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# Study of Drug Use Pattern of Anti hypertensive drugs At A Tertiary Care Hospital: A Prospective Observational Study

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**ABSTRACT:** Hypertension (HTN or HT), also known as high blood pressure (HBP), is a long-term medical condition in which the blood pressure in the arteries is persistently elevated; there has been a consistent increase in the use of ACEIs, ARBs, and CCBs and many robustly conducted clinical studies have shown no consistent differences in antihypertensive efficacy on blood pressures.

Control of hypertension is one of the most important health care priorities and is expected to increase with an aging population and increasing the burden of obesity and other risk factors related to lifestyle. Hypertension is primarily managed in ambulatory settings accounting for an estimated 79% of primary care visits. Better hypertension control can positively impact cardiovascular and kidney health8. There are many classes of antihypertensive drugs that are used to control hypertension which is shown in table 15

this study, it's aimed to analyse and correlate the drug use patterns and disease patterns of antihypertensive drugs at a tertiary care hospital.

A total of 131 patients were included in the study where 61.83% were male and 38.16% female, most ages were between 50 to 70 years old. 95.41% had no allergy to Antihypertensive drugs, while (4.58%) had a specified allergy; 61.06% had a history of antihypertensive use at their history. hypertension and, heart diseases, and infectious diseases were the most common history of diseases and also they were includes as the most diagnosed disease when they presented to the hospital. 95.41% of patients used Sympathetic Inhibitors, furosemide, propranolol, and metoprolol were the most popular drugs Among all antihypertensive drugs. they are given more in tablet dosage form than other forms. most antihypertensive drugs are prescribed in multiple doses more than a single dose with a size of 3 to 1.

Based on data collected in this study antihypertensive drugs are mostly used in males and they are prescribed for patients with hypertension, heart disorders, and infection diseases diagnoses; furosemide, propranolol, and metoprolol are the most antihypertensive drugs prescribed by doctors, and they are prescribed in tablet more than others routs. Generally, antihypertensive drugs are prescribed more in multiple drug therapy than single-drug therapy.

**KEYWORDS:** Hypertension, Antihypertensive drugs, ACEIs, ARBs, and CCBs, blood pressures heart diseases.

## I. INTRODUCTION

Hypertension (HTN or HT), also known as high blood pressure (HBP), is a long-term medical condition in which the blood pressure in the arteries is persistently elevated. High blood pressure typically does not cause symptoms. Long-term high blood pressure, however, is a major risk factor for coronary artery disease, stroke, heart failure, atrial fibrillation, peripheral arterial disease, vision loss, chronic kidney disease, and dementia1.2.4.5.

High blood pressure is classified as primary (essential) hypertension or secondary hypertension. About 90–95% of cases are primary hypertension, defined as high blood pressure due to nonspecific lifestyle and genetic factors. Lifestyle factors that increase the risk include excess salt in the diet, excess body weight, smoking, and alcohol use. The remaining 5–10% of cases are categorized as secondary high blood pressure, defined as high blood pressure due to an identifiable cause, such as chronic kidney disease, narrowing of the kidney arteries, an endocrine disorder, or the use of birth control pills1.2.6.

Hypertension is rarely accompanied by symptoms, and its identification is usually through screening, or when seeking healthcare for an unrelated problem. Some people with high blood pressure report headaches (particularly at the back of the head and in the morning), as well as light-headedness, vertigo, tinnitus (buzzing or hissing in the ears), altered vision, or episodes. Or in physical examination, hypertension may be associated with

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the presence of changes in the optic fundus seen by ophthalmoscopy. The severity of the changes typical of hypertensive retinopathy is graded from I to IV; grades I and II may be difficult to differentiate. The severity of the retinopathy correlates roughly with the duration or the severity of the hypertension1.2.

Hypertension is the most common modifiable risk factor for cardiovascular diseases (CVD), stroke, and renal failure. It is the second leading cause of chronic kidney disease (CKD). It is estimated that more than one billion adults are hypertensive worldwide3. Antihypertensive drugs are prescribed mainly to reduce the morbidity and mortality caused by hypertension and its complications. Many a time, patients require more than one drug for effective control of hypertension. Various classes of antihypertensive drugs like diuretics, inhibitors of the renin-angiotensin system, calcium channel blockers (CCB), and beta-blockers (BB) have been shown to reduce complications of hypertension and may be used for initial drugtherapy3. Treatment of hypertension plays a central role in the management of CKD, including in patients with End-stage kidney disease (ESKD). Hypertension is both a cause and a consequence of CKD, and its prevalence is high among patients with CKD and ESKD. Patients with CKD have an outsized burden of cardiovascular disease; indeed, the presence of CKD represents a coronary risk equivalent on par with diabetes mellitus6.8.14.

There have been several studies evaluating the prescribing pattern of antihypertensive drugs worldwide. Over the past 20 years, there has been a consistent increase in the use of ACEIs, ARBs, and CCBs and many robustly conducted clinical studies have shown no consistent differences in antihypertensive efficacy, side effects, and quality of life within these drug classes3. Hypertension (HTN) in children and adolescents is defined as an average clinical measured systolic blood pressure (SBP) and/ or diastolic blood pressure (DBP) ≥ 95th percentile (based on age, sex, and height percentiles)5.9.18.

Several guidelines have been developed worldwide for the management of hypertension, and these serve as reference standards for clinical practitioners3. But many clinicians practice their prescribing pattern in treating hypertensive patients according to their clinical experience. Primary care physicians need to be empowered in the appropriate and evidence-based management of hypertension3.12.14.

Control of hypertension is one of the most important health care priorities and is expected to increase with an aging population and increasing the burden of obesity and other risk factors related to lifestyle. Hypertension is primarily managed in ambulatory settings accounting for an estimated 79% of primary care visits. Better hypertension control can positively impact cardiovascular and kidney health8. There are many classes of antihypertensive drugs that are used to control hypertension.\

| NO | antihypertensive type | antihypertensive classification | drugs examples |
|---|---|---|---|
| 1 | Diuretics | thiazides | chlorothiazide hydrochlorothiazde Chlorthalidone indapamide |
| | | high ceiling | furosemide |
| | | Pot. Sparing | spironolactone eplerenone, amiloride |
| 2 | renin-angiotensin system inhibitors | ACE inhibitors | Captopril, enalapril Lisinopril, ramipril |
| | | Angiotensin b, ($AT_1$) receptor | losartan candestartan |
| | | direct renin inhibitor 7 | aliskiren |
| | | beta-adrenergic blockers | Propranolol, metoprolol |

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| | | | |
|---|---|---|---|
| **3** | sympathetic inhibitors | alpha and beta-blockers | Labetalol, carvedilol |
| | | alpha adrenergic blockers | prazosin<br>doxazosin |
| | | central sympatholytic | clonidine |
| **4** | Calcium channel blockers | phenyl-alkyl amine | verapamil |
| | | benzodiazepine | diltiazem |
| | | dihydropyridines | amlodipine, nifedipine |
| **5** | vasodilators | arteriolar dilator | diazoxide |
| | | arteriolar and venodilatore | nitroprusside sod |

Table 1: Classification of antihypertensive drugs.

In this study, we consider studying prescribing patterns and essential use of the antihypertensive drugs in a teaching tertiary care hospital, where to find out about different indications, most age usage, dose and dosage form use routes, and essential uses during treatment

## II. OBJECTIVE

Primary objective:
To analyse the drug use patterns and disease patterns of antihypertensive drugs at a tertiary care hospital.

Secondary objective:
To determine the indications for antihypertensive use in the hospital inpatient department.
To evaluate the appropriateness of the prescribed antihypertensive.
To evaluate for its rational use of antihypertensive among patients inpatient.

## III. METHODOLOGY

- Study design:

It is a prospective observational study conducted in the inpatient department at a tertiary care hospital.

- Source of data and Materials:
  - Inpatient demography
  - Medical history
  - Medication chart
  - Medication history chart/interview
  - Medication availability
- Inclusive Criteria:
  - All inpatient prescribed with antihypertensive.
  - Patients with the age of above than 18 years old.
  - Patients with a history of antihypertensive use.
- Exclusion Criteria:
  - Patients not consenting to the study are excluded from the study.
  - Pregnant women
- Method of collection of data:

This was a prospective observational study carried in the in-patient department at a tertiary care hospital with a six-month duration.
All of the data were collected in a specific data collection form which includes patient profile; antihypertensive drugs prescribed information, diagnosis, and other

- Study procedure:

a prospective observational study was conducted in a tertiary care hospital.

After collection and study of previous related articles about this study and references all of the details used to prepare a data collection form, which is used to collect the cases that are required for the study.

In the next step of the study, the collection of the case started until all of the required patients and data are collected.
Base on this data which is collected from the subjects or patient a computer analysis study will be done to see the last results of the analysis which is mentioned in the objective of the study.
When the study is done and completed it processed to share with health care professions and society population as updated information about antihypertensive drugs prescription in hospital.

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➢ Study period:
The study and data collection carried out for 6 month

➢ Study site:
This study was conducted in the inpatient department at a hospital in Bangalore Baptist Hospital (BBH).

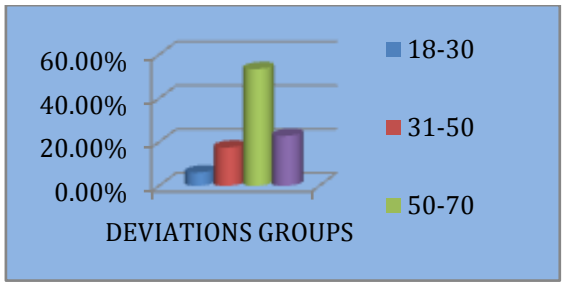
## IV. OBSERVATION

The study included a total of 131 patients of which 61.83% were male and 38.16% female (Table 2).

| DEMOGRAPHICS | NO OF PARTICIPANTS | NO OF PERCENTAGES |
|---|---|---|
| total | 131 | 100% |
| Male | 81 | 61.83% |
| female | 50 | 38.16% |

Table 2-Genders population categorization of participants

patients were divided into four groups of ages to identify the most ages of antihypertensive drugs used among them; results shown that 6.1% of patient belonged to the age of 18-30, 17.55% of patients belonged to the age of 31-50, 53.43% of patients belonged to the age 50-70 and 22.9% were for patients above 70 (graph 1).




1-Demographic information based on age deviations groups required data were collected from different wards in the in-patient department, which results indicates that patients were 14.5% from intensive care unit (ICU), 24.42% from high intensive care unit(HICU), 3.05% from cardiac care unit(CCU), 56.48% from medicine and surgery wards, 1.52% from private and semi-private wards (Table 3).

| **WARDS** | **NO OF PARTICIPANTS** | **NO OF PERCENTAGES** |
|---|---|---|
| **intensive care unit (ICU)** | 19 | 14.5% |
| **high intensive care unit(HICU)** | 32 | 24.42% |
| **cardiac care unit(CCU)** | 4 | 3.05% |
| **medicine and surgery wards** | 74 | 56.48% |
| **private and** | 2 | 1.52% |

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| |
|---|
| **semi-private wards** |

Table 3- Demographic information collected from wards.

Among patients, 95.41% (125) had no allergy to Antihypertensive drugs, where others (4.58%) (6) had a specified allergy to antihypertensive drugs, which included Captopril 2 patients (1.52%), Enalapril 3 patient (2.29%), and Ramipril 1 patient(0.76%) (Table 4).

| ALLERGY ACTIONS OF ANTIHYPERTENSIVE | NO OF PARTICIPANTS | NO OF PERCENTAGES |
|---|---|---|
| **No Allergy To Antihypertensive** | 125 | 95.41% |
| **Allergy To Antihypertensive** | 6 | 4.58% |
| • **Captopril** | 2 | 1.52% |
| • **Enalapril** | 3 | 2.29% |
| • **Ramipril** | 1 | 0.76% |

**Table 4- Allergy actions of antihypertensive**

Of the total patients, 61.06% had a history of antihypertensive use, which included the following classes of antihypertensive drugs (Table 5 and graph 2 )

| MEDICAL PAST HISTORY OF ANTIHYPERTENSIVE DRUGS | NO OF PARTICIPANTS | NO OF PERCENTAGES |
|---|---|---|
| **total patients used previously** | 80 | 61.06% |
| **Propranolol** | 17 | 12.97% |
| **Furosemide** | 36 | 24.48% |
| **Metoprolol** | 18 | 13.74% |
| **Captopril** | 11 | 8.39% |
| **propranolol** | 17 | 12.97% |
| **spironolactone** | 7 | 5.34% |
| **carvedilol** | 12 | 9.16% |
| **amlodipine** | 6 | 4.58% |
| **Ramipril** | 3 | 2.29% |
| **Amiloride** | 8 | 6.10% |
| **nebivolol** | 4 | 3.05% |
| **not specified** | 51 | 38.93% |

Table 5 - Medical history of use of antihypertensive drugs.

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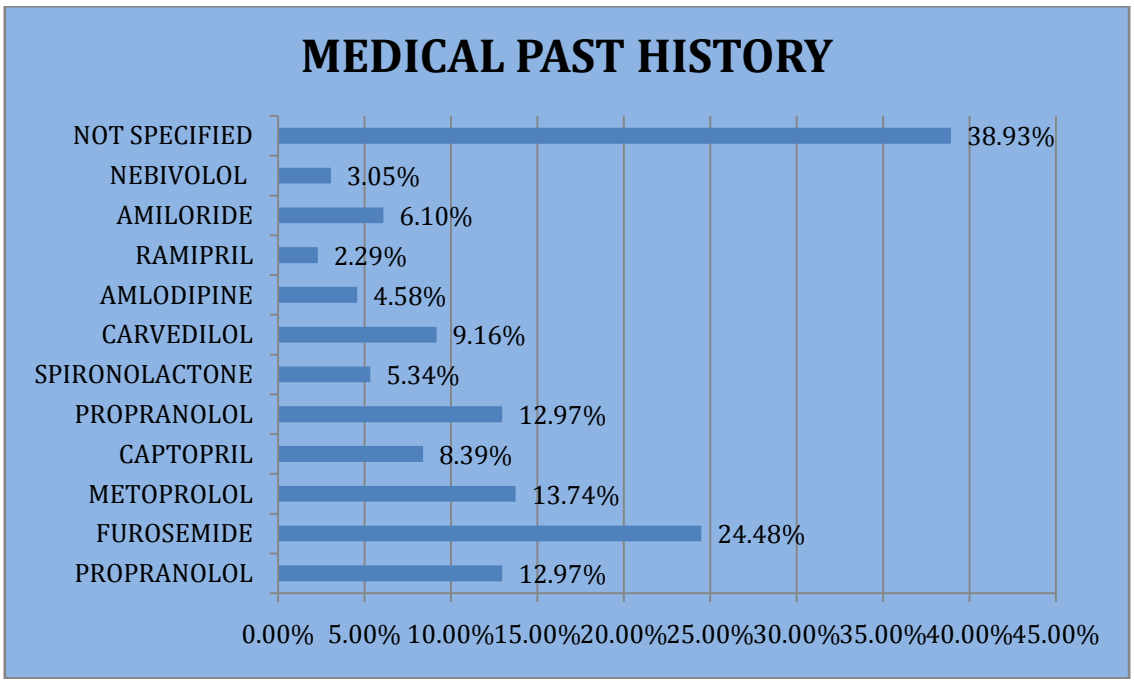
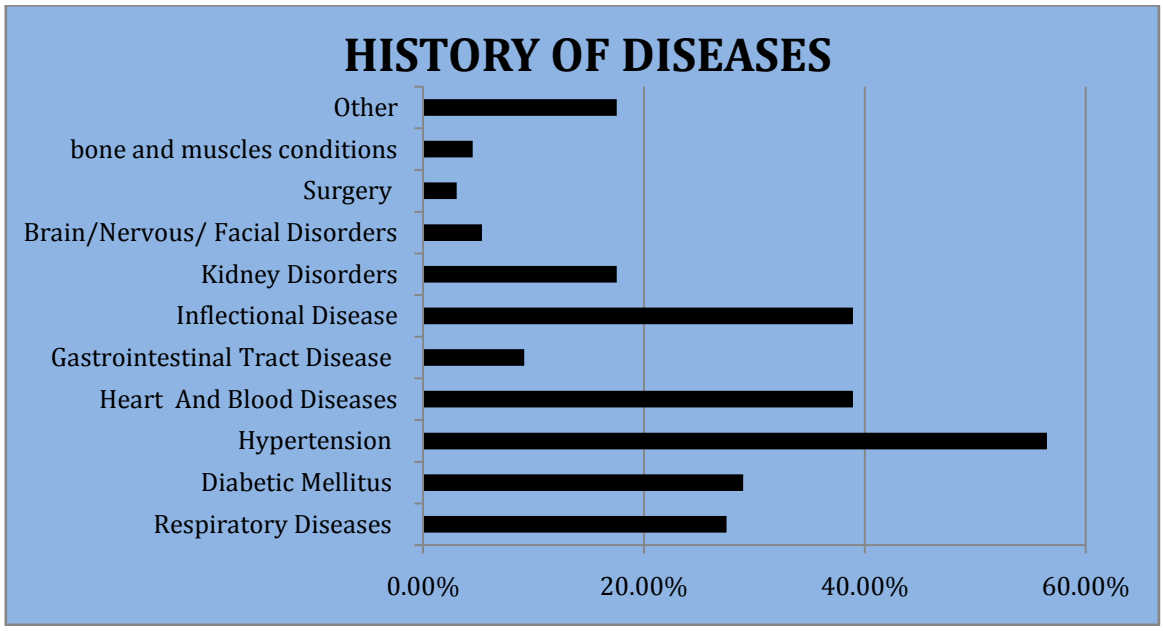



Graph 2- Medical history of antihypertensive drug use.

Presence of comorbidities:

Of the 131 patients, 27.48% had a history of Respiratory Diseases, 29% had a history of Diabetic Mellitus, 56.48% had a history of Hypertension, 38.93% had a history of Heart and Blood Diseases, 9.16% had a history of Gastrointestinal Tract Disease, and 38.93% had a history of Inflectional Disease, 17.55% had a history of Kidney Disorders, 5.34% had a history of Brain/Nervous/ Facial Disorders, 3.05% had a history of Surgery, 4.5% had a history of bone and muscles conditions and 17.55% were other conditions ( graph 3).




Graph 3- history of diseases

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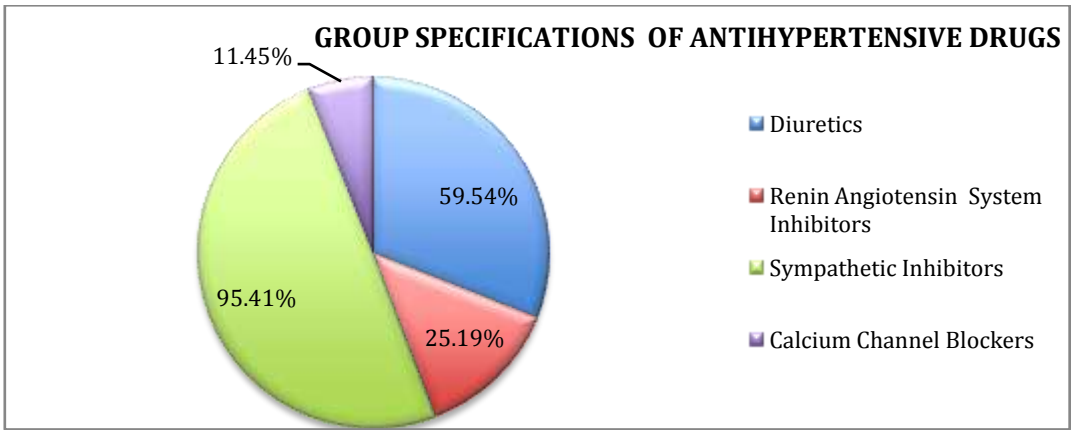
Based on the data collected, the antihypertensives prescribed were categorized into its different classes accordingly 95.41% of patients used Sympathetic Inhibitors which were the most popular antihypertensive drugs used among patients, and in the second place are diuretics (59.54%), other classes like 25.19% Renin-Angiotensin System Inhibitors and 11.45% Calcium Channel Blockers were used among patients (graph4)




Graph 4- Group specifications of the antihypertensive drugs (% of patients that used the class of antihypertensive )

The different antihypertensive drugs that were used 2.29% Hydrochlorothiazde, 44.27%, Furosemide, 8.39% Spironolactone, 4.58% Amiloride, 12.21% Captopril, 4.58%, 4.58% Enalapril, 5.34% Ramipril, 3.05% Losartan, 31.29% Propranolol, 30.53% Metoprolol, 2.29% Atenolol, 17.55% Nebivolol, 12.21% Carvedilol, 0.76% Doxazosin, 0.76% Clonidine, 3.05% Verapamil, 5.34% Diltiazem, 1.52% Amlodipine and 1.52% Nifedipine (Table 6 )

| ANTIHYPERTENSIVE | NO OF PARTICIPANTS | NO OF PERCENTAGES |
|---|---|---|
| TOTAL DRUGS | 251 | - |
| HYDROCHLOROTHIAZIDE | 3 | 2.29% |
| FUROSEMIDE | 58 | 44.27% |
| SPIRONOLACTONE | 11 | 8.39% |
| AMILORIDE | 6 | 4.58% |
| CAPTOPRIL | 16 | 12.21% |
| ENALAPRIL | 6 | 4.58% |
| RAMIPRIL | 7 | 5.34% |
| LOSARTAN | 4 | 3.05% |
| PROPRANOLOL | 41 | 31.29% |
| METOPROLOL | 40 | 30.53% |
| ATENOLOL | 3 | 2.29% |
| NEBIVOLOL | 23 | 17.55% |
| CARVEDILOL | 16 | 12.21% |

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| | | |
|---|---|---|
| DOXAZOSIN | 1 | 0.76% |
| CLONIDINE | 1 | 0.76% |
| VERAPAMIL | 4 | 3.05% |
| DILTIAZEM | 7 | 5.34% |
| AMLODIPINE | 2 | 1.52% |
| NIFEDIPINE | 2 | 1.52% |

Table 6- Current antihypertensive drugs used among patients during hospitalization.

Out of 251 antihypertensive drugs prescribed to patients for control of hypertension or abnormal blood pressures, nearly 62.94% are used in tablets form, 7.17% are used in form of capsules and 29.88% are used in form of injections (Table 7)

| DOSAGES FORM | NO OF DRUG | NO OF PERCENTAGES |
|---|---|---|
| tablet | 158 | 62.94% |
| capsule | 18 | 7.17% |
| injection | 75 | 29.88% |

Table 7- Different dosage forms available for antihypertensive drugs around 26% of patients have been prescribed a single dose of antihypertensive drugs and 74% are given multiple doses of antihypertensive drugs during their treatment at the hospital (table8).

| ANTIHYPERTENSIVE COMBINATIONS | NO OF PARTICIPANTS | NO OF PERCENTAGES |
|---|---|---|
| single dose (drug) | 34 | 26% |
| multiple doses | 97 | 74% |

Table 8- Antihypertensive combinations status

## V. DISCUSSION

In this study most of the patients (61.83%) were male; therefore it could be defined as males are more at risk of hypertension and anti-hypertension use. On the other hand, patients are mostly exposed to hypertension in ages between 50 to 70 years old and more than 70 years old, which includes geriatric patients that are at more risk of inappropriate prescribing.

Data were collected mostly from 24.42% from high intensive care unit (HICU), 56.48% from medicine and surgery wards than other wards, which shows patients with diagnosed hypertension needs a high level of cares and medical therapy, by other hands it could be affected based on the care cost.

During the collection of data in the study, we had high limitations and a lack of information about allergy actions to antihypertensive drugs, therefore it was difficult to find out exact allergy cases among patients; therefore, only about 4.58% of patients are reported to antihypertensive drugs allergy.

For a total of 131 patients and 251 antihypertensive drugs use, near 95.41% of patients used Sympathetic Inhibitors (they include beta-adrenergic blockers, alpha and beta-blockers, alpha-adrenergic blockers, and central sympatholytic drugs which were the most popular antihypertensive drugs used among patients and in second place are diuretics (59.54%), in comparison to Sang Hyuck Kims conducted study ARB from Sympathetic Inhibitors was the most frequently prescribed drugs.

Among all antihypertensive drugs FUROSEMIDE, PROPRANOLOL and METOPROLOL were the most popular drugs used as antihypertensive drugs in patients with a history of hypertension; antihypertensive drugs are given more in tablet dosage form than other forms. At antihypertensive combinations use status, most antihypertensive drugs are prescribed in multiple drug therapy than single dose with a size of 3 to 1. In Ashok K. Sharma's study, it was more on the combination therapy (67.97%) while 31.18% of patients received monotherapy.

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Based on this study the Sympathetic Inhibitors are the most commonly used class of antihypertensives and more than 95% of the patients have been prescribed at least one Sympathetic Inhibitors and most of the prescriptions include multiple or combined drug therapy (74%) and many other studies conducted on the antihypertensives indicates that between 65 to 95 % of the patients have been prescribed combined drug therapy and from those prescriptions above 75 % of patients had at least one Sympathetic Inhibitors in their prescriptions. This indicates the importance of this class of antihypertensives in hypertension management.

## VI. CONCLUSION

Based on the result of this study and what is also known based on previous studies hypertension is an underlying condition for many other diseases or is concurrent with many other conditions that make a very important among the diseases and also makes the studying use of antihypertensives very important to keep the health care professionals updated with the new data.

Based on data collected in this study antihypertensive drugs are mostly used in males with most ages between 50 to 70 years old, antihypertensive drugs are prescribed mostly for patients with hypertension, heart disorders, and infection diseases; Sympathetic Inhibitors and Diuretics are the most drugs used as antihypertensive drugs prescribed, antihypertensive drugs are prescribed in tablet more than others routes.

Generally, antihypertensive drugs are prescribed more in multiple drug therapy than single-drug therapy. that this fact makes it sensitive in prescribing hypertensives and the prescriptions will need more review by the pharmacist or other health care professionals to prevent drug interactions drug duplications and inappropriate dose or toxicities.

Sympathetic Inhibitors are the most prescribed antihypertensives and this class of medications most common side effects is associated with cardiovascular effects that are one of the most concurrent diseases with hypertension and also it can cause gastrointestinal problems that are another concurrent conditions with hypertension and prescribing should be done based on the risk-benefit ratios for the patients to avoid inappropriate prescribing. Prescribing Policies to be followed to minimize the irrational use of antihypertensive drugs.

## VII. LIMITATIONS

**Future direction:**
**Limitations,**
**Re-assessing and expanding**
**Future Construction of the research in a new context**

This study conducted for 6 months on the patients with the common characteristic of hypertension disease, as for the long term period studies(more than 6 months), antihypertensive drugs needs more data and term of study to make a stronger result because they are the class of drugs that are prescribed for many other patients with the other problems such as edema where the diuretics as an important class of antihypertensive drugs will be prescribed.

This study was conducted by a specific inclusion and exclusion criteria in a tertiary care hospital in the inpatient department shows that most of the patients were male that 95.41 % of patients used sympathetic inhibitors class of hypertensives, most of the previous studies and references are either cross-sectional studies or have been conducted as single-center studies and if future studies get conducted with a very vast inclusion and very narrow exclusion criteria and are conducted as randomized multi-centered studies and are based on every prescription that includes antihypertensive drug it can give a very useful and clear indication on the uses of antihypertensives for society and health care professionals and help to update policies guidelines and formularies.

Antihypertensive drugs are the specific classes of drugs that are prescribed in most conditions, especially for hypertension and cardiac diseases and they need updated information about their prescriptions to give better guidance to health care professionals.

Hospital-specific prescribing policies and guidelines based on national

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