

Prescribing Patterns of Anti-Hypertensives Among Hypertensive Patients in General Medicine Department at A Tertiary Care Teaching Hospital

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ABSTRACT

Hypertension is one of the prominent causes of high mortality and morbidity that occur in approximately one in three adults worldwide. It is the most common long-lasting medical problem urging visits to health care providers. The global incidence is similar between both men and women, but differs with age. This study was done to evaluate drug utilisation pattern of antihypertensive drugs among hypertensive patients. This is a prospective observational study carried out in Department of General Medicine for a period of 6 months. A total of 410 patients who have hypertension and other comorbidities are included in the study. 203 patients have single comorbidity with hypertension. 247 prescriptions contain 6-10 drugs. In 410 prescriptions, 795 Anti-Hypertensive drugs were prescribed and Amlodipine was the most commonly prescribed drug (31.44%).

Keywords: Hypertension, Anti-Hypertensive drugs, prescribing patterns.

INTRODUCTION

Hypertension is one of the prominent causes of high mortality and morbidity worldwide¹. It is the most common long-lasting medical problem urging visits to health care providers. The global incidence is similar between both men and women, but differs with age. For persons less than 45 years old, high blood pressure occurs more frequently in men than women. For persons 65 years old or older, high blood pressure occurs in women greater than men². Increasing age is associated with changes in the structure of walls of blood vessels producing loss of vascular compliance, affecting size and volume of the lining of the arteries that ultimately results in hypertension³. In India, cardiovascular diseases [CVDs] are estimated to be responsible for 1.5 million deaths annually⁴. As HTN is a major risk factor for CVDs and one of the most prevailing disease states, a number of national and international guidelines for the treatment of hypertension have been published. JNC 7 guideline recommends diuretics as the first-line treatment in hypertension⁵. The European guideline, on the other hand, suggests that unless a special indication exists, any of the five antihypertensive classes can be used as first-line treatment⁶. The National Institute for Health and Clinical Excellence (NICE) guideline⁷ recommend angiotensin-converting enzyme (ACE) inhibitor or angiotensin-II receptor blocker (ARB) as step 1 antihypertensive treatment aged under 55 years, whereas calcium channel blockers (CCBs) are preferred step 1 antihypertensive treatment aged over 55 years. Prescription pattern monitoring studies (PPMS) are drug utilization studies with the main focus on prescribing, dispensing and administering of drugs. The aim of PPMS

is to facilitate the rational use of drugs in a population. The rational use of medicines (RUM) is defined as "Patients receive medications appropriate to their clinical needs, in doses that meet their own individual requirements, for an adequate period of time, and at the lowest cost to them and their community. The main objective of the study is to identify and suggest appropriate treatments options for patients and to improve rational use of drugs.

METHODOLOGY

A Prospective observational study was conducted over a period of 6 months from November 2016 – April 2017.

Study criteria

Inclusion criteria

Inpatients of General Medicine department of either gender with age above 18 years who have hypertension with other comorbidities.

Exclusion criteria

Patients who are not willing to participate in the study
Pregnant women
Psychiatric patients
People with portal and pulmonary hypertension
Poison cases

Sample Size

410 inpatients suffering from hypertension with or without comorbidities were studied.

Collection of data

Data of patients matching inclusion criteria were recorded. Before including in the study, patients were explained about the aspects of research work. Written informed consent was taken before including him or her into the study. Once the consultation by the physician was over the

prescriptions were copied and patients were interviewed regarding duration of taking past Anti-Hypertensive drugs.

A standard subject socio demographic and clinical features data collection form was prepared and the characteristics

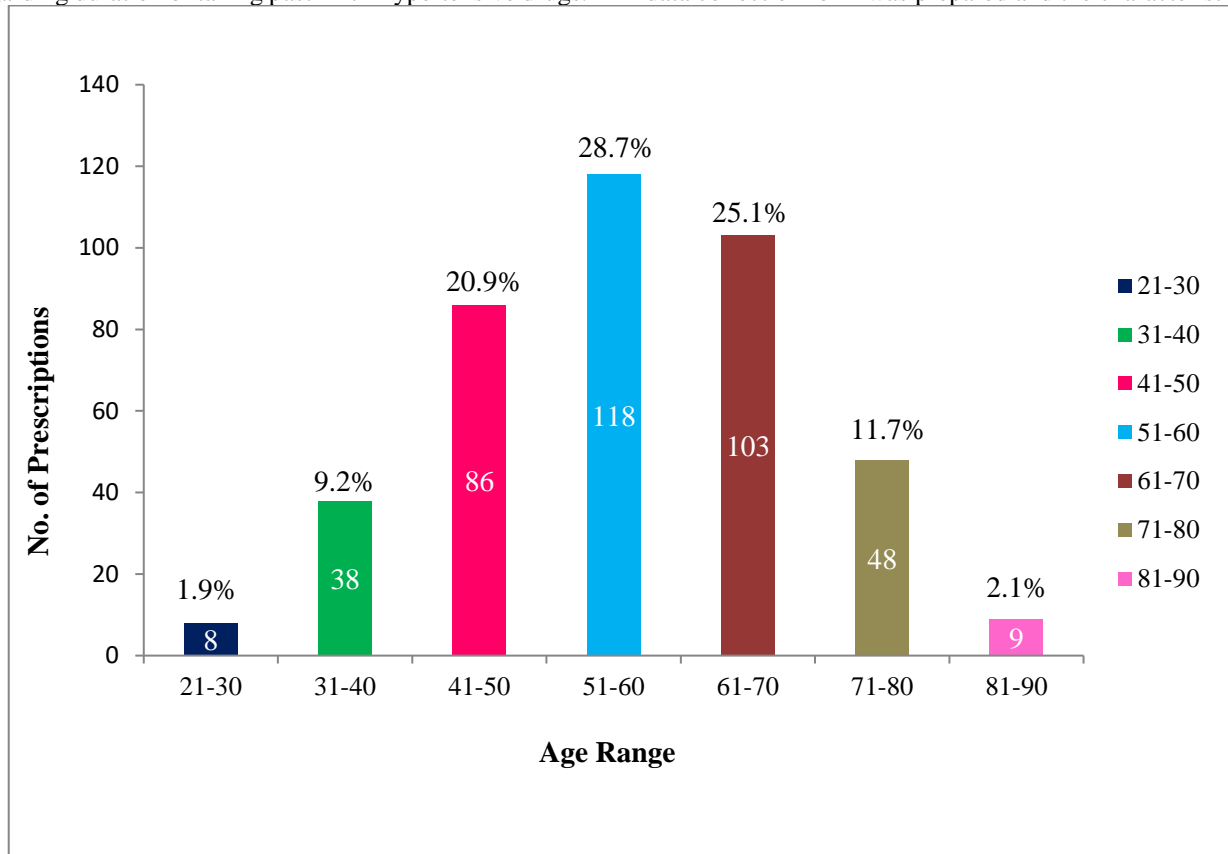


Figure 1: Age wise distribution of patients.

The most prevalent age group observed was 51-60 years with 118 (28.78%) patients followed by 61-70 with 103 (25.12%) patients and the less prevalent age group was 20-30 years with only 8 (1.95%) patients.

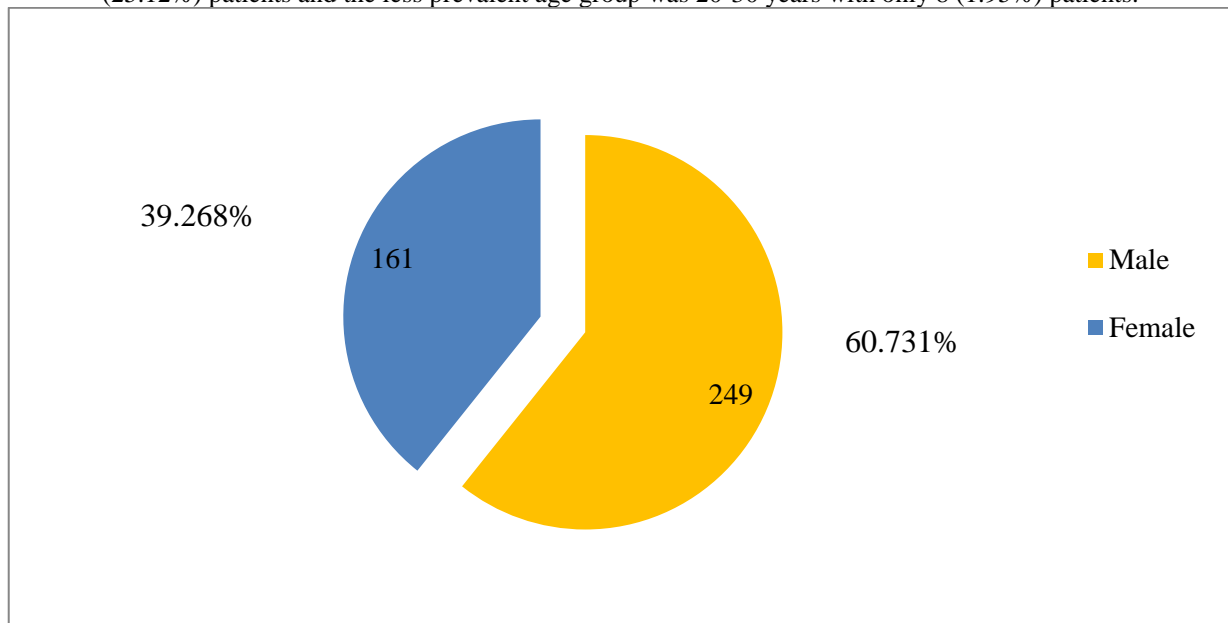


Figure 2: Gender wise distribution.

We observed that male patients 249 (60.173%) were more than female patients 161 (39.268%).

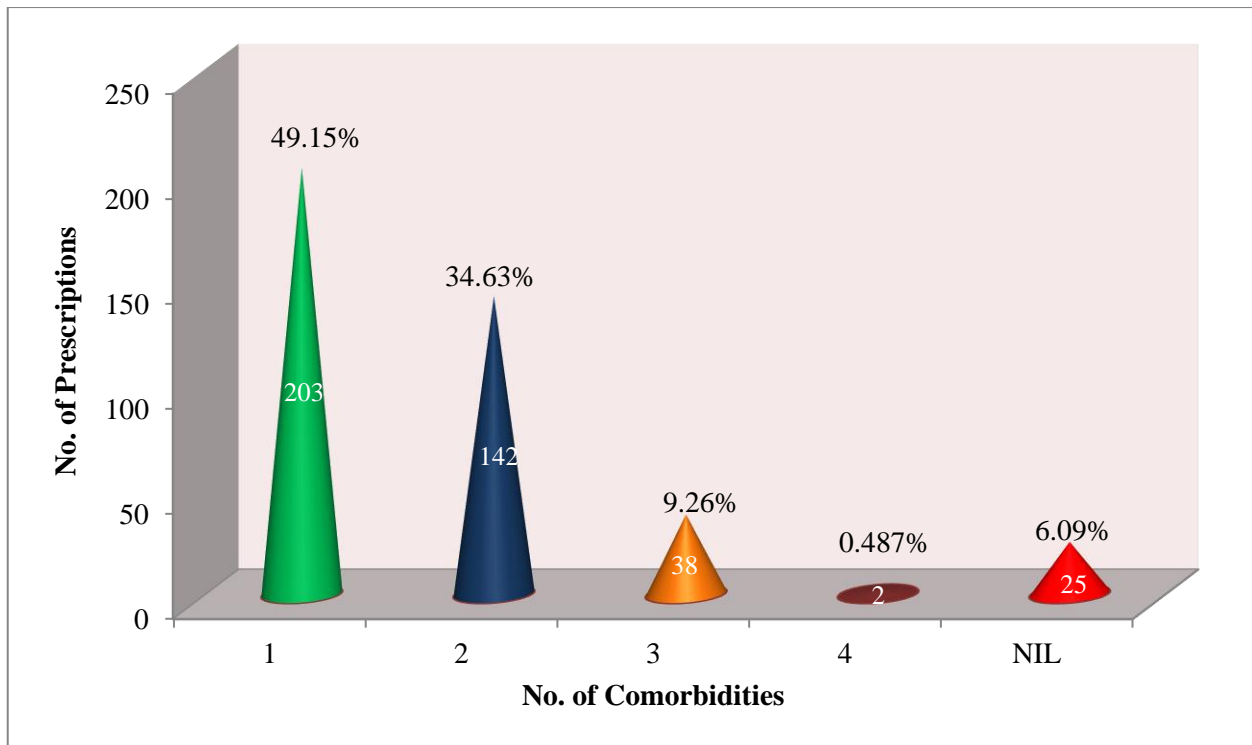


Figure 3: Frequency of comorbidities with Hypertension.

In our study only 1 comorbidity 203 (49.15%) was observed in majority of hypertensive patients and no comorbidity was seen in 25 (6.09%) patients.

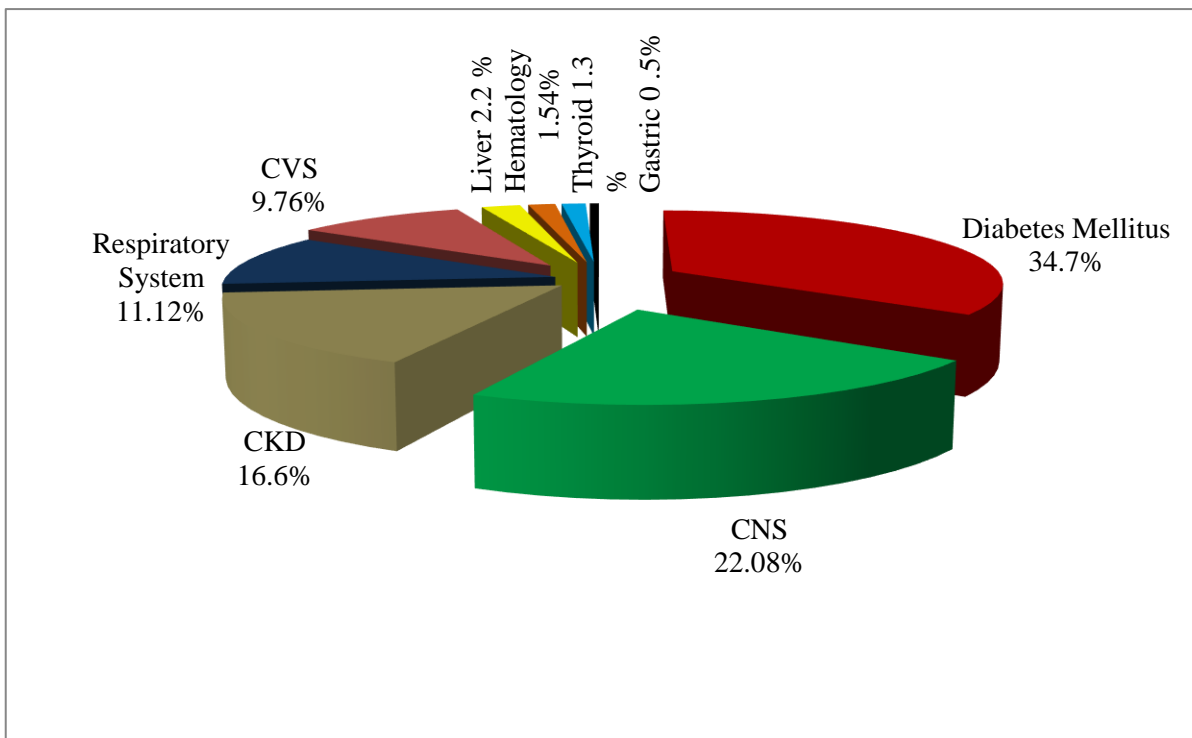


Figure 4: Affected system wise distribution.

As we can observe in our study the most common complication is Diabetes Mellitus (35 %) followed by CNS (22 %) with very minimal Thyroid (1 %).

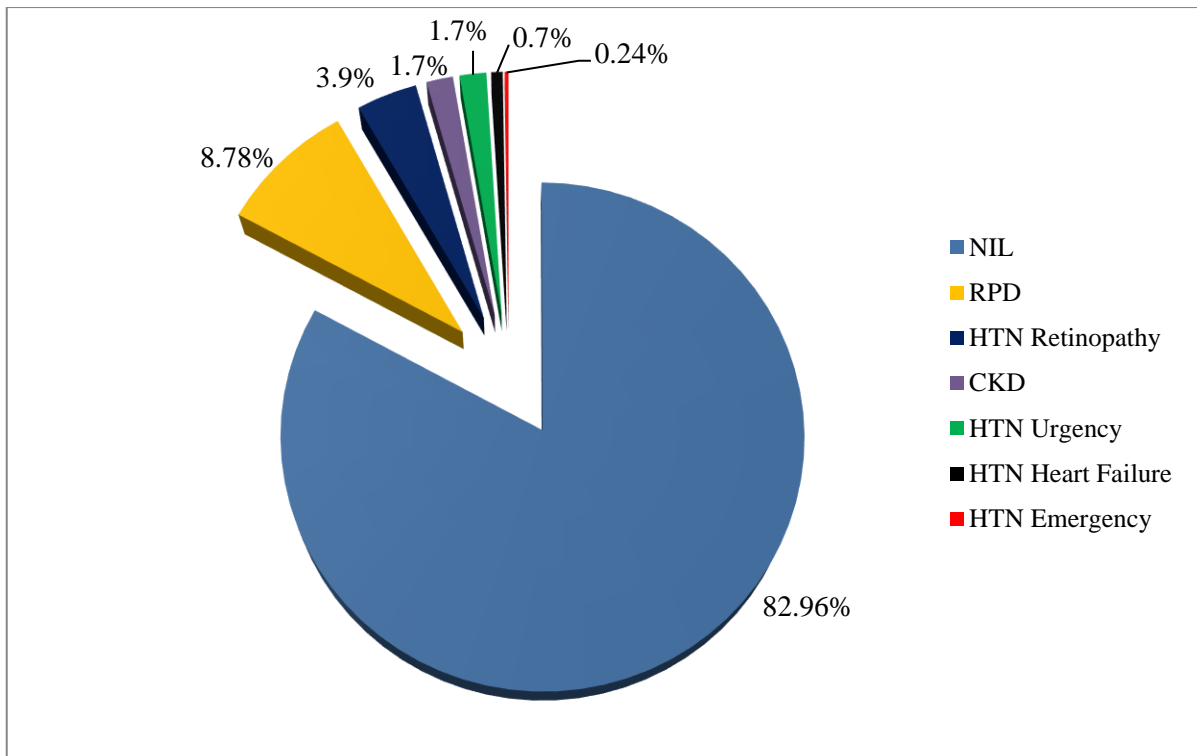


Figure 6: Complications of Hypertension.

Most of the patients in the study have no complications (82.96%) followed by Renal Parenchymal Disease (8.78%), HTN Retinopathy (3.9%), CKD (1.7%), HTN Urgency (1.7%), HTN Heart Failure (0.7%) and HTN Emergency (0.24%).

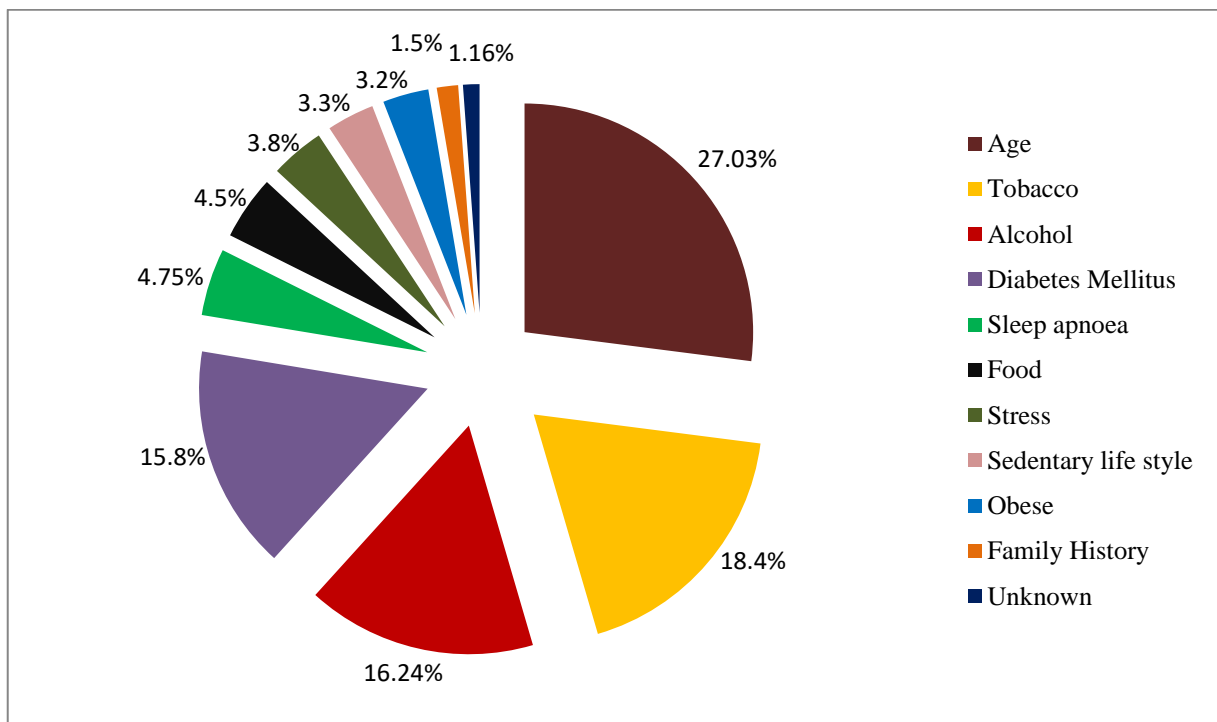


Figure 7: Risk factors for Hypertension.

The most common risk factor for hypertension is Age (27.03%) followed by Tobacco (18.4%) and Alcohol consumption (16.24%).

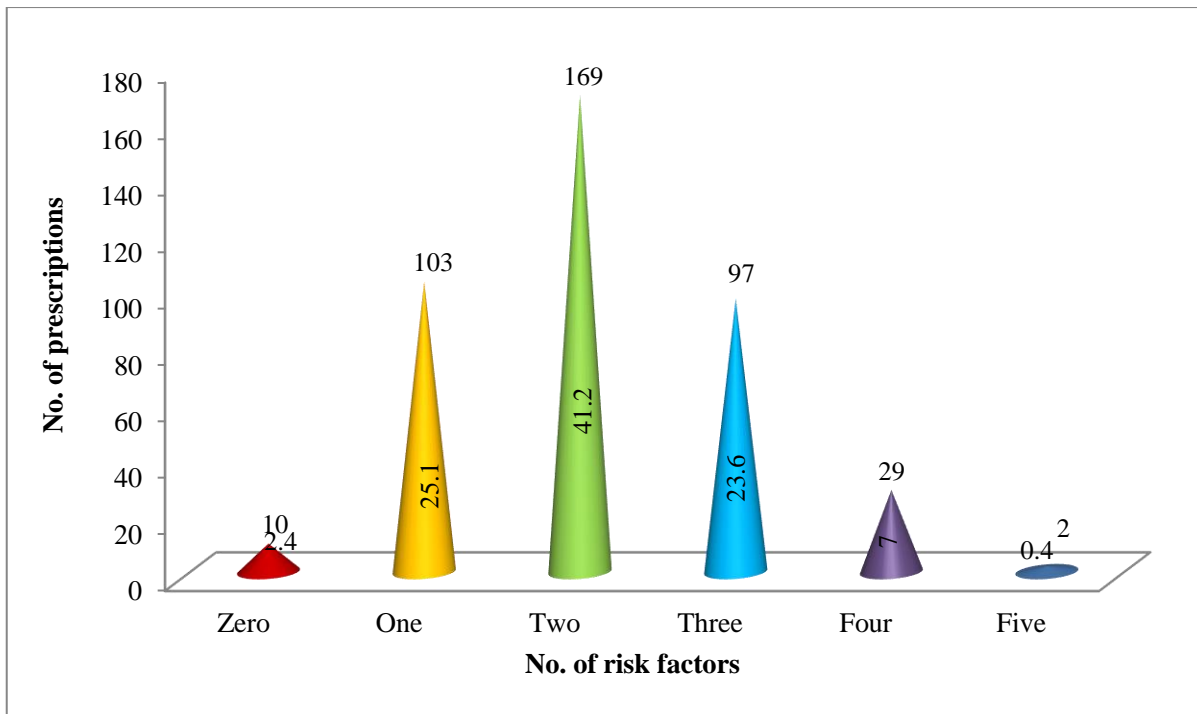


Figure 8: Presence of risk factors.

From the observed study mainly 2 risk factors are seen in majority of patients 169 (41.2%) and no risk factor was seen in 10 (2.4%) patients.

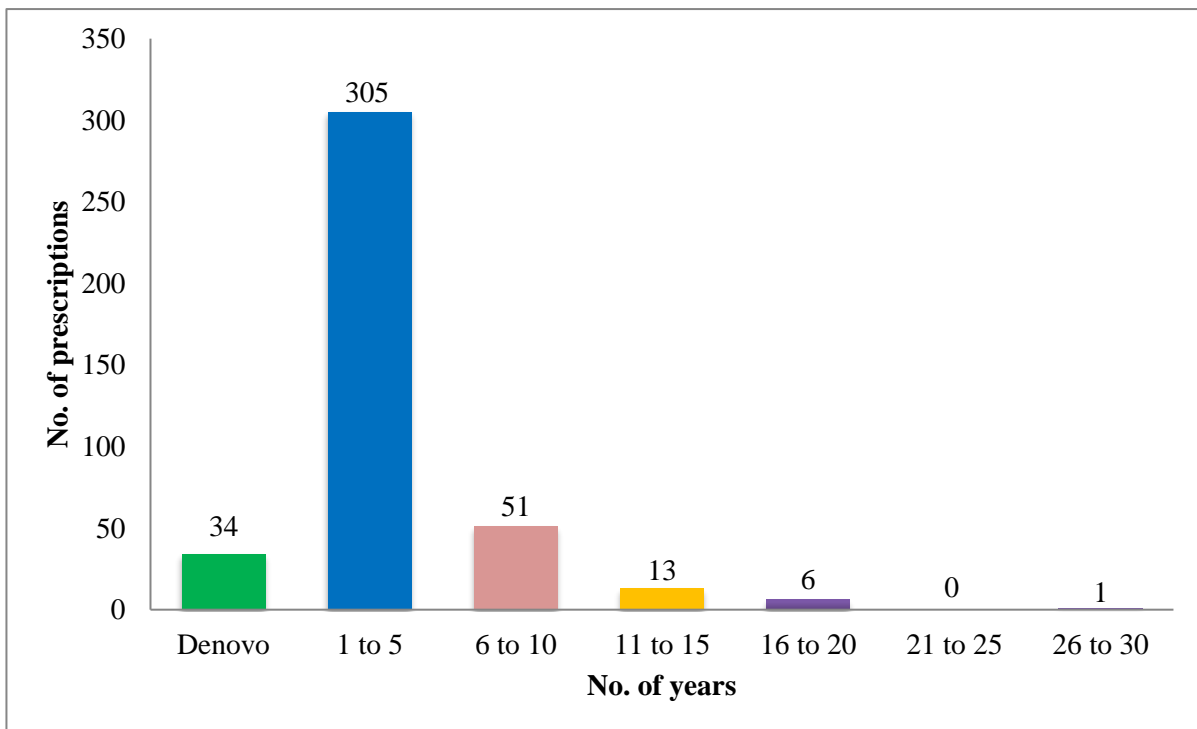


Figure 9: Hypertensive status.

Majority of patients are known hypertensive for 1-5 years 305 (74.3%) followed by 6-10 years 51 (12.4%) and Denovo detected were 34 (8.2%).

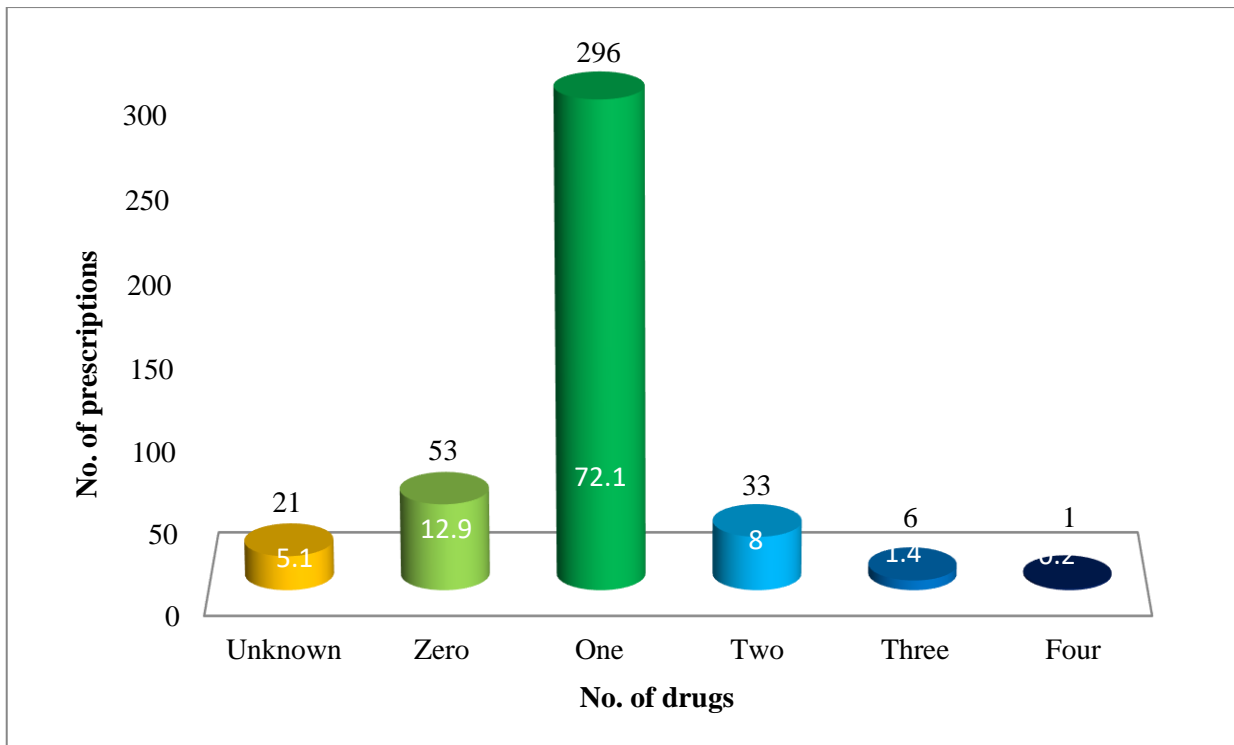


Figure 10: Number of Anti-Hypertensive drugs in past medication.

Majority of patients were using at least 1 Anti-Hypertensive drug 296 (72.1%) in their past medications followed by no therapy in 53 (12.9%) patients.

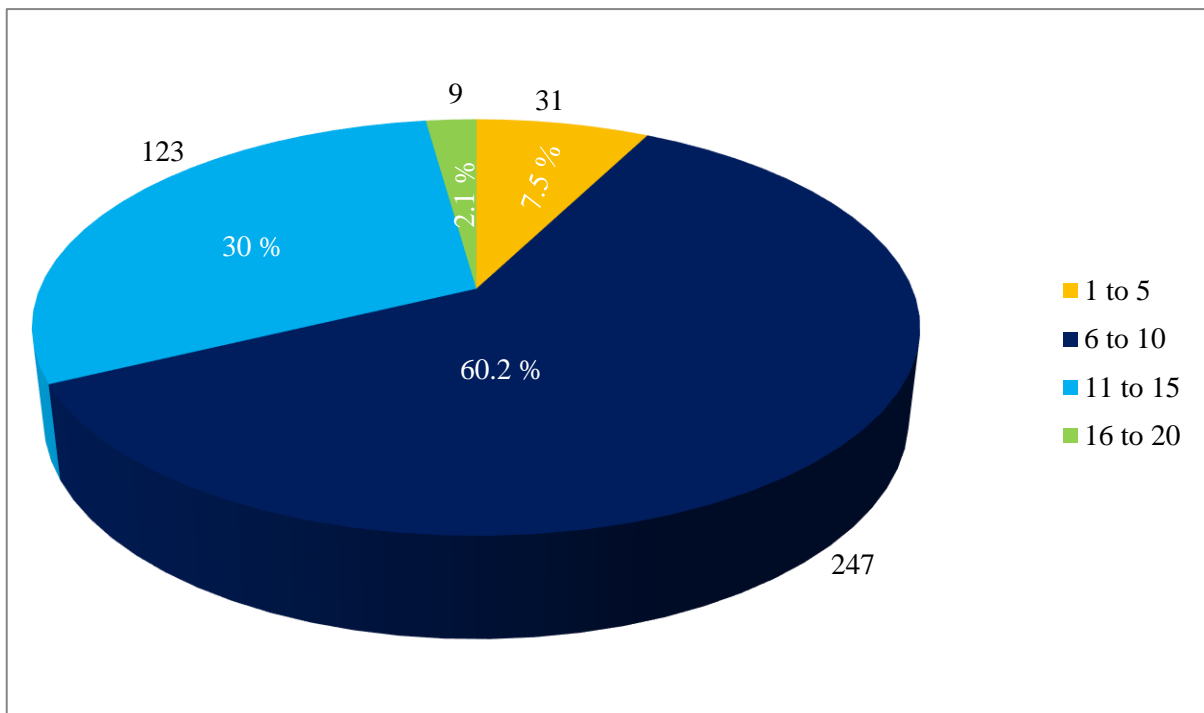


Figure 11: Number of drugs in current therapy.

Most of the patients were prescribed with 6-10 drugs 247 (60.2%) in their current therapy and very few were prescribed 16-20 drugs 9 (2.1%).

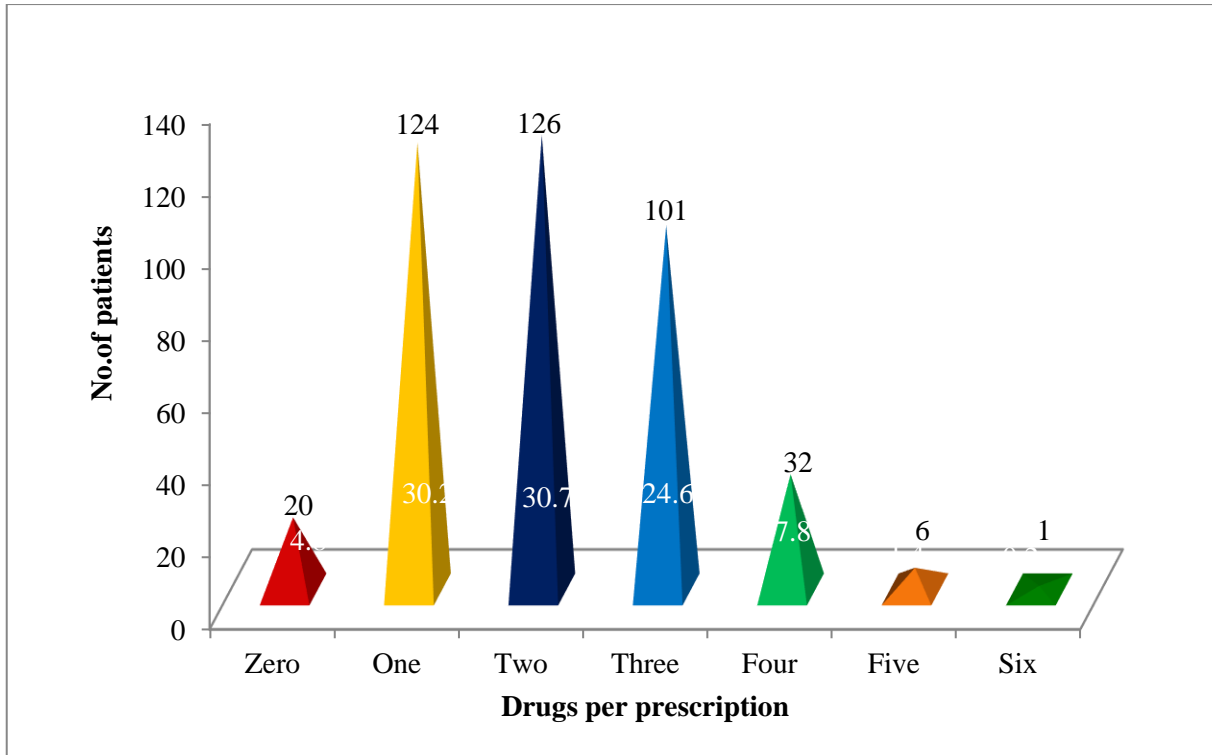


Figure 12: Number of Anti-hypertensive drugs per prescription.

We observed that 2 Anti-Hypertensive drugs were given in majority of patients 126 (30.7%) followed by 1 Anti-Hypertensive drug in 124 (30.2%) patients.

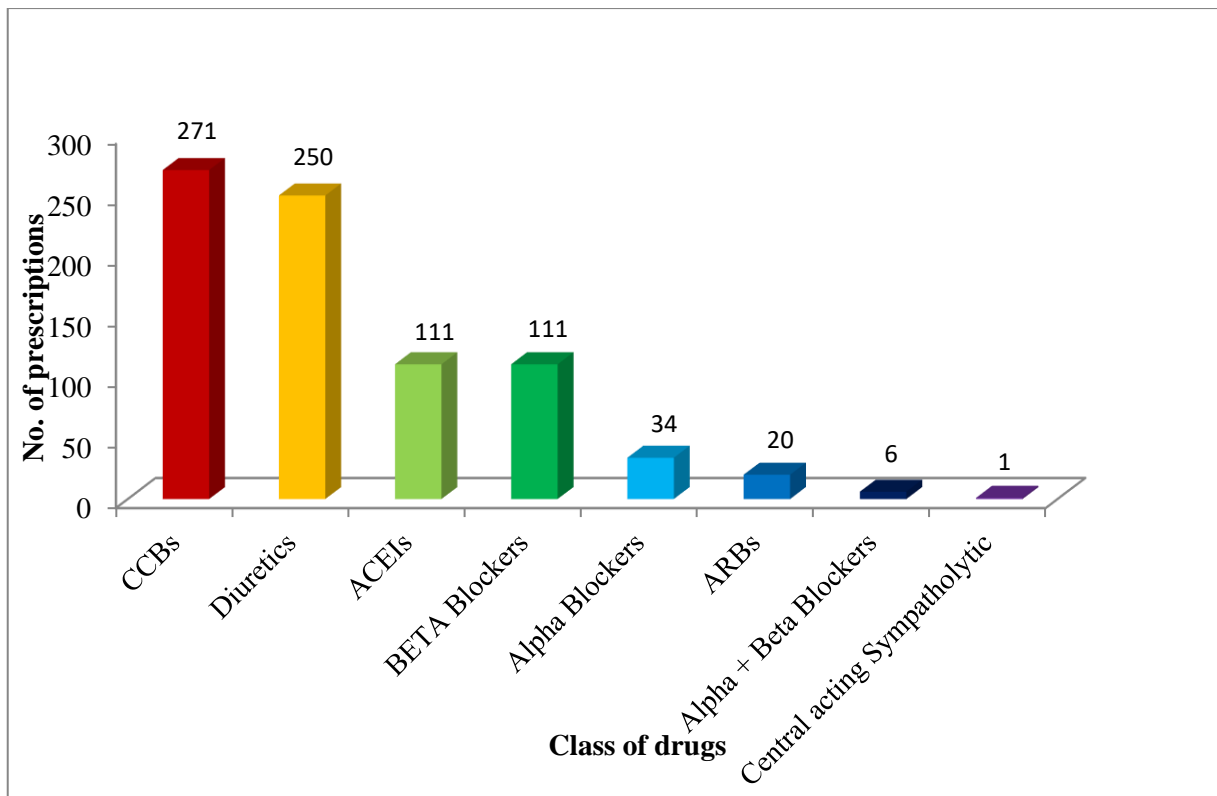


Figure 13: Frequency of various classes of Anti-Hypertensive drugs.

In our study, we observed that CCBs are commonly prescribed class of drugs with 271 (33.7%) prescriptions and the least prescribed are Central acting sympatholytics with only 1 (0.12%) prescription.

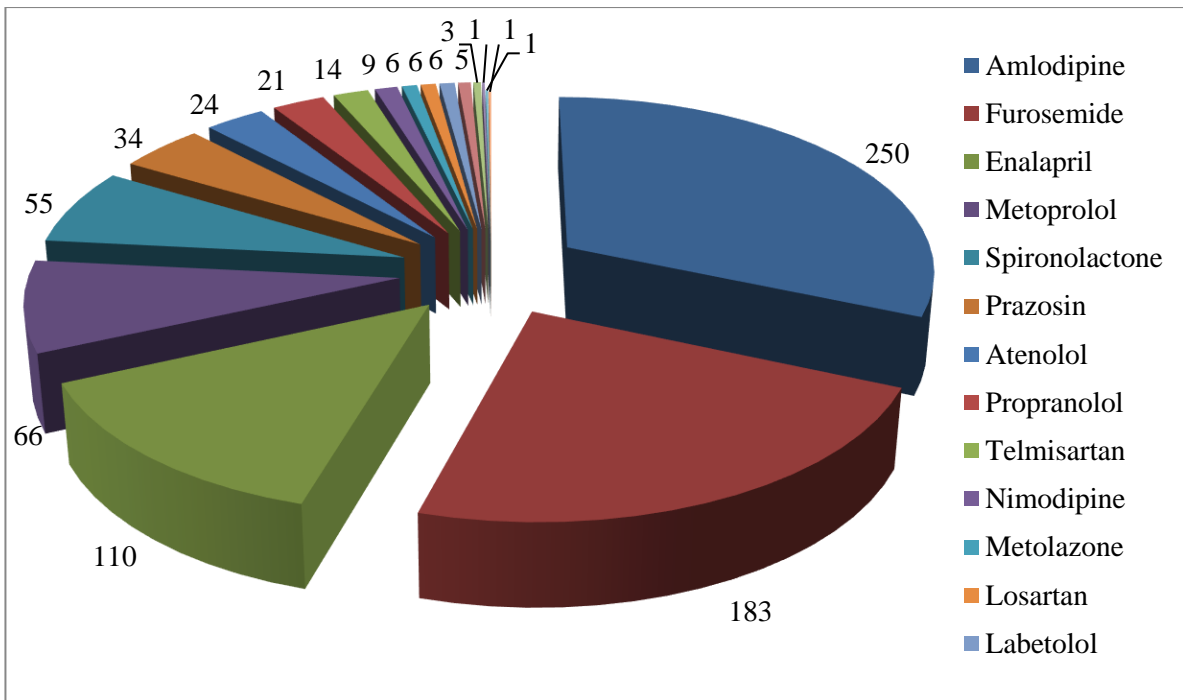


Figure 14: Commonly prescribed individual Anti-Hypertensive drugs.

As we can observe Amlodipine was commonly prescribed drug with 31.4 % followed by Furosemide 23 % and least commonly prescribed drugs were Ramipril, Nicardipine and Clonidine.

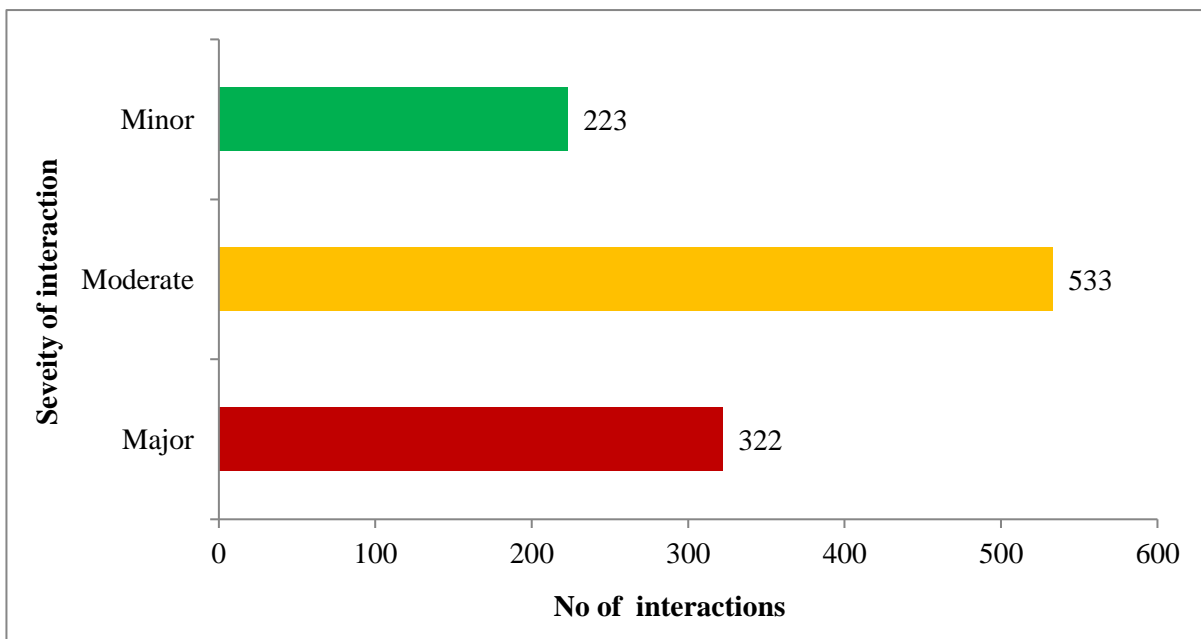


Figure 15: Presence of drug interactions.

As observed in our study Moderate drug interactions were majorly seen in majority 533 (49.44%) of prescriptions followed by major 322 (29.87%) interactions and minor 223 (20.68%) interactions.

like age, gender, diagnosis, subject present or past medical history, number of days hospitalized, knowledge on Hypertension, therapy duration for Hypertension, therapy duration for other comorbid conditions was included and the individual data was collected from individual subjects case sheets, then data was analysed first manually and then entered into Microsoft excel 2007. All the data is used to summarize:

- The prevalence of hypertension along with its comorbidities in both genders
- The age group that is more prevalent to develop comorbidities due to hypertension
- Risk factors for hypertension
- Complications associated
- Number of Anti-Hypertensives used
- Adverse drug reactions
- Drug-drug interactions.

Table 1: Adverse effects observed in prescriptions.

Adverse effect observed	Suspected drug	Score	Outcome	Total no. of prescriptions
Headache	AMLODIPINE	4	Continuing	4
Giddiness	AMLODIPINE	5	Continuing	3
Ankle edema	AMLODIPINE	5	Continuing	27
Increased BUN	SPIRONOLACTONE	5	Continuing	1
Cough	NIFEDIPINE	4	Symptomatic therapy	1
Orthostatic Hypotension	FUROSEMIDE	4	Symptomatic therapy	1
Total				37

The diagnosis of the ADR was done by a consultant physician based on clinical and laboratory investigation data. All the information of ADR was carefully recorded in CDSCO suspected ADR reporting form. Causality of ADR was assessed by Naranjo assessment scale.

From all the above information, any changes in patient's treatment regimen as per guidelines, lifestyle changes, adverse effects and potential drug – drug interactions were reported to the physicians and the changes were observed by follow up of the patient until their discharge. If there are no changes the reasons were kindly enquired from the physicians.

RESULTS

In our study, we observed that among 410 prescriptions errors were observed only in 106 (25.8%) prescriptions and majority 304 (74.1%) were without errors.

DISCUSSION

Hypertension is a chronic medical condition requiring lifelong treatment and there is increase in its prevalence day by day. Although lifestyle modifications play an important role in Hypertension management, drugs become unavoidable in many patients. This study analysed the prescription pattern in hypertensive patients attending the inpatient department in a tertiary care hospital.

From the 6-month's study period a total of 410 participants were enrolled in the study. Average number of drugs per prescription was 9.57. Among them average number of Antihypertensive drug was 1. Among them the prevalence of Hypertension was more in Males (60.73%) than Females (39.23%). Hypertension is more common in men as compared to women before the age of 50 years old. After the age of 55 years, menopause related hormonal changes i.e., decline in estrogen levels make the women more risk for cardiovascular problems. A study conducted by Anju Madhwar et al., reported 63.3% male and 36.7% female. Other study conducted by Zahra Eslampanah reported 67% were male and 33% were female.

This study revealed that the highest prevalence was seen in the age group of 51-60 years (28.78%), followed by 61-70 years (25.12%) and 41-50 years (20.97%). Increase in age may cause blood vessels to lose some of their elastic quality, which can contribute to increase in blood pressure. Tiwari et al., also found most common age group in their study as 50-59 years (33.3%) followed by 60-69 years and 40-49 years (26.7%). Study conducted by P. Ansuman Abhisek et al also found most common age group 51-60 years (43%) followed by age group 41-50 years (29%).

Patients with chronic diseases like Hypertension usually suffer from other associated conditions. In our study, majority of the patients were suffering with one comorbid condition (49.15%), followed by 2 comorbid conditions (34.63%) and 3 comorbid conditions (9.26%). Patients without any comorbid condition were observed in 6%.

In our study, Diabetes Mellitus was the most common comorbid condition (34.76%) and it is expected that uncontrolled Diabetes may lead to microvascular compromise including arterial stenosis and hence elevated Blood Pressure. The other comorbidities include Cerebrovascular accidents (22.08%), Kidney disorders (16.6%), Respiratory disorders (11.12%), cardiovascular accidents (9.76%), and liver problems (2.22%). Hypertension and Diabetes are common, intertwined conditions in which the common pathogenic mechanism for both insulin resistance and hypertension could be activation of the sympathetic nervous system. These results support the work of Krishna Murti et al., reported that Diabetes was the most common comorbid condition (16.05%), CKD (8.75%), CVD (5.10%). Increase in comorbidities also increases the length of hospital stay thereby leading to polypharmacy.

Patients suffering with Hypertension if left untreated may result in organ damage. Another study by Pyarelal reported Diabetes was the common comorbid condition (57.7%). Most of the patients do not have any complication (82.92%). The common complications were found to be Renal Parenchymal Disease (8.78%), Hypertensive Retinopathy (3.9%), Chronic Kidney Disease (1.7%), Hypertensive Urgency (1.7%), Hypertensive Heart Failure (0.73%) and Hypertensive Emergency (0.24%).

The risk of developing Hypertension was higher with increase in Age (27%) followed by Tobacco (18.45%) and Alcohol (16.24%) consumption and Diabetes Mellitus (15.89%).

Presence of more risk factors also decreases the quality of life and increases the risk of developing Hypertension. Most of the patients in our study have 2 risk factors (41.21%), followed by 1 risk factor (25.12%), 3 risk factors (23.65%), 4 risk factors (7.07%), unknown risk factor (2.43%) and 5 risk factors (0.48%).

In our study, the past history of hypertension was collected from patients and most of the patients have a history of 1-5 years (74.39%), 6-10 years (12.43%), 11-15 years (3.17%), 16-20 years (1.46%), 26-30 years (0.24%), 21-25 years (0%) and there were 8.29% of Denovo detected cases of Hypertension.

From patients with past history of Hypertension, their

Table 2: Inappropriate treatment found in the prescriptions.

S.no	Drug prescribed	Medical condition	Reason	No of prescriptions
1.	ALDACTONE, ENALAPRIL	T2DM WITH HTN WITH CKD HF WITH HTN HF WITH ICMP HTN WITH T2DM WITH ANEMIA IN CCF DCMP CKD WITH PULMONARY EDEMA WITH HTN WITH LVF COPD WITH CORPULMONALE	Concurrent use of 2 drugs may result in hyperkalemia, resulting in severe arrhythmias. These 2 drugs should be used in caution especially in patients with renal dysfunction or diabetes.	24
2.	BETA BLOCKERS	DM (Insulin Dependent) WITH HTN	Beta Blockers acts by inhibiting the actions of Norepinephrine thereby masking symptoms of hypoglycaemia such as tremors, tachycardia, sweating and blood pressure changes.	25
3.	ACE INHIBITORS	COPD AND ASTHMA	ACEIs were shown to induce cough and bronchial hyperresponsiveness in some patients due to an increased inflammation in the bronchial mucosa as substances like bradykinin are not metabolised.	22
4.	THIAZIDE DIURETICS	HTN WITH DM	Thiazide diuretics in high doses may worsen glycemic control by impairing insulin secretion and decreasing peripheral insulin sensitivity.	23
5.	AMLODIPINE BD	Hypertension	As Amlodipine has a longer t _{1/2} (35-48 hrs) it should be taken orally once a day. It has a slow but complete oral absorption, hence side effects like tachycardia, headache, flushing will be observed.	12

medication history was collected through counselling and from both past and present medical case record. Most of the patients had used one drug (72.19%) followed by two (8.04%), three (1.46%) and four drugs (0.24%). Some patients were on irregular therapy (12.92%) and some were on regular therapy but the information was not known (5.12%).

In the present study, the patients were prescribed drugs based on their comorbidities and complications. Some were prescribed with 6-10 drugs (60.24%) and others with 11-15 drugs (30%), 1-5 drugs (7.56%) and 16-20 drugs (2.19%) based on their need.

Out of 410 prescriptions, 126 prescriptions contained two Anti-Hypertensive drugs (30.73%), 124 contained one (30.24%), 101 contained three (24.63%), 32 contained four (7.8%), 6 contained five (1.4%) and only 1 prescription

contained six drugs (0.24%). 20 prescriptions did not contain any Anti-Hypertensive drug (4.8%). Our result is in consonance with krunal C. Solanki et al., which reported that about half of the patients had receive two antihypertensive drugs (49.5%), followed by one antihypertensive (33.16%), and three (15.5%) antihypertensive drugs.

The present study revealed that CCBs (33.7%) were the drug of choice for hypertensive patients as a single therapy and overall utilization, followed by Diuretics (31.09%), ACEIs and Beta blockers (13.8%), Alpha blockers (4.22%), ARBs (2.48%), Alpha + Beta blockers (0.74%), Centrally acting sympatholytic (0.12%). A study conducted by P. Ansuman Abhisek et al., reported that CCBs (32.47%) were most frequently used followed by Beta-blockers (24.78%). This was also supported by a

study conducted by Anand Kale that Calcium channel blockers (49%) were most frequently prescribed followed by diuretics (43.5%), angiotensin converting enzyme inhibitors (29.5%) beta blockers (29%) and angiotensin receptor blockers (21%).

In 410 prescriptions, 795 Anti-Hypertensive drugs were prescribed and Amlodipine was the most commonly prescribed drug (31.44%) followed by Furosemide (23.01%), Enalapril (13.83%), Metoprolol (8.3%), Spironolactone (6.9%) and the less commonly prescribed drugs were Ramipril, Nicardipine and Clonidine (0.12%). Our results are in accordance with Anju Madhwar and P. Ansuman Abhisek et al., reported Amlodipine was the most common prescribed drug.

In the present study 37 patients (9.02%) from the total of 410 patients developed ADR. Most common individual ADR was Ankle edema (72.9%), followed by Headache (10.8%), Giddiness (8.1%). Amlodipine causes decrease in arteriolar resistance thereby increasing hydrostatic pressures in the precapillary circulation and permits fluid shifts into the interstitial compartment. Our results are in harmony with Ramya Y. S. et al., reported that Ankle edema as most common ADR due to Amlodipine, and followed by Headache.

Drug-drug interactions increase the length of hospital stay and cost burden over the patient, resulting in non-compliance to treatment. In current study, a total of 1078 interactions were found. Out of them, 322 (29.87%) were Major interactions, 533 (49.44%) were moderate interactions and 223 (20.68%) were minor interactions. A total of 27 major interactions followed by 70 moderate interactions were found between two Antihypertensive drugs.

In our study, treatment intensity was increased when concomitant comorbid diseases were present. On choosing the drug from different classes of antihypertensives by physicians, inappropriate prescriptions were found by us. Out of 410 prescriptions, 106 prescriptions (25.8%) were inappropriate. The main error in prescribing was found in case of Insulin Dependent Diabetes condition (23.58%). Concurrent use of ALDACTONE and ENALAPRIL may result in hyperkalemia, resulting in severe arrhythmias. These 2 drugs should be used in caution especially in patients with renal dysfunction or diabetes.

Beta Blockers acts by inhibiting the actions of Norepinephrine thereby masking symptoms of hypoglycaemia such as tremors, tachycardia, sweating and blood pressure changes⁸.

ACEIs were shown to induce cough and bronchial hyperresponsiveness in some patients due to an increased inflammation in the bronchial mucosa as substances like bradykinin are not metabolised⁸.

Thiazide diuretics in high doses may worsen glycaemic control by impairing insulin secretion and decreasing peripheral insulin sensitivity⁸.

As Amlodipine has a longer $t_{1/2}$ (35-48 hrs) it should be taken orally once a day. It has a slow but complete oral

absorption, hence side effects like tachycardia, headache, flushing will be observed⁸.

CONCLUSION

Hypertension is more prevalent in male patients than in female patients. Most of the patients were in the age group of 51-60 years. Diabetes Mellitus was the most common comorbid condition associated with Hypertension. It is observed from the study that the prescription of diuretics in hypertension is comparatively low whereas the calcium channel blockers are widely prescribed. Many adverse effects and potential drug- drug interactions are observed, out of which moderate drug-drug interactions shared a major portion. In this study, 74% of prescriptions were appropriate adhering JNC-VIII guidelines suggesting possible improvement in prescription pattern of antihypertensives. Therefore, it indicates the need of clinical pharmacist at hospital setting to work in collaboration with physicians in order to improve the patient care because suboptimal adherence leads to adverse clinical outcomes.

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