THERAPEUTICS MONITORING AND CHARACTERISTIC APPLICATION OF DRUG USED IN HYPERTENSIVE PATIENTS

Syed Azhar Ullah Quadri[*1], Hajera Hafeez[2], Mohd. Ateeq Ur Rehman[3], Mohammed Zubair Ahmed[1], Syed Fayyazuddin[1], Md. Ismail zubair[1], Pawan Kumar[1], Mohammed Majid Iqbal[4]

[1]Singhania University, Pacheri Beri, Jhunjhunu. Rajasthan. INDIA.

[2]Life Pharmacy, Bay Square, Business bay. DUBAI. UAE.

[3]MESCO College of Pharmacy, Hyderabad. Telangana. INDIA.

[4]Sultan College of Pharmacy, BIDAR. Karnataka. INDIA.

ABSTRACT

The main objective of the study is to assess drug use pattern of antihypertensive medications in hypertensive patients. It is a prospective study conducted in the Tertiary care hospital, for the period of 8 months from June 2024 to January 2025. About 500 prescriptions of patients visiting Hospital with an antihypertensive prescription were enrolled for the study. Drug use patterns of different modules of antihypertensive medications were analyzed from separate prescriptions. A total of 500 patients were included in this study, among which 281 were male 56.2% & 219 43.8% were female. In 500 patients, 133 patients were treated with monotherapy. In that 42.1% of patients were treated with amlodipine, 28.57% of patients were treated with losartan. In combination therapy most commonly used was double therapy 42.8% followed by triple therapy 24.2%. Calcium Channel Blockers 56.2% was most prescribed class of drug followed by Angiotensin Receptor Blockers. In our study the final conclusion of the study reveals that calcium channel blockers as most prescribed class of antihypertensive and Amlodipine was the most prescribed antihypertensive. In our study, most of the patients were treated with combination therapy in that double drug therapy was most common. There is a chance of various medication errors, development of adverse drug reaction as majority 290 of patients belong to age above 60 and chances of getting error also increases as combination therapy is most used. Therefore, close

monitoring is required for such patients. During our discussion with patients we suggested for Lifestyle changes, it can help lower high blood pressure. Include, eating a healthy, low-salt diet, losing weight, being physically active and quitting tobacco & Alcohol.

KEYWORDS: Angiotensin Receptor Blockers, Calcium Channel Blockers, Drug Utilization Study, Hypertension & Hospital.

INTRODUCTION

A chronic health disease, in which the pressure of the blood in the arteries is abnormally elevated is hypertension (HTN), commonly known as high BP or blood pressure (BP). This requires that the heart works faster than average in the blood arteries to circulate. BP depends on the contraction of the cardiac muscles, i.e., on systolic BP (SBP), and on diastolic BP (DBP), which depends on the relaxation of the heart muscular tissue. The normal SBP range 100-140mmHg (top reading) and DBP range 60-90mm Hg (bottom reading). If the BP is constant at or over 140/90 mmHg, HBP is present.[1]
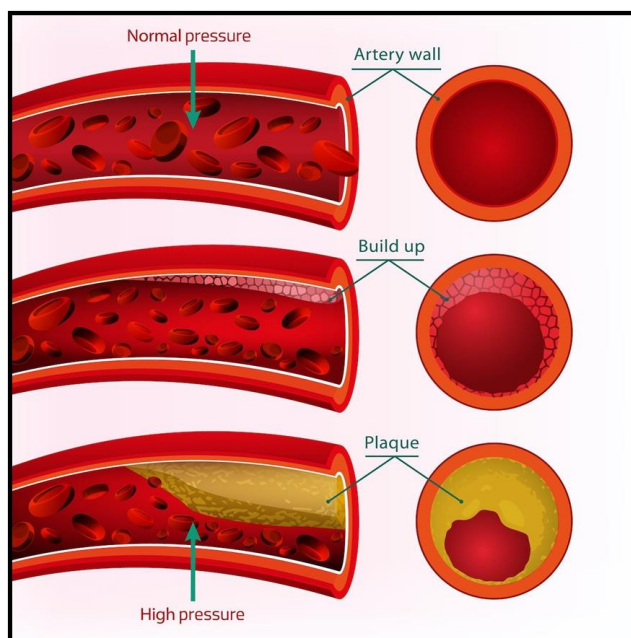

Figure No. 1. Artery in hypertensive condition.

According to WHO the Key facts and Overview of hypertension (HTN)[2]

1. A predictable 1.28 billion adults aged 30–79 years worldwide have hypertension, most (two-thirds) living in low and middle income countries

2. An expected 46% of adults with hypertension are unaware that they have the hypertension.

3. Less than half of adults (42%) with hypertension are identified and treated.

4. Around 1 in 5 adults (21%) with hypertension have it under control.

5. Hypertension is a major cause of premature death worldwide.

6. One of the global targets for non-communicable diseases is to reduce the frequency of hypertension by 33% between 2010 and 2030.

People with high blood pressure may not feel indications. The only way to know is to get your blood pressure checked.

Things that increase the risk of having high blood pressure include.

- Older Age
- Genetics
- Being Overweight or Obese
- Not Being Physically Active
- High-Salt Diet
- Drinking Too Much Alcohol

Lifestyle changes like eating a healthier diet, quitting tobacco and being more active can help lower blood pressure. Some people may still need to take medicines.

According to WHO the Risk factors of hypertension (HTN)[2]

➢ Modifiable risk factors include unhealthy diets (excessive salt consumption, a diet high in saturated fat and trans fats, low intake of fruits and vegetables), physical inactivity, consumption of tobacco and alcohol, and being overweight or obese. In addition, there are environmental risk factors for hypertension and associated diseases, where air pollution is the most significant.

➢ Non-modifiable risk factors include a family history of hypertension, age over 65 years and co-existing diseases such as diabetes or kidney disease.

METHODS

Drug utilization research can increase our understanding of how drugs are being used. It can determine the pattern or profile of drug use and the extent to which alternative drugs are being used to treat hypertension conditions. It can be used to match the experimental patterns of drug use for the management of a certain disease with current references or guidelines of

Joint National Committee Hypertension in Adults guideline (JNC-8). The aim of this study was to perceive the drug utilization design of antihypertensive patient's prescription.[3]

❖ **Study design**

Prospective cross sectional study.

❖ **Study site**

Tertiary care hospital.

❖ **Study period**

8 months (June 2024 to January 2025)

❖ **Study place**

Patients visiting Hospital with an antihypertensive prescription.

❖ **Sample size**

500 patients prescribed with antihypertensive medications.[4]

❖ **Inclusion criteria[5]**

➢ Patients of both genders above 18 years of age.

➢ Patients diagnosed with Hypertension or high blood pressure Patients with or without co-morbidities.

➢ Patients who are willing to participate in the study are included in the study

❖ **Exclusion criteria[5]**

➢ Patients below 18 years of age

➢ Pregnant and lactating women

➢ Patients aged above 80 years old are excluded from the study

❖ **Data collection technique**

➢ Details will be obtained from the patients through structured questionnaire by direct interview.

➢ Drugs use pattern assessed from individual prescription.

❖ **Ethical consideration**

➤ Ethical clearance was obtained from University Research/Human Ethics Committee of the University. Informed consent was obtained from the patient and caregiver before commencing the study. Permission for checking case sheets of patients was obtained from the hospital authorities. All data will be kept confidential and was used for the purpose of this study only.[6]

❖ **Statistical analysis**

➤ Data obtained was entered into Microsoft Excel Sheet and analyzed using Statistical Package for the Social Sciences trial version 18.0. Qualitative variables will be expressed in percentages. Quantitative variables will be expressed in mean and standard deviation (SD) and its confidence interval.[7]

RESULTS AND DISCUSSION

In this probable study, a total of 500 patients were registered and among these patients, 293 (58.60%) patient were Males and 207 (41.40%) patients were females. Mean age in the study population from the Table.

Results from the table showed that among 500 patients 72.4% were in the age group of below 60 years and 27.6% were of age group of above 60 years.

Table No. 1: Basic characteristics of all hypertensive patients.

Characteristics	Frequency (n)	Percentage
Gender		
Males	293	58.60
Females	207	41.40
Age Group		
<60	362	72.4
60>	138	27.6
Family History		
Yes	158	31.60
No	342	68.40
Social Habits		
Alcoholic	13	2.0
Non-alcoholic	396	81.4
Ex-alcoholic	72	12.6
Occasional alcoholic	19	12.6
Smoking	17	2.8
Non- Smoking	384	75.0
Ex- Smoking	87	20.8
Occasional Smoking	12	1.4

This study also showed that 31.60% of patients have a family history of Hypertension and 68.40% does not have any family history of hypertension. In case of social habits, 2.8% patients were smokers, 2% patients were alcoholic, 2.8% were ex-alcoholic, and 20.8 were ex-smokers.

Table No. 2: Age- and sex-wise distribution of illness.

Age	Sex		Number	Percentage
	Male	Female		
18-30	14	10	24	4.8
31-40	62	53	115	23.0
41-50	78	64	142	28.4
51-60	48	33	81	16.2
61-70	76	35	111	22.2
71-80	15	12	27	5.4

The enrolled patients were categorized, based on blood pressure level as per the Joint National Committee Hypertension in Adults guideline (JNC-8). Among 500 patients, most of the patients belong to stage 1 hypertension 33.8% having systolic blood pressure and 38.8% having diastolic blood pressure. In stage 2 hypertension 24% have systolic blood pressure and 10.2% have diastolic blood pressure shown in Table No.3.

Table No. 3: Distribution of Patients according to their blood pressure.

Blood Pressure Types of Prescription	Systolic Blood Pressure (mmHg)	Diastolic Blood Pressure (mmHg)	Systolic Blood Pressure		Diastolic Blood Pressure	
			Frequency	Percentage	Frequency	Percentage
Normal	< 120	< 80	69	13.8	221	44.2
Pre Hypertension	120-139	80-89	142	28.4	34	6.8
Stage 1 Hypertension	140-159	90-99	169	33.8	194	38.8
Stage 2 Hypertension	≥160	≥ 100	120	24	51	10.2
Total			500	100	500	100

In this study, 237 patients were treated with monotherapy in that 80.61% patients were treated with amlodipine, followed by Losartan (56.22%), Telmisartan (32.99%), Metoprolol (60.42%). Ramipril 28.37% and Enalapril 58.10% were used less frequently shown in the Table No. 4.

Among angiotensin-converting enzyme inhibitors most prescribed was Enalapril 58.10%, followed by Ramipril 28.37%) and Captopril 5.40%.

Beta-blockers are now considered as first-line drug when having compelling indications like coronary disease risk and myocardial infraction. It was seen that 60.42% were treated with Metoprolol, 20.23% patients were treated with atenolol, 9.24% patients were treated with Nebivolol, 5.65% were treated Propranolol and 4.46% were treated with Bisoprolol. Are shown in Table No. 4.

Table No. 4: Distribution of prescription according to various class of antihypertensive drug prescribed.

Antihypertensive class	Name of the drug	Prescriptions	Percentage
Angiotensin receptor blocker (n=297)	Losartan	167	56.22
	Telmisartan	98	32.99
	Olmesartan	8	2.69
	Candesartan	24	8.10
Angiotensin converting enzyme inhibitor (N=148)	Enalapril	86	58.10
	Ramipril	42	28.37
	Captopril	8	5.40
	Lisinopril	12	8.13
Beta blocker (N=336)	Metoprolol	203	60.42
	Nebivolol	31	9.24
	Atenolol	68	20.23
	Bisoprolol	15	4.46
	Propranolol	19	5.65
Calcium channel blocker (N=294)	Amlodipine	237	80.61
	Clinidipine	43	14.60
	Diltiazem	9	3.10
	Nifedipine	5	1.70
Diuretics (N=132)	Furosemide	60	45.44
	Hydrochlorothiazide	26	19.70
	Spironolactone	19	14.40
	Chlorthalidone	15	11.36
	Triamterene	12	9.10
Centrally acting drugs (N=37)	Clonidine	37	100
Alpha blocker (N=23)	Prazosin	23	100
Alpha and beta blocker (N=12)	Carvedilol	12	100

Table No. 4. showed that Calcium Channel Blockers for 294 patients either alone or in combination were the most commonly prescribed antihypertensive class of drug and in this class Amlodipine 80.61% was frequently prescribed followed by Clinidipine 14.60%, Diltazem 3.10% and Nifedipine 1.70%. Around 297 patients were prescribed with

Angiotensin Receptor Blockers as antihypertensive drug; In that Losartan 56.22% was commonly prescribed and which is followed by Telmisartan 32.99%, Candesartan 9.10% and Olmesartan 2.69%.

The Diuretics prescribed preferably Thiazides are first-line agents for most patients with hypertension, especially in combination therapy. The result showed that Furosemide 45.44% was the most prescribed Diuretic, followed by Hydrochlorothiazide 19.70%, Spironolactone, 14.40%, Chlorthalidone 11.36%, last Torsemide 9.10%.

In combination therapy most commonly used was double therapy (45.60%) followed by triple therapy (16.80%), four-drug therapy (7.80%), and five drug therapy (2.20%) shown in the Table No. 5.

Table No. 5: Distribution of patients according to comorbidities drug therapy.

Combination therapy	Prescriptions	Percentage
Single Drug Therapy	138	27.60
Double Drug Therapy	228	45.60
Triple Drug Therapy	84	16.80
Four Drug Therapy	39	7.80
Five Drug Therapy	11	2.20

Hypertension is usually associated with co-morbidities such as heart diseases, diabetes, stroke, and kidney failure. In 500 patients about 414 patients 82.8% where with comorbidity. The Table showed that 51.2% of patients had Coronary artery disease (CAD), followed by diabetes 48.6%, Urinary tract infection 13.4%, hypothyroidism 12.6%, chronic kidney disease (CKD) 7.2%, Bronchiectasis 11.6 and Stroke 2.8%.

Table No. 6: Distribution of patients according to comorbidities.

Illness	Number	Percentage
Alcoholic liver disease	67	13.4
Bronchiectasis	58	11.6
Chronic obstructive pulmonary disease	45	9.0
Chronic renal failure	36	7.2
Coronary artery disease	256	51.2
Diabetes mellitus	243	48.6
Gastritis	107	21.4
Hypothyroid disease	63	12.6
Ischemic heart disease	77	15.4
Pneumonia	43	8.6

Stroke	14	2.8
Urinary tract infection	67	13.4
No co-morbidities	86	17.2

CONCLUSION

This study was conducted in the Tertiary care hospital., and a total of 500 patients were enrolled. The study duration was a period of 8 months. In the study, among the 500 patients, 293 (58.60%) patients were males and 207 (41.40%) patients were females. The enrolled patients were categorized based on blood pressure level in adults as per Joint National Committee Hypertension in Adults guideline (JNC-8).

In most cases, hypertension will lead to several other diseases including cardiovascular and renal diseases. In our study people most frequently observed comorbidity was CAD and Diabetes Mellitus. Majority were having stage 1 hypertension and 31.60% had family history of hypertension. Most of the patients were treated with combination therapy in that double drug therapy was most common. Combination therapy was preferred as majority of patients were having comorbidities. On analysis of drug use pattern calcium channel blocker was most prescribed class of antihypertensive and drug was Amlodipine.

Most geriatric patients were on combination therapy so avoiding polypharmacy and promoting rational use of drug should be considered while prescribing. Fixed-dose combinations can be preferred for geriatric patients with proper monitoring.

In our study, for the treatment of hypertension Calcium channel blocker were commonly prescribed medicines followed by diuretics. The most commonly used Calcium channel blocker was amlodipine. In majority of times, generic medicines were prescribed, which are welcoming and prescribing by generic names.

Limitations of the study include single centered and limited time period for follow-up. If the study was conducted in larger sample size for long duration more significant results would have been obtained.

AUTHOR CONTRIBUTION

All authors contributed equally.

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