. doi:10.1186/1471-2458-13-90.
34. Al-Azzam SI, Najjar RB, Khader YS. Awareness of physicians in Jordan about the treatment of high blood pressure according to the seventh report of the Joint National Committee (JNC VII). *Eur J Cardiovasc Nurs.* 2007;6(3):223-232. doi:10.1016/J.EJCNURSE.2006.10.001.
35. Al-Gelban KS, Khan MY, Al-Khaldi YM, Mahfouz AA, Abdelmoneim I, Daffalla A, et al. Adherence of primary health care physicians to hypertension management guidelines in the Aseer region of Saudi Arabia. *Saudi J Kidney Dis Transpl.* 2011;22(5):941-948.
36. 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) [published correction appears in JAMA. 2014 May 7;311(17):1809]. *JAMA.*

- 2014;311(5):507-520.
doi:10.1001/jama.2013.284427.
37. Whelton PK, Carey RM, Aronow WS, Casey DE Jr, Collins KJ, Dennison Himmelfarb C, 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. <https://doi.org/10.1016/j.jacc.2017.11.006>.
38. Edelmann F, Musial-Bright L, Gelbrich G, Trippel T, Radenovic S, Wachter R et al. Tolerability and Feasibility of Beta-Blocker Titration in HFpEF Versus HFrEF: Insights From the CIBIS-ELD Trial. *JACC Heart Fail.* 2016;4(2):140-149. doi:10.1016/j.jchf.2015.10.008.
39. Al-Ali KA, Al-Ghanim FA, Al-Furaih AM, Al-Otaibi N, Makboul G, El-Shazly MK. Awareness of hypertension guidelines among family physicians in primary health care. *Alexandria J Med.* 2013;49(1):81–87. [http: doi:10.1016/j.ajme.2012.07.003](http://doi:10.1016/j.ajme.2012.07.003).
40. Battarbee AN, Sinkey RG, Harper LM, Oparil S, Tita ATN. Chronic hypertension in pregnancy. *Am J Obstet Gynecol.* 2020;222(6):532-541. doi:10.1016/j.ajog.2019.11.1243.
41. American College of Obstetricians and Gynecologists' Committee on Practice Bulletins—Obstetrics. ACOG Practice Bulletin No. 203: Chronic Hypertension in Pregnancy. *Obstet Gynecol.* 2019;133(1):e26-e50. doi:10.1097/AOG.0000000000003020.
42. Berry C, Atta MG. Hypertensive disorders in pregnancy. *World J Nephrol.* 2016;5(5):418-28. doi: 10.5527/wjn.v5.i5.418.
43. Dahlöf B, Sever PS, Poulter NR, Wedel H, Beevers DG, Caulfield M, et al. Prevention of cardiovascular events with an antihypertensive regimen of amlodipine adding perindopril as required versus atenolol adding bendroflumethiazide as required, in the Anglo-Scandinavian Cardiac Outcomes Trial-Blood Pressure Lowering Arm (ASCOT-BPLA): a multicentre randomised controlled trial. *Lancet.* 2005;366(9489):895-906. doi:10.1016/S0140-6736(05)67185-1.
44. Alshehri NA, Almigbal TH, Alodhayani A, Batais MA. Family and internal medicine resident's awareness of and adherence to the Joint National Committee 8 (JNC 8) hypertension guidelines: a cross sectional study. *Biomed Res.* 2017; 28:12-15.

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