



Evaluation of Drug Management of Essential Hypertension in Patients in the Sikar District (Rajasthan)

Neha Deora¹, Surbhi Jangir²

¹Department of Pharmacology, Jaipur College of Pharmacy, Jaipur

²Associate Professor, Department of Pharmacology, Jaipur College of Pharmacy, Jaipur

Article Info: Received: 14-04-2024 / Revised: 18-05-2024 / Accepted: 10-06-2024

Address for correspondence: Neha Deora

DOI: <https://doi.org/10.32553/jbpr.v13i3.1090>

Conflict of interest statement: No conflict of interest

Abstract:

Due to its terrific incidence and position as a key risk issue for cardiovascular illnesses and other effects, hypertension is a widespread public fitness challenge and an critical subject matter of research. To determine the management of hypertension and the factors that contribute to it. To gauge study participants' knowledge, access to care, and level of control over their hypertension. A cross-sectional study was performed in a hospital in Sikar District. An updated version of the WHO STEPS interview schedule was used for 200 patient, ages 20–60. 32% of people had hypertension at age 49 to 50. 58.3% of hypertensive patients were male. Male individuals who were the oldest had a higher likelihood of having hypertension. healthcare interventions are needed to enhance the management of high blood pressure on this location because of the higher incidence (30%-35%). nonpharmacological management is also an effective way to control hypertension, a lowering of mean SBP by >10 mm Hg and DBP by 5 mm Hg.

Introduction

Hypertension, normally referred to as high blood stress, is a normal and chronic clinical situation characterised via chronic blood stress in the arteries. it is a sizeable public fitness difficulty globally due to its association with an expanded threat of cardiovascular sicknesses, consisting of stroke, coronary heart assault, and coronary heart failure, as well as other headaches like kidney disorder and imaginative and prescient loss. This literature overview objectives to offer a complete evaluate of the present day understanding of high blood pressure, together with its definition, epidemiology, pathophysiology, danger factors, and management techniques.

hypertension influences about thirteen billion p eople international, with a higher incidence in low and center earning countries. it's far chargeable for an estimated 9.4 million deaths yearly. the superiority of high blood pressure will increase with age, and it's far more commonplace in guys than in women up to the age of 45, after which the prevalence in girls surpasses that in guys.

METHODOLOGY

1. SORT OF STUDY

Usually, cross-sectional study was used. Additionally, a search was done to understand

that how patients start the course of hypertensive agents to manage the hypertension.

In this study, two different types of questions were used: an observation checklist and structured questionnaires.

(A) The initial surveys were created to learn more about the hospital's medical officers' and assistants' (prescribers') understanding of and approaches to treating hypertension patients. The purpose of these questions was to learn how prescribers and clients co-managed the disease.

(B) In the second step discussed with the patient and collected patient data. The data gathered in the form validated the prescribers' answers to the questionnaires they had filled out.

2. HOSPITALIUM SERVE

Sikar is a district of Rajasthan, India's Jaipur city. According to Census 2024, 3,160,000 people are living there in total. The study was performed in the following hospitals in Sikar:

➤ MITAL HOSPITAL

3. CHOICE OF STUDY TOPICS

Individuals between the ages of 21 and 60 who gave their agreement to take part in the study were eligible to apply, To evaluate the course of treatment, the patients had to be enrolled in Hospital, requiring a minimum of three clinic visits. At the period of collecting data, they ought to were taking at least one antihypertensive medication.

Criteria for Exclusion

Patients whose agreement to participate was rejected and insufficient clinical data were the exclusion criteria—those who suffer from severe physical or mental illnesses and are unable to respond.

Criteria for Evaluation

200 is the sample size.

Age range: 21 to 60

Gender: Both men and women.

4. STUDY VARIABLES

Blood pressure (measured in millimeter-Hg), Conditions that manifest as comorbidities or complications to elevated blood pressure, height, weight, age, financial situation, sex, stress, and body mass index (BMI).

Additional therapies include giving up tobacco use, changing one's marital status, education, and occupation, as well as taking nutritional supplements.

5. RESEARCH TOOLS

Schedule of interviews [adapted and validated WHO stepwise strategy to monitoring risk factors for chronic diseases (STEPS)]. The Omron BP Machine, measuring tape, and anthropometry rod were utilized.

6. INVESTIGATE POPULATION

Those who worked as prescribers at the hospital were selected to participate in the study. Both recently diagnosed and elderly HP patients were included in the population under research. The patients ought to have been taking medication to control their hypertension. The primary data collecting method and survey strategy were used to gather the information. There were only 200 patients from the S.B. Mittal Memorial Heart and Critical Care Hospital included in the research sample.

7. CURRENT MANAGEMENT

I work with hospital patients in this step. They declined to fill out the questionnaire there. When patients were unable to read and comprehend then I helped the patients finish the questionnaire by interpreting it using standard terms from the area. I gave the patients permission to finish the questionnaire on their own if they were literate and comprehended it. The patient's height, weight, and body mass index were determined. The study included 200 questionnaires in all.

8. TIME SPLENDID

It starts with hypertension patients and prescribers receiving a questionnaire. the necessary data that was retrieved during data

collection. The information was prepared using the Chi-square test and (ANOVA) statistical analysis.

Momentum Time frame: four months

Number of Samples: 200

RESULT AND DISCUSSION

(Figure 1) shows that among those with hypertension, 32.2% were diagnosed between

the ages of 40 and 49, 21% between 30 and 39, and 16.8% between 50 and 59. This together comprises 70% of the participants and validates the idea that BP rises with age. It provides a hint as well. when doctors should check a patient's blood pressure because the majority of cases of hypertension don't show any symptoms at first. This demonstrates that there is a male-to-female risk factor for hypertension. (Figure 2).

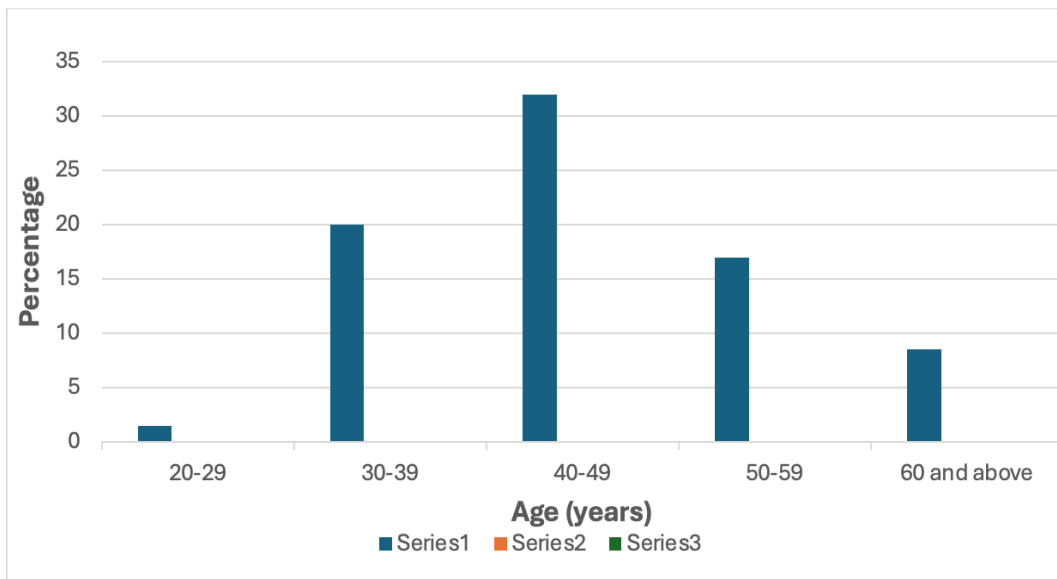


Figure 1: The age distribution of the subjects at the beginning of their hypertension.

Ages 40 to 49 accounted for 32% of the hypertension cases.

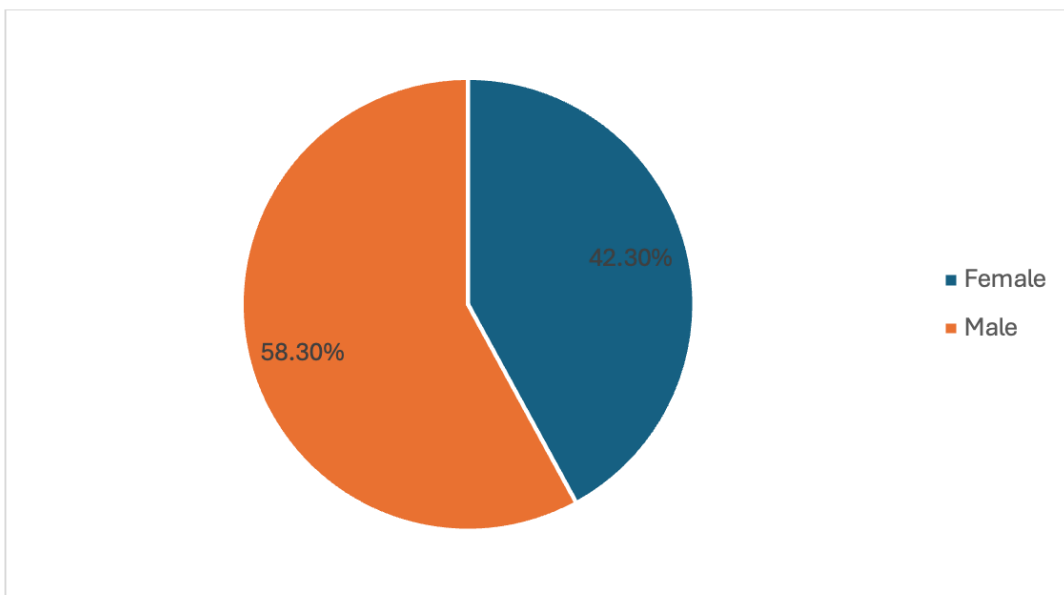


Figure 2: Subject distribution by sex.

Males made up 58.3% of the population with hypertension.

the majority of prescribers (57.1%) concurred that hypertension was explained as a consistently elevated hypertension of 140/90 mmHg. The ESH/ESC recommendations for the treatment of hypertension allow for the use of blood pressure break-off values to streamline the diagnosis and management of high blood pressure in regular clinical practice.

The classification of hypertension as number one/vital, secondary/symptomatic, on the only hand, and mild, mild, and excessive, on the opposite, was commonplace through all responders. consistent with the BHS-IV guidelines⁹, there are three grades of high blood pressure: Grade 1 (140-159 mmHg systolic and/or ninety-nine mmHg diastolic), Grade 2 (160-179 mmHg systolic and/or one hundred-109 mmHg diastolic), and Grade 3 (>one hundred eighty mmHg systolic and/or > one hundred ten mmHg diastolic). it's miles cited that these classifications are equivalent to the mild, slight, and severe classifications that were applied in the previous responses.

Nonpharmacological management of hypertension

Untreated high blood pressure can bring about numerous intense headaches and is a sneaky disease that increases the danger of

cardiovascular issues. due to its low price and many advantages with few or no aspect results, non-pharmacological therapy for high blood pressure has emergeas a famous method for dealing with both in rich and developing countries, with high blood pressure. This turned into performed to discover pertinent references, with a focal point on original studies, randomized controlled trials, and meta-analyses. New avenues within the area of non-pharmacological management of health are being opened by life-style modifications along with dietary sample adjustments, adoption of unique diets low in sodium and saturated fat and high in calcium, magnesium, and potassium, and experimentation with noval techniques like time constrained meal consumption constrained meal

Methods other than medication had a crucial duty in the management of BP. It involves enhancing one's manner of dwelling, including following aspecific diet, less sodium consumptionpotassium consumption, bodily interest, alcohol intake, weight loss, tobacco cessation, nutritional supplements, self measured BP tracking, meditation, and many others. each parameter become able to decreasing BP, result proven in table no. beneat h. most of those who received the result with nonpharmacological management of high blood pressure, a lowering of imply SBP through >10 mm Hg and DBP with the aid of 5 mm Hg.

Table 1: A table summarizing the diploma of BP reduction consistent with each non-pharmacological treatment.

NON-MEDICAL TREATMENT	DEGREE OF HYPERTENSION DECREASED
1. Diet	SBP = 5.5 mm Hg DBP = 3 mm Hg
2.Reduced sodium intake (sodium-limited eating regimen of 2(sodium-limited weight loss program of 1,500 mg in keeping with day)	Decrease = 2/1 mm hg Decrease = 7/3 mm hg

3. Reduced potassium intake	SBP= 6.8 mmhg DBP = 4.6 mmhg
4. Enhance magnesium intake (magnesium supplementation (368 mg/day) for three months)	SBP = 2.0 mmhg DBP = 1.78 mmhg
5. Weight reduction (about 10 kg)	Overall decrease of 5 to 20 mm hg
6. Cocoa	2 to 3 mm Hg
7. Substitution of alcohol consumption with low alcohol substitutes (during the first month of treatment)	SBP = 5 mm hg DBP = 3 mm hg
8. Mindfulness-based pressure-reduction application (mbsrp)	From a median of 154.7 ± 7.5 to 138.1 mm hg in the intervention institution diastolic blood stress values from 90.6 ± 5.3 to 86.1 mm hg
9. Domestic monitoring of blood strain	Mean discount insystolic blood stress of three.nine mm hg at six months additional help resulted in a discount in systolic blood pressure of two.1 to eight.three mm hg.

MEDICATION-BASED ESSENTIAL HYPERTENSION STARTING AN ANTIHYPERTENSIVE MEDICATION

According to the prescribers, the following factors might affect the start of medication for hypertension. Prior to starting antihypertensive medication, 85.7% of respondents said that the existence of co-morbidities and diastolic blood pressure were the most crucial factors. Prior to starting antihypertensive medication, 42.9% of respondents said that the overall cardiovascular risk was the most significant factor. The level of systolic blood pressure was cited by 28.6% of respondents as the factor that influences the decision to start medication treatment for hypertension. The aforementioned factors were important, but they weren't sufficient to provide a clearer understanding of the illness state. For instance, just 28.6% of prescribers deemed systolic blood pressure to be the most significant factor when starting medication. According to authorities, after the SBP objective is met, the majority of patients will meet the DBP goal. Consequently, they highlight the need to pay more notice to the upper value of blood pressure as a significant risk factor for cardiovascular illnesses (CVDs). But for people under 50, DBP is a more powerful cardiovascular risk factor

than SBP (a fact that most prescribers knew). 35.2% of participants started taking medication for hypertension the day after it was discovered that their blood pressure was elevated. 56.3% of people on antihypertensive medication.

CALCIUM CHANNEL BLOCKERS (CCBs):

Of all the antihypertensive medications in the hospital, CBs seemed to be the most popular. Among individuals, 59.3% and 80.3%, respectively, utilized CCBs for start and maintenance therapy. The percentage of beginning and maintenance therapy that used CCBs as monotherapy was 28.2% and 11.3%, respectively. 31% of them used combination therapy for commencement, while 69% used it for maintenance. Furthermore, 87.5% of prescribers selected CCBs as their first-line management agent, and 100% of prescribers thought CCBs were helpful in managing hypertension. Moreover, CCBs were used with other antihypertensive classes to attain additive or synergistic blood pressure control. By preventing calcium from entering the vascular smooth muscle cells, CCBs reduce blood pressure.

B-BLOCKERS

B-blockers lower blood pressure by inhibiting the release of renin and by decreasing cardiac output. Additional mechanisms could be peripheral and central adrenergic outflow depression. Less than 3% of people take κ -blockers as a monotherapy, while 44% of participants use them as their preferred antihypertensive medication. -blockers may be a

highly used class of hypertension medications in the university hospital. Mostly, they were used in conjunction with other antihypertensive medication groups to achieve synergistic or additive blood pressure control. -blocker combos with diuretics alone, CCBs alone, CCBS and ARBs, CCBs and diuretics, ACEI and diuretics, CCBs and diuretics, or ARBS, diuretics and CCBs were a few of the combinations mentioned above.

Table 2: A table that summarizes each non-pharmacological treatment's impact on BP lowering.

DISCRIPTION	REASON FOR USE
Combination therapy	CCBs, Vasodilator, BB used to lower
	First line therapy failure
	To manage other symptoms
	Signs of end organ damage
	Vasodilator and pulse rate lowering effect needed simultaneously.
Monotherapy	To avoid drug inraction.
	Monotherapy has always been effective.

DIURETICS

Diuretics were primarily utilized as antihypertensive medications in fixed-dose combinations or as distinct tablets with varying strengths in conjunction with other antihypertensive drugs. 18.4% of individuals began their hypertension medication regimen with a diuretic, either alone or in combination with other medications. Just 1.4% of the participants started with a diuretic. That being said, 23.9% of the individuals used diuretics during the maintenance treatment. This study found that, on average, 95% of patients on diuretics also used other kinds of antihypertensive medications. Furosemide, bendroflumethiazide, and hydrochlorthiazide are a few of the often used diuretics. The effects of all other antihypertensive medications are enhanced by diuretics. A number of combinations were noted when using diuretics, including -blockers, CCBs, ARBS, and ACEIs.

ANGIOTENSIN-CONVERTING ENZYME INHIBITORS (ACEIS)

The hospital had extremely little utilization of ACEIs. It was one of the least prescribed drugs for people to begin monotherapy. However, it ranked among the top three medications for maintenance therapy. In maintenance therapy, the usage rate as monotherapy was 8.5%. In general, 24% of hypertension patients use ACEI as a monotherapy or combo medication to lower their blood pressure. A few of the often-seen combos included ACEI and CCBs, followed by CCBs with a diuretic. It is established that certain mixtures have a cumulative effect on decreasing blood pressure. ACEI can successfully manage mild to moderate hypertension in up to 60% of patients when used as monotherapy.

MONOTHERAPY VERSUS COMBINATION THEORY

To begin managing their hypertension, 64.8% and 31% of the individuals used monotherapy and combo treatment, respectively. However, monotherapy accounted for 29.6% of maintenance therapy whereas combination therapy accounted for. Over two-thirds of

hypertension patients require two or more hypertensive drugs chosen from various classes in order to be managed on one medication. In the ALLHAT trials, for instance, only 30% of patients had their blood pressure under control with just one medication, while 60% of patients whose blood pressure was reduced to less than

140/90 mmHg used two or more drugs. When starting pharmacotherapy, 57.1% of prescribers preferred to use a combination of two or more antihypertensive drugs from various classes. However, according to observations made from the folders, just 31% of patients really started therapy.

Table 7: some antihypertensive drugs employed by prescribes in the management of some associated conditions.

Condition	Recommended therapy
Cardiac disease	Administer a beta blocker
Bronchial asthma	Administer an ACE-I
Malignant hypertensive	Administer hydralazine
Heart failure	Administer an ACE-inhibitor
LVH	Give an ARB
DM	Give an ACE-inhibitor
Pheochromocytoma	Give a B-blocker
Renal failure	Give an ACE-inhibitor
Thyrotoxicosis	Beta-blocker administration
Pregnancy	Administer methyldopa
Cushing syndrome	Give an ARB

RESULTS OF THE PATIENTS' DATA COLLECTION

Rajasthan, a state in northern India, exhibits a rising prevalence of hypertension along with national trends. A prevalence rate among adults ranging from 20% to 40% has been found by several research carried out in various regions of Rajasthan. According to studies, between 25% and 35% of persons in the Sikar district have hypertension. Compared to women, men

typically have a somewhat higher prevalence of hypertension. Nonetheless, women who have gone through menopause have a higher risk, which causes the gender disparity in older age groups to shrink.

For the survey, 200 study participants in total were interviewed. Among them, 84 (42%) and 116 (58%) were female subjects. The study participants ranged in age from 20 to 60, with the majority

Table 8: Baseline characteristics of the study participants (N = 200)

Variables	N	%
Age group		
20-29	02	01
30-39	48	24
40-49	93	46.528.
50-60	57	
Sex		
Male	116	58.3
Female	84	42.3
Genetic		
Yes or	8	4
No	192	96

Current Smoking		
Male	32	27
Female	00	00
Current alcohol consumption		
Male	40	30
Female	00	00
Smoking or alcohol consumption		
Male		
Female	15	12.93
	00	00
Physical activity		
Inactive	148	74
Active	52	26
Occupation Government		
Private	10	5
Self-employed Retired	30	15
Homemaker	22	11
	35	17.5
Others	8	4
	95	47.5
Education		
No schooling	107	53.5
Others	93	46.5
Marital-status Unmarried		
Married	09	4.5
	191	95.5
Socioeconomic status Lower class		
Lower middle class Middle class	11	5.5
Upper mi class	14	7
	83	41.5
	92	46
BMI (kg/m ²)		
Overweight	94	47
Obeses	21	10.5
Waist circumference (cm)		
Abdominal obesity	132	66
Diabetes	52	26
Stress	66	33

Most Prescribed Antihypertensive Drugs in Sikar District

Calcium Channel Blockers (CCBs)

Amlodipine: Amlodipine is widely prescribed due to its efficacy in reducing blood pressure and its relatively favorable side effect profile. It is particularly popular for its once-daily dosing, which improves patient compliance.

Angiotensin-converting enzyme (ACE) Inhibitors

Enalapril and Ramipril: These ACE inhibitors are frequently prescribed in the Sikar district. They are effective in lowering blood pressure and have additional benefits in patients with diabetes or chronic kidney disease.

Angiotensin II Receptor Blockers (ARBs)

Losartan and Telmisartan: ARBs like losartan and telmisartan are preferred for patients who experience side effects such as cough with ACE inhibitors. They are also beneficial for patients with diabetic nephropathy and heart failure.

Beta-blockers

Atenolol and Metoprolol: These are commonly prescribed, especially for patients with concomitant conditions like ischemic heart disease or arrhythmias. They are effective in reducing blood pressure and heart rate.

Diuretics

Hydrochlorothiazide and Chlorthalidone: These thiazide diuretics are often used either alone or in combination with other antihypertensive drugs. They are particularly effective in older adults and in controlling isolated systolic hypertension.

Combination Therapy

Common combinations include: In many cases, combination therapy is used to achieve better blood pressure control.

ACE Inhibitors/ARBs with Diuretics: For synergistic effects and improved blood pressure control.

CCBs with ACE Inhibitors/ARBs: To leverage the complementary mechanisms of action and reduce side effects.

Adverse Effects of Antihypertensive Drugs

Diuretics: Common side effects include electrolyte imbalances (e.g., hypokalemia, hyponatremia), dehydration, and gout.

Beta-blockers: These can cause fatigue, depression, and bradycardia, and may worsen asthma.

ACE inhibitors: Associated with cough, hyperkalemia, and, rarely, angioedema.

ARBs: Generally well-tolerated but can cause dizziness and hyperkalemia.

CCBs: May lead to peripheral edema, constipation, and headache.

Alpha-blockers: Can cause postural hypotension, dizziness, and fatigue.

Specific Findings in Sikar District

Research in the Sikar district indicates several patterns:

Prevalence of Adverse Effects: Studies show a significant percentage of patients report adverse effects, impacting adherence to medication regimens.

Common Adverse Effects Reported: The most commonly reported adverse effects include dizziness, fatigue, and electrolyte imbalances.

Impact on Quality of Life: Adverse effects significantly affect the quality of life, leading to discontinuation of medication in some cases.

Contributing Factors

Several factors contribute to the prevalence and severity of adverse effects:

Demographic Factors: Age, gender, and comorbid conditions such as diabetes and kidney disease influence the occurrence of adverse effects.

Drug Interactions: Concurrent use of multiple medications can exacerbate adverse effects.

Dosage and Duration: Higher doses and longer duration of therapy are associated with increased adverse effects.

CONCLUSION

According to a study, the majority of hospital prescribers classified hypertension as a condition in which a patient's blood pressure consistently rises above 140/90 mm Hg for both systolic and diastolic readings. A blood pressure of 140/90 mmHg was the goal for managing hypertension in the absence of any other illness. The top limit of blood pressure in patients with co-morbidities, comorbidities, or target organ damage was 130/80 mmHg.

The hospital uses the following classes of drugs to manage hypertension;

- a) Diuretics,
- b) Calcium channel blockers,
- c) B-blockers,
- d) Ace-inhibitors,
- e) Angiotensin ii receptor blockers,
- f) Adrenergic-blocking antihypertensive drugs

In general, the pattern of drug use indicated that 31% of cases started with combination therapy and 64.8% with monotherapy. When it comes to monotherapy, CCBs (59.3%) and adrenergic antihypertensive medications (31%), are the most commonly used classes. 29.6% of prescriptions for maintenance treatment were for monotherapy, and 69% were for combinations of two or more different types of antihypertensive medications. The greatest percentage of CCBs (80.3%) were used in maintenance therapy, both alone and in combination. The largest percentage of maintenance (31%) and all combination therapy (44.9%) were found in combinations comprising CCBs and BBs.

In Sikar district, beta-blockers like atenolol and metoprolol, ACE inhibitors like enalapril and ramipril, CCBs like amlodipine, ARBs like losartan and telmisartan, and diuretics like hydrochlorothiazide are the most often prescribed antihypertensive medications.

Adverse effects of antihypertensive drugs are a significant concern in the Sikar district, affecting patient compliance and quality of life. The most commonly reported adverse effects include dizziness, fatigue, and electrolyte imbalances. : Age, gender, and comorbid conditions such as diabetes and kidney disease influence the occurrence of adverse effects. Concurrent use of multiple medications can exacerbate adverse effects. Higher doses and longer duration of therapy are associated with increased adverse effects.

Understanding the prevalence, types, and contributing factors of these adverse effects is crucial for developing strategies to mitigate them. Further research and healthcare interventions are needed to improve the management of hypertension in this region. Urban areas tend to have a higher prevalence (30%-35%) compared to rural areas (20%-25%), likely due to lifestyle differences such as diet, physical activity, and stress levels.

Addressing this public health challenge requires a multifaceted approach, including education, early detection, lifestyle modification, and improved healthcare services. By implementing effective strategies, it is possible to reduce the burden of hypertension and improve the overall health of the population in Sikar district.

Drug therapy can lower the blood pressure levels of hypertensive patients in the majority of cases. The agents now in use are usually better tolerated and more effective than many of those available a few years ago. It would be difficult to believe that a close relationship between elevated blood pressure and the increased mortality rate of hypertension did not exist and that a significant lowering of this blood pressure would not result in a decrease in this mortality rate.

REFERENCE

1. Ali, A., Zar, M.A., Kamal, A., Faquih, A.E., Bhan, C., Iftikhar, W., Malik, M.B., Ahmad, M.Q., Ali, N.S., Sami, S.A. and Jitidhar, F.N.U., 2018. American Heart Association high blood pressure protocol 2017: a

- literature review. *Cureus*, 10(8).
- Anchala, R., Kannuri, N.K., Pant, H., Khan, H., Franco, O.H., Di Angelantonio, E. and Prabhakaran, D., 2014. Hypertension in India: a systematic review and meta-analysis of prevalence, awareness, and control of hypertension. *Journal of hypertension*, 32(6), p.1170.
 - Al-Makki, A., DiPette, D., Whelton, P.K., Murad, M.H., Mustafa, R.A., Acharya, S., Beheiry, H.M., Champagne, B., Connell, K., Cooney, M.T. and Ezeigwe, N., 2022. Hypertension pharmacological treatment in adults: a World Health Organization guideline executive summary. *Hypertension*, 79(1), pp.293-301.
 - Alexander, M.R., Hank, S., Dale, B.L., Himmel, L., Zhong, X., Smart, C.D., Fehrenbach, D.J., Chen, Y., Prabhakaran, N., Tirado, B. and Centrella, M., 2022. A single nucleotide polymorphism in SH2B3/LNK promotes hypertension development and renal damage. *Circulation Research*, 131(9), pp.731-747.
 - Bidani, A.K. and Griffin, K.A., 2002. Long-term renal consequences of hypertension for normal and diseased kidneys. *Current opinion in nephrology and hypertension*, 11(1), pp.73-80.
 - Czerwinska, K., Gac, P., Poreba, R., Mazur, G. and Pawlas, K., 2021. Cardiac and vascular disorders as paraoccupational diseases-a Polish perspective. *Annals of Agricultural and Environmental Medicine*, 28(2).
 - Cheng, J.W., Kalis, M.M. and Feifer, S., 2001. Patient-reported adherence to guidelines of the sixth joint national committee on prevention, detection, evaluation, and treatment of high blood pressure. *Pharmacotherapy: The Journal of Human Pharmacology and Drug Therapy*, 21(7), pp.828-841.
 - Doe, J.K. and Asiedu, M.A., 2023. An Analysis of the Prevalence and Risk Factors of Hypertension in Ghana: A Systematic Review. *World Journal of Public Health*, 8(4), pp.261-265.
 - Deokate, G., Deshmukh, M.T. and Shete, R.V., Formulation and Evaluation of Antihypertensive Bilayer Tablet.
 - Douglas, P.S., Khandheria, B., Stainback, R.F., Weissman, N.J., Brindis, R.G., Patel, M.R., Khandheria, B., Alpert, J.S., Fitzgerald, D., Heidenreich, P. and Martin, E.T., 2007. ACCF/AHA/ACEP/ASNC/SCAI/SCCT/SCMR 2007 appropriateness criteria for transthoracic and transesophageal echocardiography: a report of the American College of cardiology Foundation quality strategic directions Committee appropriateness criteria Working group, American Society of echocardiography, American College of emergency physicians, American Society of nuclear cardiology, Society for cardiovascular angiography and interventions, society of cardiovascular computed tomography, and the Society for *Journal of the American College of Cardiology*, 50(2), pp.187-204.
 - Gregg, L.P., Carmody, T., Le, D., Toto, R.D., Trivedi, M.H. and Hedayati, S.S., 2020. Inflammation and response to sertraline treatment in patients with CKD and major depression. *American Journal of Kidney Diseases*, 75(3), pp.457-460.
 - Gupta, R., 2015. Hypertension as a public health problem in India. *Hypertension J*, 1(1), pp.1-3.
 - Garjon, J., Saiz, L.C., Azparren, A., Gaminde, I., Ariz, M.J. and Erviti, J., 2020. First-line combination therapy versus first-line monotherapy for primary hypertension. *Cochrane Database of Systematic Reviews*, (2).
 - Hernández, J.L., Nan, D., Fernandez-Ayala, M., García-Unzueta, M., Hernández-Hernández, M.A., López-Hoyos, M., Muñoz-Cacho, P., Olmos, J.M., Gutiérrez-Cuadra, M., Ruiz-Cubillán, J.J. and Crespo, J., 2021. Vitamin D status in hospitalized patients with SARS-CoV-2 infection. *The Journal of Clinical Endocrinology & Metabolism*, 106(3), pp.e1343-e1353.
 - <https://en.wikipedia.org/w/index.php?titl>

- e=Antihypertensive_drug&oldid=1221685260
16. <https://www.who.int/publications/i/item/improving-hypertension-control-in-3-million-people-country-experiences-of-programme-development-and-implementation>.
 17. Hompesch, C., Ma, T.W., Neyra, J.A., Ripley, L., Xiao, G., Inrig, J., Toto, R. and Van Buren, P.N., 2016. Comparison of ambulatory blood pressure patterns in patients with intradialytic hypertension and hemodialysis controls. *Kidney and Blood Pressure Research*, 41(3), pp.240-249.
 18. Houston, M.C., 2005. Nutraceuticals, vitamins, antioxidants, and minerals in the prevention and treatment of hypertension. *Progress in cardiovascular diseases*, 47(6), pp.396-449.
 19. Hassan khalil; Roman Zeltser; (2023) Antihypertensive Medication <https://www.ncbi.nlm.nih.gov/books/NBK554579/>.
 20. Han, H.R., Song, H.J., Nguyen, T. and Kim, M.T., 2014. Measuring self-care in patients with hypertension: a systematic review of literature. *Journal of Cardiovascular Nursing*, 29(1), pp.55-67.
 21. Jones, D.W. and Hall, J.E., 2004. Seventh report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure and evidence from new hypertension trials. *Hypertension*, 43(1), pp.1-3.
 22. Kaloyanides, G.J., 1996. Hypertension: Pathophysiology, Diagnosis, and Management.
 23. Kizzie-Hayford Arimathea, J., 2010. Evaluation of Drug Management of Essential Hypertension in the University of Cape Coast Hospital, Ghana.
 24. Kitt, J., Fox, R., Tucker, K.L. and McManus, R.J., 2019. New approaches in hypertension management: a review of current and developing technologies and their potential impact on hypertension care. *Current hypertension reports*, 21, pp.1-8.
 25. Mahfoud, F., Wang, J. and Ray, S., 2024. The current position of β -blockers in hypertension: guidelines and clinical practice. *Current Medical Research and Opinion*, 40(sup1), pp.25-32.
 26. Mazzeo, F., Motola, G., Rossi, S., Russo, F., Vitelli, M.R., Capuano, A., Rossi, F. and Filippelli, A., 2001. Management of hypertension by general practitioners: an Italian observational study. *Advances in therapy*, 18, pp.122-130.
 27. Maranta, F., Spoladore, R. and Fragasso, G., 2017. Pathophysiological mechanisms and correlates of therapeutic pharmacological interventions in essential arterial hypertension. *Hypertension: from basic research to clinical practice*, pp.37-59.
 28. Mancia, G., De Backer, G., Dominiczak, A., Cifkova, R., Fagard, R., Germano, G., Grassi, G., Heagerty, A.M., Kjeldsen, S.E., Laurent, S. and Narkiewicz, K., 2007. 2007 Guidelines for the management of arterial hypertension: The Task Force for the Management of Arterial Hypertension of the European Society of Hypertension (ESH) and of the European Society of Cardiology (ESC). *European heart journal*, 28(12), pp.1462-1536.
 29. Mancia, G., 2007. Management of Arterial Hypertension of the European Society of Hypertension. 2007 Guidelines for the Management of Arterial Hypertension. *J Hypertens*, 25, pp.1105-1187.
 30. Mills, K.T., Stefanescu, A. and He, J., 2020. The global epidemiology of hypertension. *Nature Reviews Nephrology*, 16(4), pp.223-237.
 31. Mogul, A., Leppien, E.E., Laughlin, E. and Spinler, S.A., 2021. Aspirin for primary prevention of cardiovascular disease: a review of recent literature and updated guideline recommendations. *Expert Opinion on Pharmacotherapy*, 22(1), pp.83-91.
 32. Masse, B.M., 1985. Antihypertensive therapy with calcium-channel blockers: comparison with beta blockers. *The American Journal of Cardiology*, 56(16), pp.H97-H100.
 33. Neyra, J.A., Manllo, J., Li, X., Jacobsen, G.,

- Yee, J., Yessayan, L. and AKICI Study Group, 2015. Association of de novo dipstick albuminuria with severe acute kidney injury in critically ill septic patients. *Nephron Clinical Practice*, 128(3-4), pp.373-380.
34. Nakagomi, A., Yasufuku, Y., Ueno, T. and Kondo, K., 2022. Social determinants of hypertension in high-income countries: A narrative literature review and future directions. *Hypertension Research*, 45(10), pp.1575-1581.
35. O'Shea, P.M., Griffin, T.P. and Fitzgibbon, M., 2017. Hypertension: The role of biochemistry in the diagnosis and management. *Clinica Chimica Acta*, 465, pp.131-143.
36. Rodgers, P.T., 1998. Combination drug therapy in hypertension: a rational approach for the pharmacist. *Journal of the American Pharmaceutical Association* (1996), 38(4), pp.469-479.
37. Szuba, A., Martynowicz, H., Zatońska, K., Ilow, R., Regulska-Ilow, B., Różańska, D., Wołyniec, M., Połtyn-Zaradna, K. and Zatoński, W., 2017. Prevalence of hypertension in Polish population of PURE Poland study. *Journal of Health Inequalities*, 2(2), pp.157-162.
38. Salvetti, A., Magagna, A., Innocenti, P., Ponzanelli, F., Cagianelli, A., Cipriani, M., Gandolfi, E., Del Prato, C., Ballestra, A.M., Saba, P. and Giuntoli, F., 1991. The combination of chlorthalidone with nifedipine does not exert an additive antihypertensive effect in essential hypertensives: a crossover multicenter study. *Journal of cardiovascular pharmacology*, 17(2), pp.332-335.
39. Shere, A., Eletta, O. and Goyal, H., 2017. Circulating blood biomarkers in essential hypertension: a literature review. *Journal of Laboratory and Precision Medicine*, 2(12).
40. Sogunuru, G.P. and Mishra, S., 2020. Asian management of hypertension: Current status, home blood pressure, and specific concerns in India. *The Journal of Clinical Hypertension*, 22(3), pp.479-482.
41. Thakre, S., Anjankar, A., Singh, A. and Kumar, T., 2022. National Hypertension Guidelines: A Review of the India Hypertension Control Initiative (IHCI) and Future Prospects. *Cureus*, 14(8).
42. Treciokiene, I., Postma, M., Nguyen, T., Fens, T., Petkevicius, J., Kubilius, R., Gulbinovic, J. and Taxis, K., 2021. Healthcare professional-led interventions on lifestyle modifications for hypertensive patients—a systematic review and meta-analysis. *BMC family practice*, 22, pp.1-15.
43. Podlekareva, D., Mocroft, A., Dragsted, U.B., Ledergerber, B., Beniowski, M., Lazzarin, A., Weber, J., Clumeck, N., Vetter, N., Phillips, A. and EuroSIDA study group, 2006. Factors associated with the development of opportunistic infections in HIV-1–infected adults with high CD4+ cell counts: a EuroSIDA study. *The Journal of infectious diseases*, 194(5), pp.633-641.
44. Rossier, B.C., 2016. Osmoregulation during long-term fasting in lungfish and elephant seal: Old and new lessons for the nephrologist. *Nephron*, 134(1), pp.5-9.
45. Van Buren, P.N., Adams-Huet, B., Nguyen, M., Molina, C. and Toto, R.D., 2014. Potassium handling with dual renin-angiotensin system inhibition in diabetic nephropathy. *Clinical Journal of the American Society of Nephrology*, 9(2), pp.295-301.
46. Verma, N., Rastogi, S., Chia, Y.C., Siddique, S., Turana, Y., Cheng, H.M., Sogunuru, G.P., Tay, J.C., Teo, B.W., Wang, T.D. and Tsoi, K.K.F., 2021. Non-pharmacological management of hypertension. *The Journal of Clinical Hypertension*, 23(7), pp.1275-1283.
47. World Health Organization, 2020. Improving hypertension control in 3 million people: country experiences of programme development and implementation.
48. Wolf-Maier, K., Cooper, R.S., Kramer, H., Banegas, J.R., Giampaoli, S., Joffres, M.R., Poulter, N., Primatesta, P., Stegmayr, B. and Thamm, M., 2004. Hypertension treatment and control in five European countries,

- Canada, and the United States. Hypertension, 43(1), pp.10-17.
49. Williams, B., Poulter, N.R., Brown, M.J., Davis, M., McInnes, G.T., Potter, J.F., Sever, P.S. and Thom, S.M., 2004. British Hypertension Society guidelines for hypertension management 2004 (BHS-IV): summary. *Bmj*, 328(7440), pp.634-640.