

Available online on 15.02.2022 at <http://jddtonline.info>

Journal of Drug Delivery and Therapeutics

Open Access to Pharmaceutical and Medical Research

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Research Article

Assessment of Prescribing Patterns of Antihypertensive Drugs and Risk Factors Associated with Hypertension in Tertiary Care Hospital

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Article Info:



Article History:

Received 21 December 2021

Reviewed 02 January 2022

Accepted 08 January 2022

Published 15 February 2022

Cite this article as:

Tom C, John AJO, SA Babu A, Sahil M, Narayanan N, Assessment of Prescribing Patterns of Antihypertensive Drugs and Risk Factors Associated with Hypertension in Tertiary Care Hospital, Journal of Drug Delivery and Therapeutics. 2022; 12(1-s):71-81

DOI: <http://dx.doi.org/10.22270/jddt.v12i1-s.5229>

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Abstract

Aim/Background: To assess the prescribing pattern of anti-hypertensive and to assess the risk factors associated with hypertension.

Materials and methods: The prospective observational study was carried out for 6 months among 31 in-patients in the various departments of Yenepoya Medical College Hospital, Mangalore. Patients of both sex aged 18 years and above, those who can understand oral and written information and those diagnosed with hypertension were added in the study. Out-patients, patients with mental or psychiatric diseases, cognitive dysfunction, patients on cancer chemotherapy, pregnant and lactating females were excluded. A suitably designed data collection form was prepared to collect the data.

Results: Out of 31 patients, hypertension was mainly affected in males above the age of 60 years. In the study, majority (41.9%) of the participants had Stage II Hypertension according to JNC 7 classification. The major risk factors associated with Hypertension was advanced age (41.9%) followed by alcoholism (12.9%) on basis of environmental risk factor and diabetes (64.5%) on disease basis. Study reveals that Type II DM was comorbidity in most of the patient's i.e., 19(61.3%), followed by 15(48.4%) patients with CKD. 25.8% patients received monotherapy while majority of the patients i.e., 74.2% received triple therapy. The most commonly prescribed drug was Furosemide (Diuretics) 18(58.1%), followed by Clonidine (Alpha agonist) 13(41.9%). The result also shows that, after health education for patients with hypertension, BP is substantially lowered.

Conclusion: Study reveals that advancing age was the most predominating risk factor among hypertensive patients. Diuretics (Furosemide), Alpha agonist (Clonidine) and Calcium channel blocker (Amlodipine) were the drug of choice for hypertensive patients in the hospital. Drug therapy along with patient counseling helped to lower BP to an extent.

Keywords: Antihypertensive drug, prescribing pattern, risk factors, hypertension, co-morbidities with hypertension

INTRODUCTION:

Hypertension, also known as high or raised blood pressure, is a condition in which the blood vessels have persistently raised pressure. Many people lack hypertensive symptoms and make them unaware of their problem. Symptoms include early morning headaches, irregular heart rhythms, vision change. It is a serious medical condition and can include the risk of heart, brain, kidney and other diseases.¹ Various neural and humoral factors are known to influence and regulate BP. These include the adrenergic nervous system (controls α - and β -receptors), the renin-angiotensin-aldosterone system (RAAS) (regulates systemic and renal blood flow), renal function and renal blood flow (influences fluid and electrolyte balance), several hormonal factors (adrenal cortical hormones, vasopressin, thyroid hormone, insulin), and the vascular endothelium (regulates bradykinin, prostacyclin, endothelin). Renin acts on angiotensinogen to catalyze the formation of angiotensin-1. Angiotensin-converting enzyme (ACE) converts angiotensin-1 to angiotensin-2. Angiotensin-2 acts directly on arteriolar

smooth muscle and also stimulates the production of aldosterone by the adrenal glands. Aldosterone causes sodium and water retention and the excretion of potassium. Several factors influence renin release, especially those that alter renal perfusion. Lastly, the resultant increase in BP results in suppression of renin release through negative feedback. Treatment options include medications, lifestyle modifications and diet changes. Initial drug selection depends on the degree of BP elevation and the presence of compelling indications for selected drugs. Patients with stage 1 hypertension initially be treated with a thiazide diuretic, angiotensin-converting enzyme (ACE) inhibitor, angiotensin II receptor blocker (ARB), or calcium channel blocker (CCB). Patients with stage 2 disease, are recommended for combination therapy with one of the agents being a thiazide diuretic if no contraindications exist. Diuretics, ACE inhibitors, ARBs, and CCBs are primary agents acceptable as first-line agents.

OBJECTIVES:

Primary objectives:

Assess the prescribing pattern of drugs in hypertensive patients.

To determine risk factors associated with hypertension.

Secondary objectives:

Assess the co-morbid conditions such as TYPE 2 DM and CKD.

Impact of patient education in the control of hypertension.

- Demographic details

JNC 7 wise classification of hypertension in patients.

MATERIALS AND METHODS:

Study design:

“A Prospective Observational Study”

Study site:

This study was conducted in the various department of Yenepoya Medical College Hospital Deralakatte Mangalore, Karnataka.

Study duration:

The study was carried out for a period of 6 months.

Study criteria:

The study was carried out by considering the following criteria:

Inclusion Criteria:

- Patient diagnosed with hypertension with or without comorbidities.

- Inpatient unit of various department

- Age >18years of either gender.

Exclusion criteria:

- All pregnant women and lactating women.
- Patients with age < 18 years
- Psychiatric patients

IEC APPROVAL:

The study was approved by the Yenepoya University Ethics Committee. The data collected were tabulated and analyzed using Microsoft Excel version 12 and SPSS Version 22.

RESULTS:

AGE WISE DISTRIBUTION OF PATIENTS:

Out of 31 patients, most of the patients were above 60 years (38.7%), followed by 50-59 years (22.6%), 40-49 years (22.6%), 30-39 years (9.7%), and 18 -29 years (6.5%).

Table 1.1: Frequency and percentage distribution of samples according to age N=31

Age in years	Frequency	Percentage
18-29	2	6.5
30-39	3	9.7
40-49	7	22.6
50-59	7	22.6
Above 60	12	38.7

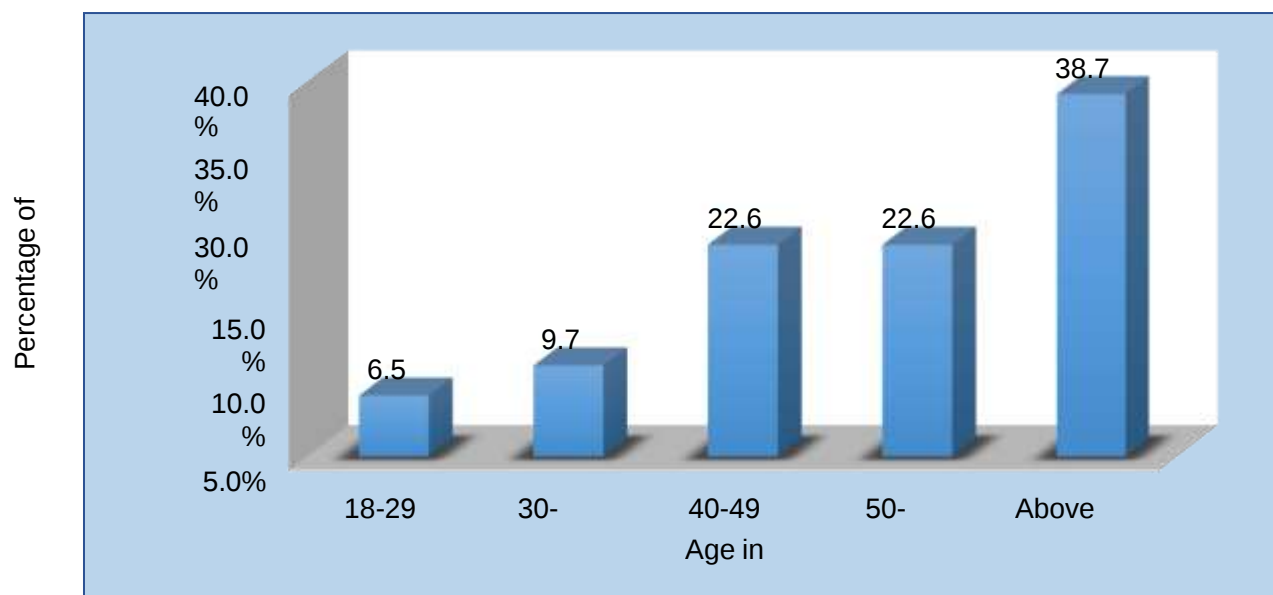


Figure 1.1: Percentage distribution of samples according to age in years

Out of 31 patients, 21 (67.7%) were males and 10 (32.3%) were females.

Table 1.2: Frequency and percentage distribution of samples according to gender (N=31)

Gender	Frequency	Percentage
Male	21	67.7
Female	10	32.3

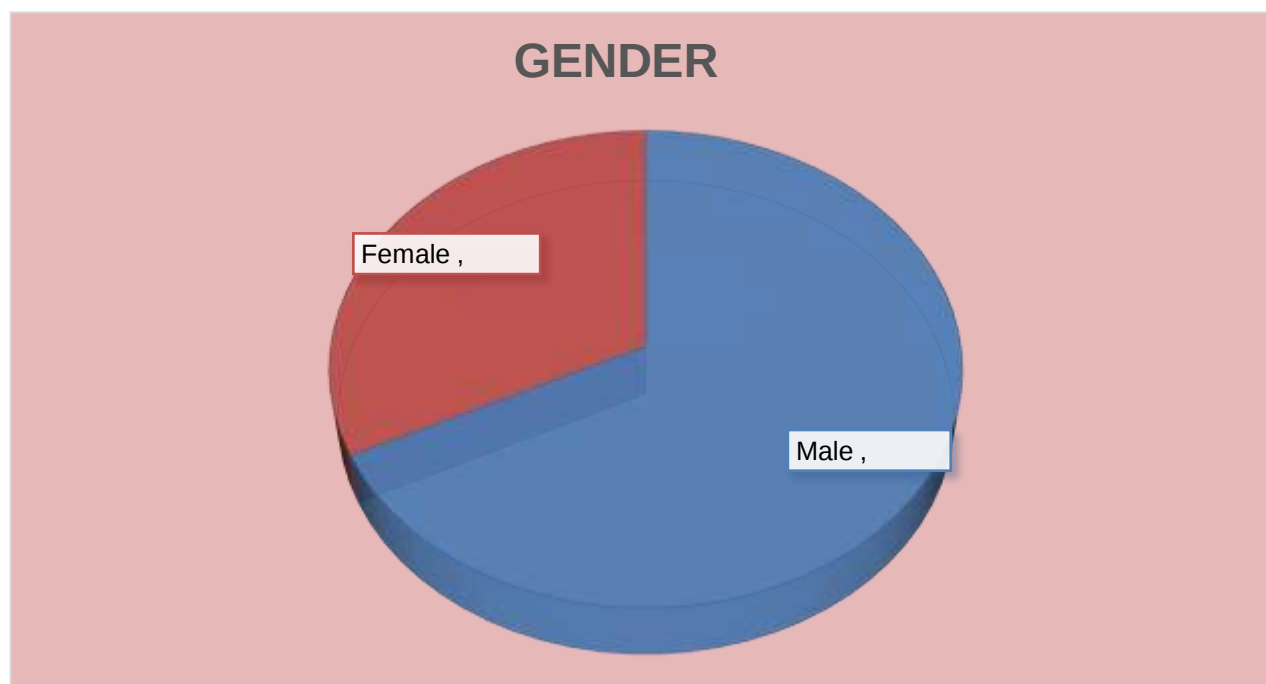


Figure 1.2: Pie chart of percentage distribution of samples based on gender

PATIENT DISTRIBUTION BASED ON JNC-7 CLASSIFICATION

Out of 31 patients, 13 patients (41.9%) had Stage II Hypertension, followed by 10 patients (32.3%) with Stage I Hypertension and 8 patients (25.8%) with Pre-hypertension.

Table 1.3: Frequency and percentage distribution of samples according to classification of hypertension (N=31)

Classification of samples	Frequency	Percentage
Pre-hypertension	8	25.8
Stage I Hypertension	10	32.3
Stage II Hypertension	13	41.9

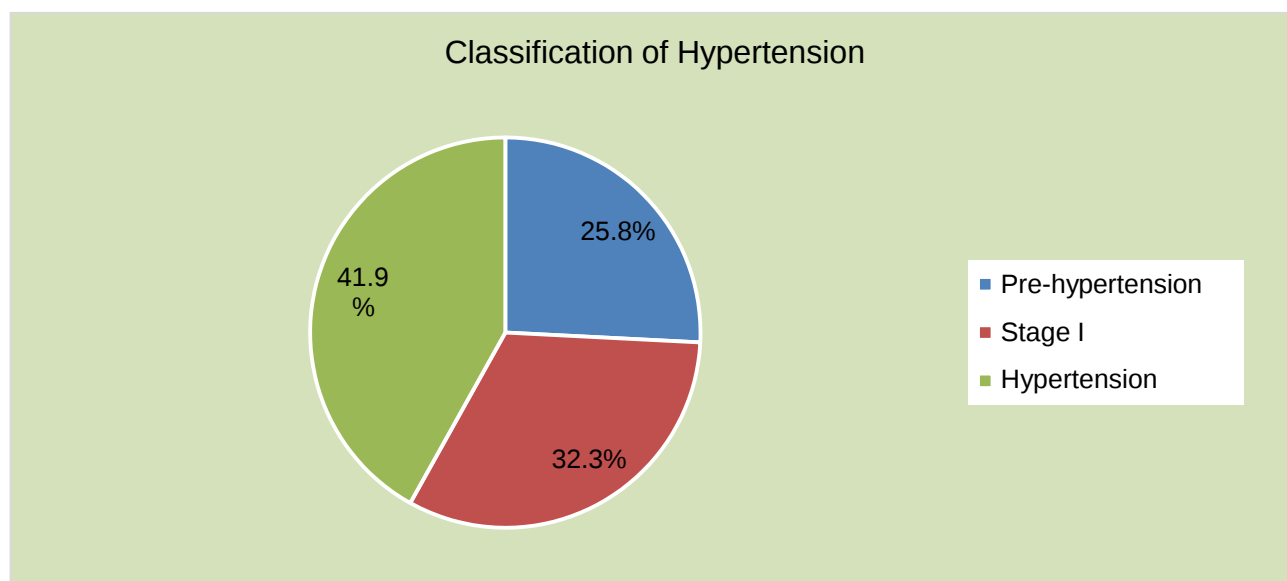


Figure 1.3: Percentage distribution of samples according to JNC 7 classification of hypertension

PATIENT DISTRIBUTION BASED ON RISK FACTORS:

In the study, disease and environmental factors were found to

be the risk factors of hypertension. Out of 31 patients, based on **disease**, 20 (64.5%) patients had diabetes, 10(32.3%) had CKD, 9(29%) had CAD and 2(6.5%) had thyroid disease.

Table 1.4.a: Frequency and percentage distribution of samples according to risk factors(Diseases) (N=31)

Risk factors (Diseases)	Frequency	Percentage
Chronic Kidney Disease	10	32.3
Diabetes	20	64.5
Coronary Artery Disease	9	29.0
Thyroid Diseases	2	6.5

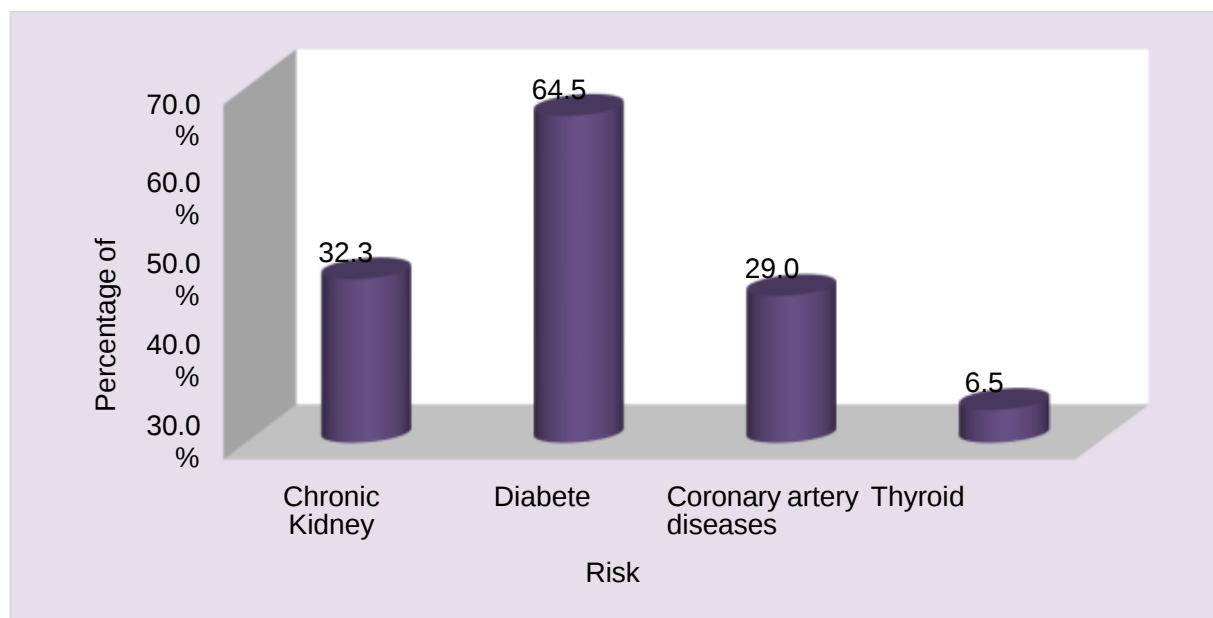


Figure 1.4.a: Percentage distribution of samples according to risk factors

Based on **environmental risk factors**, out of 31 patients, 13(41.9%) patients risk factor was advanced age, 4(12.9%) patients were alcoholic, 1(3.2%) patient was smoker and 1(3.2%) had tobacco use as risk factors.

Table 1.4.b: Frequency and percentage distribution of samples according to risk factors (Environmental factors) (N=31)

Risk factors (Environmental factors)	Frequency	Percentage
Alcohol	4	12.9
Smoking	1	3.2
Age	13	41.9
Tobacco	1	3.2

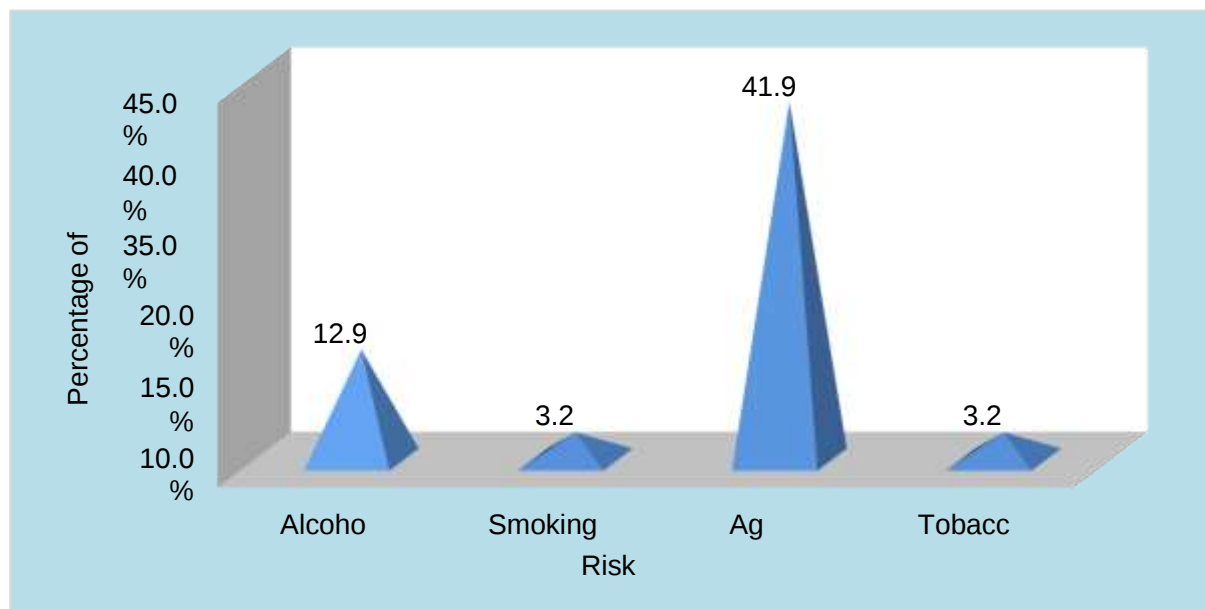


Figure 1.4.b: Percentage distribution of samples according to riskfactors

PATIENT DISTRIBUTION BASED ON CO-MORBIDITIES:

Out of 31 patients, majority of the patients i.e., 19(61.3%) patients had Type II DM as a co-morbidity followed by 15(48.4%) patients with CKD. Some of the patients had other co-morbid conditions, which is represented in the table 1.5 and figure 1.5.

Table 1.5: Frequency and percentage distribution of samples according to Co-morbidities (N=31)

Co-morbidities	Frequency	Percentage
Type II Diabetes mellitus	19	61.3
Chronic Kidney Diseases	15	48.4

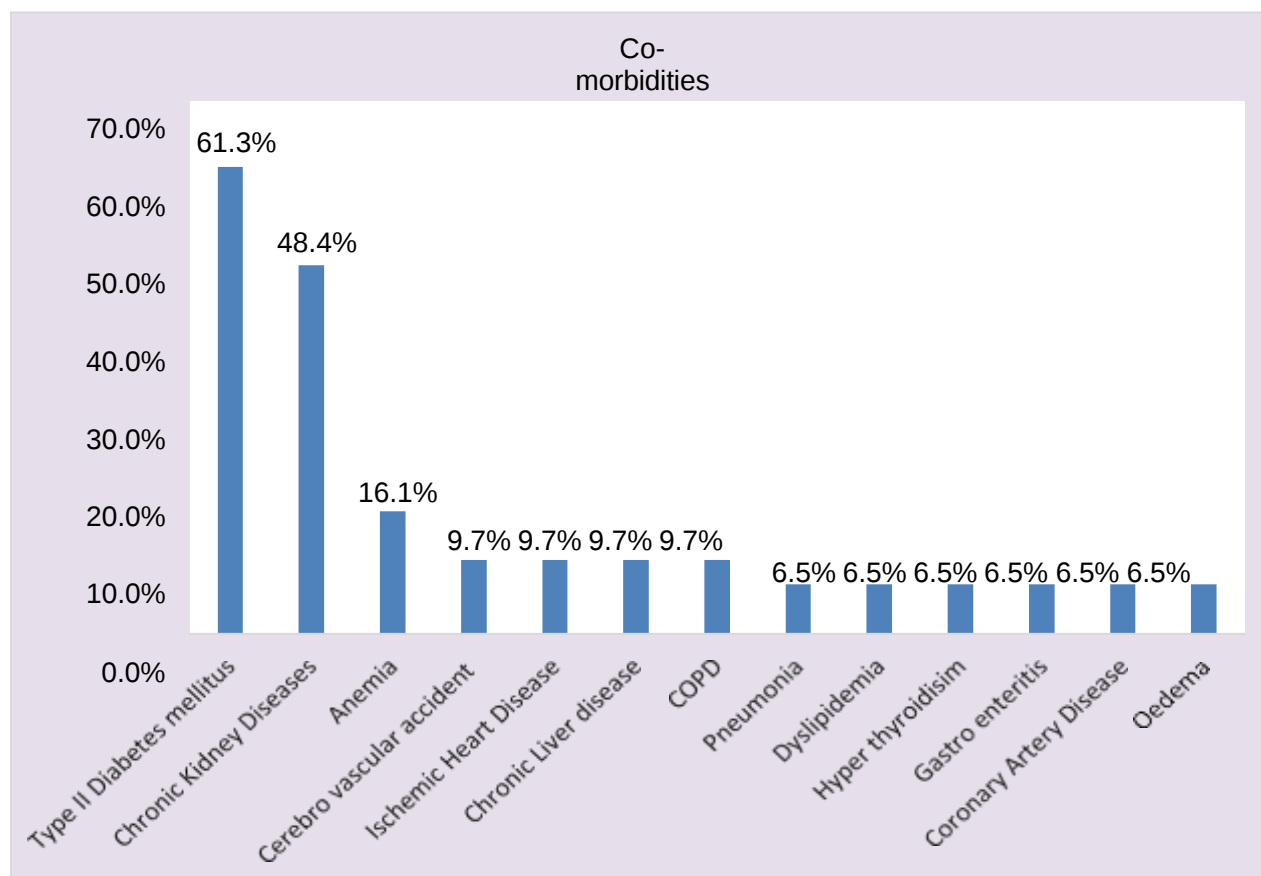


Figure 1.5: Percentage distribution of samples according to co-morbidities

PATIENT DISTRIBUTION BASED ON DRUGS PRESCRIBED:

Out of 31 patients, commonly prescribed drug was Furosemide (Diuretics) 18(58.1%) followed by Clonidine

(Alpha agonist) 13(41.9%) which is followed by Nifedipine (CCB) 10(32.3%) and followed by other anti-hypertensive drugs as represented in table 1.6.a and figure 1.6.a.

Table 1.6.a: Frequency and percentage distribution of prescribed drug class and name (N=31)

Drug class	Drug name	Frequency	Percentage
Calcium channel blocker	Clinidipine	5	16.1
	Nifedipine	10	32.3
	Amlodipine	6	19.4
Alpha agonist	Clonidine	13	41.9
Alpha blocker	Prazosin	2	6.5
Beta blocker	Metoprolol	7	22.6
	Propranolol	2	6.5
Alpha and beta blocker	Carvedilol	2	6.5
	Labetelol	1	3.2
Diuretics	Furosemide	14	45.2
	Hydrochlorothiazide	1	3.2
	Spironolactone	3	9.7
Ace inhibitor	Enalapril	1	3.2
ARB inhibitors	Telmisartan	4	12.9
	Losartan	4	12.9

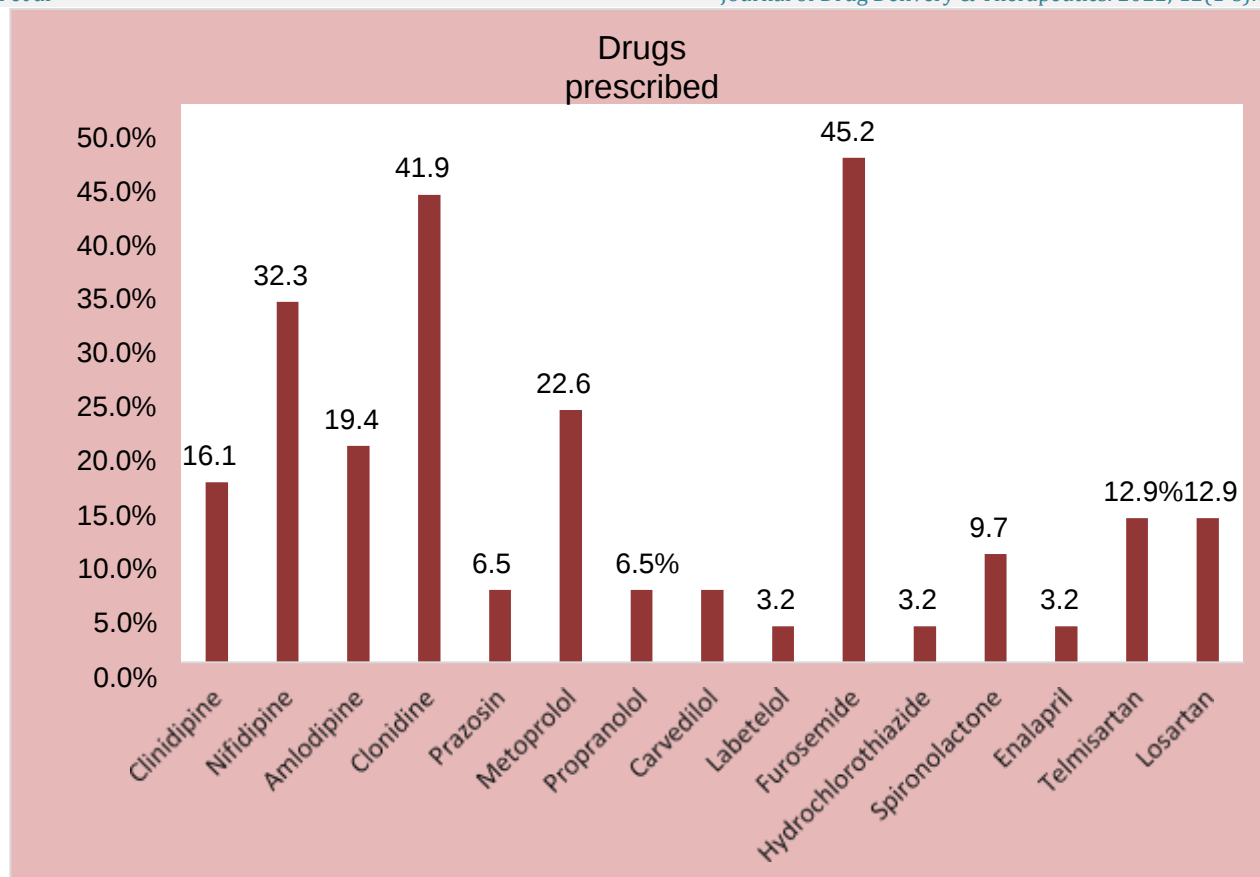


Figure 1.6.a: Percentage distribution of samples according to drugs prescribed

Out of 31 patients, 23 (77.4%) patients received triple therapy, followed by 8 (25.8%) patients received mono-therapy.

Table 1.6.b: Frequency and percentage distribution of samples according to type of therapy N=31

Type of therapy	Frequency	Percentage
Triple therapy	23	74.2
Dual therapy	0	0
Mono therapy	8	25.8

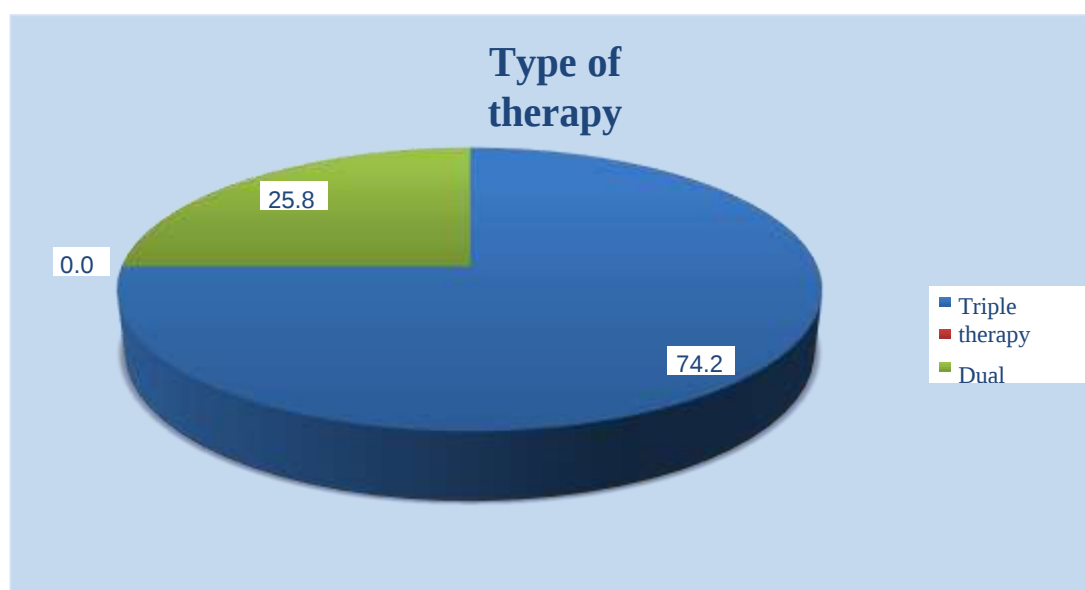


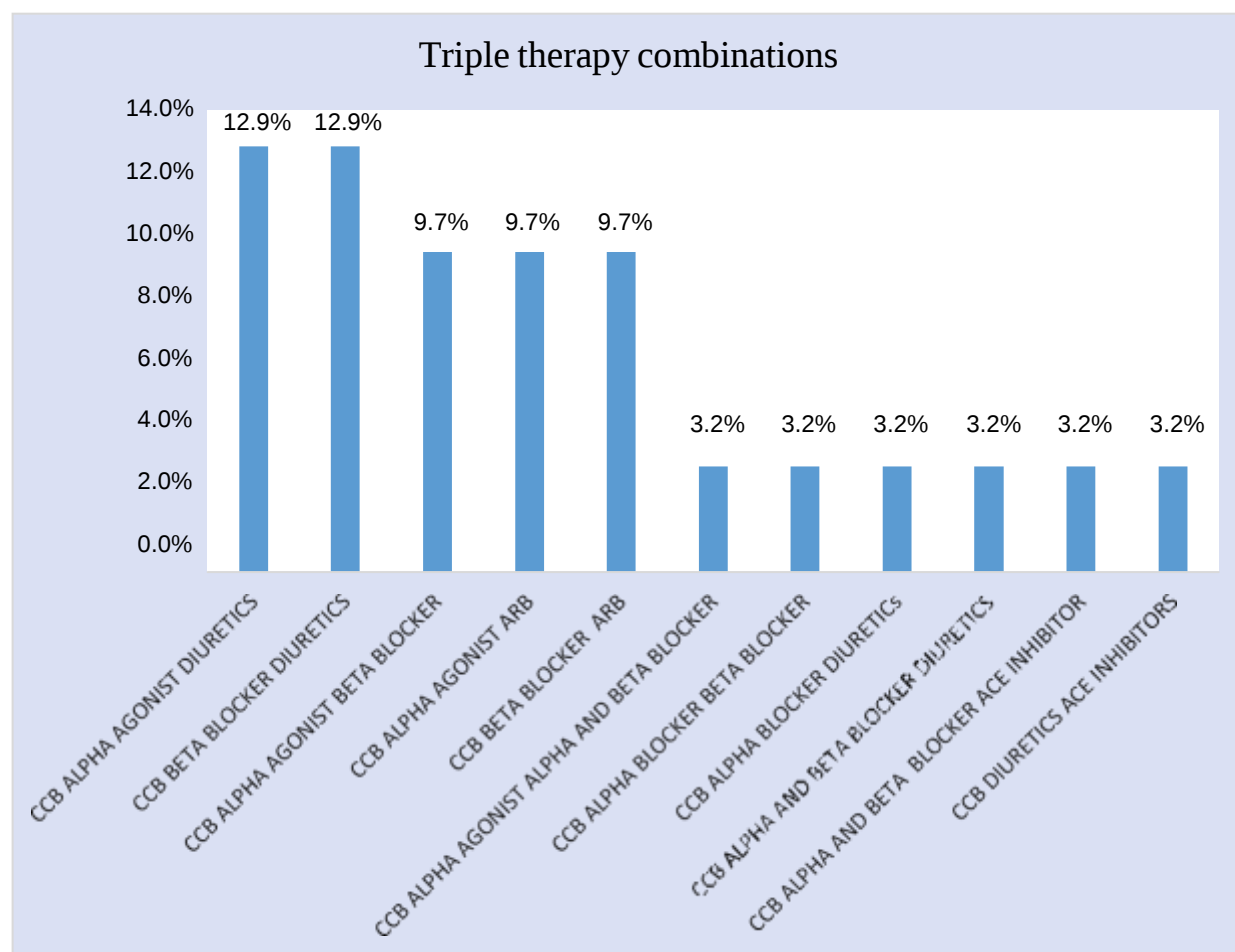
Figure 1.6.b: Percentage of samples according to type of therapy

Out of 31 patients, 23 patients got triple therapy and 8 patients got mono therapy. The major triple therapy combinations prescribed were CCB + Alpha Agonist + Diuretics

and CCB+ Beta Blocker + Diuretics i.e., 4(12.9%) followed by other combinations of drug class as represented in table 1.6.c and figure 1.6.c.

Table 1.6.c: Frequency and percentage distribution of samples according to multi-drug therapy (N=31)

Triple therapy combination	Frequency	Percentage
CCB + ALPHA AGONIST + DIURETICS	4	12.9
CCB + BETA BLOCKER + DIURETICS	4	12.9
CCB + ALPHA AGONIST + BETA BLOCKER	3	9.7
CCB + ALPHA AGONIST + ARB	3	9.7
CCB + BETA BLOCKER + ARB	3	9.7
CCB + ALPHA AGONIST + ALPHA AND BETA BLOCKER	1	3.2

**Figure 1.6.c: Percentage of samples according to triple therapy combination**

In a total of 8 patients getting mono-therapy, 4 (12.9%) patients were prescribed with CCBs, followed by ARBs in 2 (6.5%) patients.

Table 1.6.d: Frequency and percentage distribution of samples according to mono-therapy

Drugs used in mono therapy	Frequency	Percentage
CCB	4	12.9
ARB	2	6.5
ALPHA AGONIST	1	3.2
DIURETICS	1	3.2

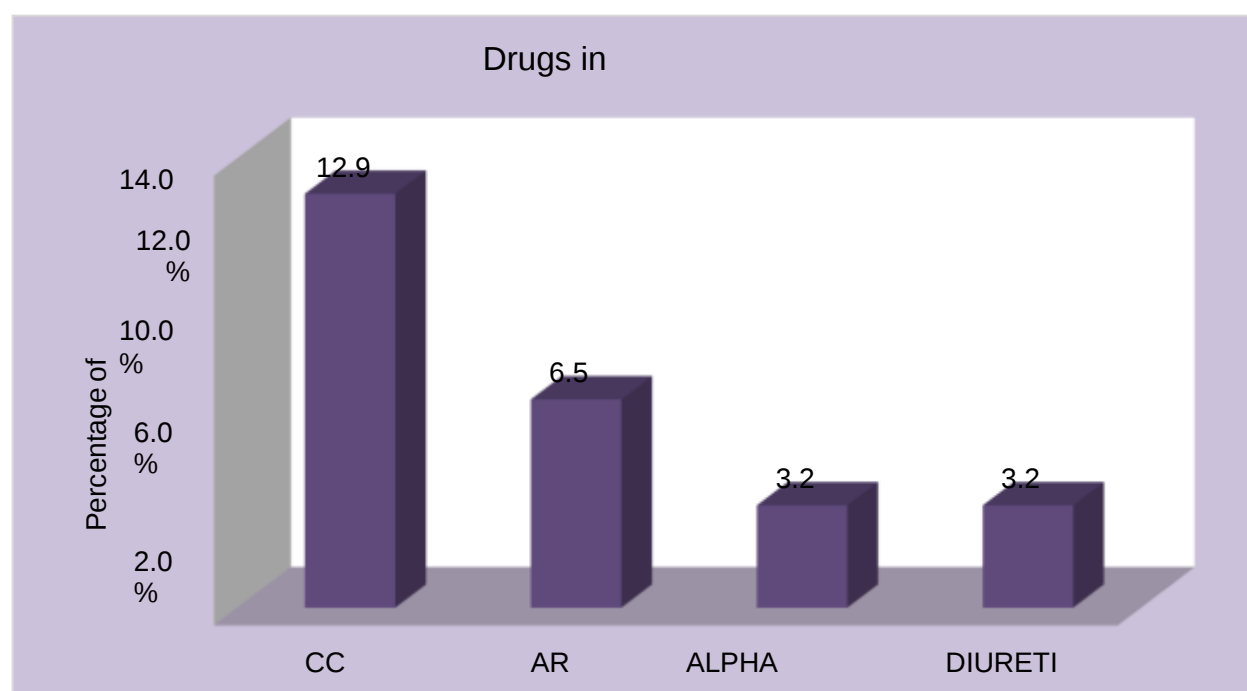


Figure 1.6.d: Percentage of samples according to drugs used in mono therapy

DISCUSSION:

Hypertension is the most common cardiovascular disease and it is estimated that approximately 30% of the population has high BP. This discussion is based on the data obtained from 31 patients included in our study. In the study conducted in hypertensive patients, the male subjects (67.7%) predominated than female subjects (32.3%). Some studies reported higher percentage of hypertension in males whereas other studies reported that the percentage of hypertension is more in females. This tells that hypertension affects both the genders equally. This was supported by the study done by **Ashok Kumar Malpani et al.²⁻⁴** In our study one of the possible explanations for this gender disparity in hypertension prevalence could be partially due to biological sex difference and partially due to behavioral risk factors like smoking, alcohol consumption, or physical activity which is similar to the study done by **Shikha Singh et al.⁵** In the present study, maximum number of patients had an age above 60 years, these results were similar to the study done by **Chandra Narayan Gupta et al.³** Hypertension is more prevalent among older individuals due to increased arterial and arteriolar wall stiffness, decreased baroreceptor sensitivity, increased responsiveness to sympathetic nervous stimuli, and altered renal and sodium metabolism associated with aging.⁶ Age was found to be an important risk factor for hypertension. Age acts as a factor and as the age increases hypertensive prevalence also increases. The study was supported by the similar findings in the study done by **Shikha Singh et al.⁵** We also found high rates of Stage II hypertension (41.9%) in the study sample, followed by stage I hypertension and pre-hypertension which is similar to the study done by **Gupta SK et al.⁷** Pre-hypertension is an important antecedent for developing hypertension and cardiovascular disease later in life, and when detected early can be lowered with lifestyle modifications without the use of anti-hypertensive medications, although not always reliably. In our 31 patients Type 2 diabetes mellitus was the most common co-morbid condition which was similar to the study conducted by **Ashok Kumar Malpani et al.²⁻³** The use of combination antihypertensive pharmacotherapy suggests increased severity of illness where optimal BP control cannot be achieved on monotherapy.⁸ In our study, it was observed that

the higher rates of (74.2%) combination therapy of anti-hypertensives were prescribed than (25.8%) monotherapy, similar to that reported by **Anastase Dzudie et al.⁹** to achieve optimal BP control combination therapy was necessary as in **Susheela SH et al.¹⁰⁻¹¹** Maximum number of patients underwent 74.2% triple therapy followed by 25.8% monotherapy. In our study, the most prescribed drugs were Diuretics followed by Alpha agonist, CCBs, and β blockers. The same pattern of prescribing was found in one of the previous study conducted by **Jugal Kishore et al.¹²** The most commonly prescribed triple therapy were Diuretics + Alpha agonist + CCB and Diuretics + Beta blocker + CCB. It is not surprising that thiazides were the most frequently used hypertensive drugs found in the previous study done by **Jugal Kishore et al.¹²** Thiazides are cheaper drug when compared with other classes of antihypertensive drugs. This finding was supported by the study done by **Oluseyi Adejumo et al.** This also tells that diuretics are used as 1st line therapy as which is similar with JNC 7 guidelines and the similar results were found in the study done by **Gupta SK et al.⁷** The mostly used monotherapy was CCB, ARB, Alpha agonist and others which is similar to previous study conducted by **Hong Cheng et al.¹⁴** patient with higher education shown to have good BP control those with the patient having no formal education. This can be because of the poor adherence of the patient towards the treatment. Also, patient with higher education will be having more affordability for the medication than those with poor educated patients. Several researches have shown that both education and economic status can influence the outcome of hypertension. The study was supported by **Busari OA et al.¹⁵**

CONCLUSION:

Our study revealed that hypertension is observed more in the age group above 60 years and most of them were males. Majority had diabetes, some had CKD and coronary artery disease, and very few had thyroid disease as risk factors among diseases whereas advancing age is the most predominating environmental risk factor in our study. Half of the patients belonged to stage II hypertension, some belonged to stage I hypertension and very few patients belonged to pre-hypertension stage respectively. Type II diabetes mellitus is the most common co-morbidity existing with the

hypertension. Besides that almost half of the patients had CKD, some had anemia and few other had cerebro vascular accident, ischemic heart disease etc. Our study analyzed the prescription pattern of antihypertensive drugs and found that the prescribing pattern was not totally consistent with the JNC VIII guidelines for the treatment of hypertension. Diuretics (furosemide) were the most commonly prescribed drug among the study population followed by Alpha agonist and calcium channel blockers. Higher percentage of patients (74.2%) was found to be on triple therapy with a combination of CCB, Diuretics, Alpha agonist or a beta blocker. Diuretics are recommended as initial monotherapy and in combination therapy for Indian hypertensive patients.

ACKNOWLEDGEMENT:

The authors of the study are heartily thankful for the guidance and support received from all the members who contributed to this project, it was vital for the success of the project. They would also like to express their sincere thanks to all the study participants.

CONFLICT OF INTEREST

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

ABBREVIATIONS

ACE: Angiotensin Converting Enzyme; **ARB:** Angiotensin II Receptor Blockers; **BP:** Blood Pressure **CCB:** Calcium Channel Blocker; **CNS:** Central Nervous System; **DBP:** Diastolic Blood Pressure; **CO:** Cardiac Output; **GFR:** Glomerular Filtration Rate; **SBP:** Systolic Blood Pressure; **DASH:** Dietary Approaches to Stop Hypertension; **JNC:** Joint National Committee; **NSAIDS:** Non-Steroidal Anti-Inflammatory Drugs; **RAAS:** Renin-Angiotensin Aldosterone System

SUMMARY

Hypertension is defined by persistent elevation of arterial blood pressure (BP). Hypertension is also one of the most significant risk factor for cardiovascular (cv) morbidity and mortality resulting from target -organ damage to blood vessels in the heart, brain, kidneys and eyes. These complications can manifest as either atherosclerotic vascular disease or other forms of CV disease. Various neural and humoral factors are known to influence and regulate BP. These include the adrenergic nervous system (controls α - and β -receptors), the rennin -angiotensin - aldosterone system (RAAS) (regulates systemic and renal blood flow), renal function and renal blood flow (influences fluid and electrolyte balance), several hormonal factors (adrenal cortical hormones, vasopressin, thyroid hormone, insulin), and the vascular endothelium (regulates release of nitric oxide, bradykinin, prostacyclin, endothelin). The exact aetiology of essential hypertension is unknown; however, lifelong modifications and pharmacotherapy are usually needed. Awareness, treatment, and control of hypertension have improved in the past decade, but are not optimal. In the present study we are dealing with the Assessment of prescribing pattern of anti-hypertensive drugs and risk factors associated with hypertension. A prospective study was carried out for a period of 6 months at General department of Yenepoya Medical College Hospital, Derlakatte, and Mangalore after obtaining the approval from the Yenepoya Ethics Committee. Considering the inclusion and exclusion criteria, a written informed consent was obtained from the patients who were willing to participate in the study. Demographic, clinical and medication details were collected in a specially designed form. Normal hypertension: Systolic less than 120 mm Hg and diastolic less than 80 mm Hg. No treatment is necessary, but you should monitor your blood

pressure to be sure that it remains within the normal range. Pre-hypertension: Systolic between 120 and 139 mm Hg or a diastolic between 80 and 89 mm Hg. Stage 1: Systolic between 140 and 159 mm Hg or diastolic 90 and 99 mm Hg. Stage 2: Systolic 160 mm Hg or higher or diastolic 100 mm Hg or higher. A total 31 patients were included in the study. In the study conducted, the male subjects (67.7%) predominated than female subjects (32.3%). Most of the patients were above 60 years (38.7%), followed by 50-59 years (22.6%). Out of 31 patients, 13 patients (41.9%) had Stage II Hypertension, followed by 10 patients (32.3%) with Stage I Hypertension and 8 patients (25.8%) with Pre- hypertension. In the study, disease and environmental factors were found to be the risk factors of hypertension. Out of 31 patients, based on disease, 20 (64.5%) patients had diabetics. Based on environmental risk factors, out of 31 patients, 13 (41.9%) patients risk factor was advanced age. Majority of the patient's i.e., 19 (61.3%) patients had Type II DM as a co-morbidity followed by 15 (48.4%) patients with CKD. Some of the patients had other co-morbid conditions. The most commonly prescribed drug was found to be Furosemide (Diuretics) 18 (58.1%). Out of 31 patients, 23 patients got triple therapy and 8 patients got mono therapy. The major triple therapy combinations prescribed were found to be CCB + Alpha Agonist+Diuretics and CCB+ Beta Blocker + Diuretics i.e., 4 (12.9%)

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