

Drug Utilization Evaluation Of Antihypertensives In A Tertiary Care Teaching Hospital.

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ABSTRACT

INTRODUCTION: A study on antihypertensive usage in a tertiary care teaching hospital necessary to realize that drugs inappropriate use represents a potential hazard to the patient and unnecessary expenses. This necessitates a periodic review of the pattern of drug utilization to ensure safe and effective treatment. The ultimate goal is to focus on the factors related to the prescribing, dispensing, administering and taking medication.

AIM: To analyse the drug utilization evaluation of antihypertensives in a tertiary care teaching hospital.

METHODOLOGY: A prospective, observational and analytical study was carried out for six months from November 2019 to April 2020 in the inpatient from different departments of a tertiary care teaching hospital in Mysore district with the aim of drug utilization evaluation antihypertensives.

RESULT: A total of 332 patients were taken into the study. 32% (103) of the patient were in the age group of 41-50 years, and this was found to be higher in a male population, 57%. During the study, 51.6% of the patients were stage 1 hypertension, followed by prehypertension and stage 2 hypertension. The most common class of drugs prescribed in the study was ACE inhibitors, 31.1%, followed by CCB 21.4%, and the most prescribed medication in the study were captopril 21.7% and nifedipine 14.3%. Diabetes mellitus was the most common comorbid condition, 35.7% associated with hypertension, followed by hyperthyroidism 14.5%.

CONCLUSION: This study concluded that by providing insight into the prescription pattern of antihypertensive medication concerning various comorbidities control, it helps the prescriber pay more attention to specific factors that affect the outcome of various comorbidities.

Keywords: Drug utilization evaluation, Antihypertensives, JNC, Hypertension.

INTRODUCTION

Drug utilization research is defined as research on "the marketing, distribution, prescription and use of drugs in a society, with special emphasis on the resulting medical, social and economic consequences" and has the principle aim of facilitating drugs' rational use. Drug utilization research developed quickly and soon became the right subject for international congresses in pharmacology and epidemiology. The study aimed to identify the possible association between the increase or decrease in antihypertensive drug groups' utilization.⁽¹⁾

The Seventh Report of the Joint National Committee on the Detection, Evaluation, and Treatment of High Blood Pressure (JNC7) is the most prominent evidence-based clinical guideline in the world for the management of hypertension, supplemented by the 2007 American Heart Association (AHA) Scientific Statement on the treatment of hypertension.⁽²⁾

It is predominantly an asymptomatic condition, and in more than 95% of cases, a specific underlying cause of hypertension cannot be found. Many risk factors may contribute to its development, including age, gender weight, physical activity, smoking, family history, serum cholesterol, diabetes mellitus, renal dysfunction, peripheral resistance vessel tone, endothelial dysfunction, autonomic tone, insulin resistance and neurohumoral factors. Hypertension doubles the risk of cardiovascular diseases, including coronary heart disease (CHD), congestive heart failure (CHF), ischemic and hemorrhagic stroke, renal failure, and peripheral arterial disease if not effectively treated.⁽²⁾

With this projected increase in prevalence rates in Hypertension, the prescription volume of antihypertensive drugs, morbidity and mortality rates are expected to assume an upward trend, especially in India, where healthcare services are sub-optimal for the rapidly expanding populations (Rodgers A et al., 2000). As mentioned earlier, the issues motivated us to undertake the present study, aiming to determine the utilization of antihypertensive drugs in south India.⁽³⁾

STUDY MATERIALS AND METHODS

All the relevant and necessary data of the patient were collected from:

- Patient case notes.
- Hospital pharmacy.
- Medication/Treatment chart.
- Prescription.

Design And Development Of Study Document

Design of data collection form (DCF):

Suitable data collection form was designed for offline data collection and documentation of all the required data. The developed data collection form consist of details such as patient demographics (Name, age, gender, height, weight, c/o, PMH, provisional diagnosis, current medication, inpatient number, etc.).

Computerization of data collection form

For easy storage, accessibility, retrieval, and analysis of collected data, online Google forms were designed along with google sheet, online and computerized database was created.

Study procedure:

This is a prospective observational study; the patients satisfying the inclusion criteria will be enrolled in the study after obtaining their written informed consent. Patient case notes, medication charts, laboratory data and other relevant documents will be reviewed. A suitably designed data collection form will record all the necessary data, including patient demographic details, patient medication history, the reason for admission, any allergic reaction, medication details, and lab investigations.

Data Analysis:

Data were entered into Google forms, Google sheets and check for accuracy. After that, the data was loaded into SPSS v20 for further analysis. Descriptive statistics on sample characteristics were computed, including means, standard deviation, and frequency of distribution.

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 antihypertensive drugs and detail of adverse drug reaction if developed. Data like name, age, sex, duration of hypertension, family history, vital data, general examination, laboratory investigation, concurrent diseases, and ongoing treatment was recorded from patient's case.

RESULT AND DISCUSSION

A total of 322 patients aged between 21-90 years who met the initial inclusion criteria were included in this study.

Table 1: Categorization of study population based on Gender		
Gender	Frequency	Percent
Male	200	62.1
Female	122	37.9
Total	322	100.0

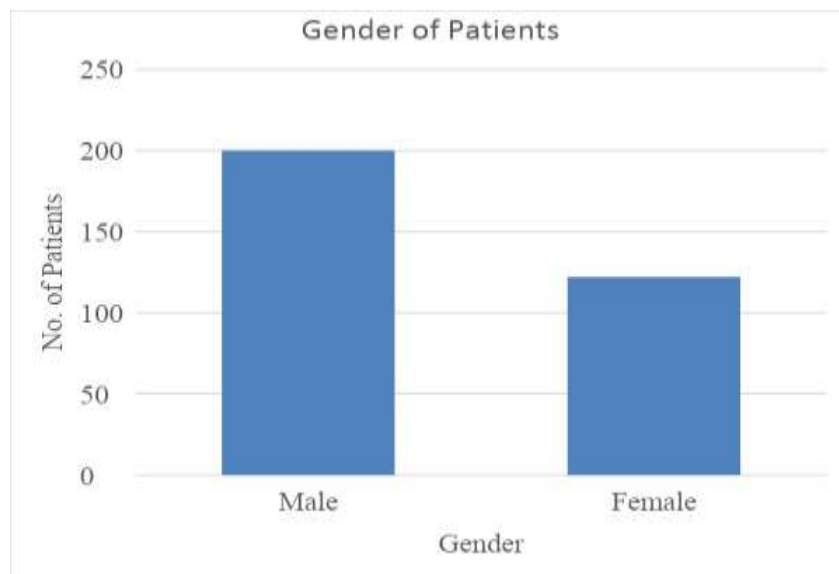


Figure.1 Patients categorization based on gender

As seen from Table (1) and Figure (1), among 322 respondents, 62% (200) are male and 37.9% (122) are female. It is clear that number of men is almost double the number of women. **Thus, most of patients are male in this survey.**

Table 2: Categorization of hypertensive patients based on age		
Age group (Years)	Frequency	Percent
21-30	20	6.2
31-40	39	12.1
41-50	103	32.0
51-60	94	29.2
61-70	55	17.1
71-80	9	2.8
>80	2	.6
Total	322	100.0

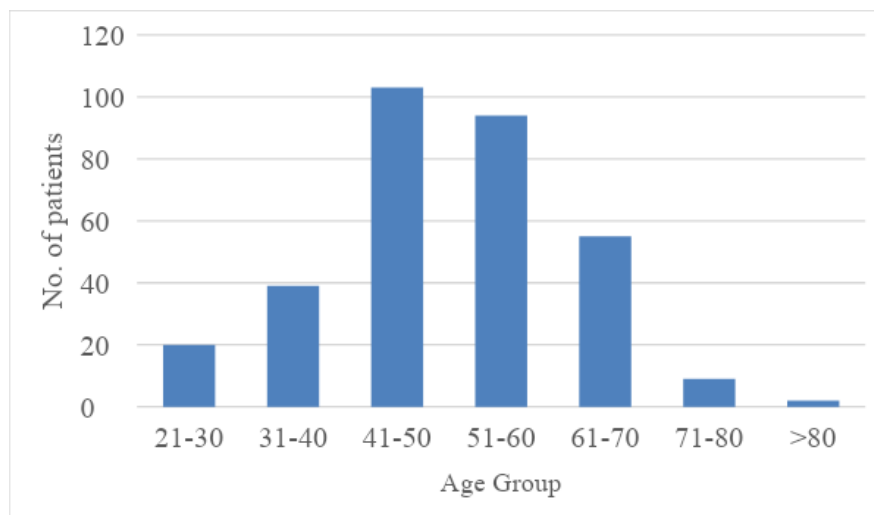


Figure.2 Hypertensive patients' categorization based on age

The study is conducted with 322 respondents in different ages. The researcher divided the respondents into seven age groups from 21 to over 80 years old with each 10 class interval. It is noticed from the Table (2) that people aged from 41-50 is the most dominant with 32% (103), the highest number recorded while those who are over 71 and under 30 years old are very less around 3.4% (11) and 6.2%(20) respectively. The age groups of 31-40 and 51-60 made up for 12.1%(39) and 17.1% (55) respectively, followed by the group the group of 51-60 with 29.2% (94). **Hence, it can be said that most of respondents were in the middle age.**

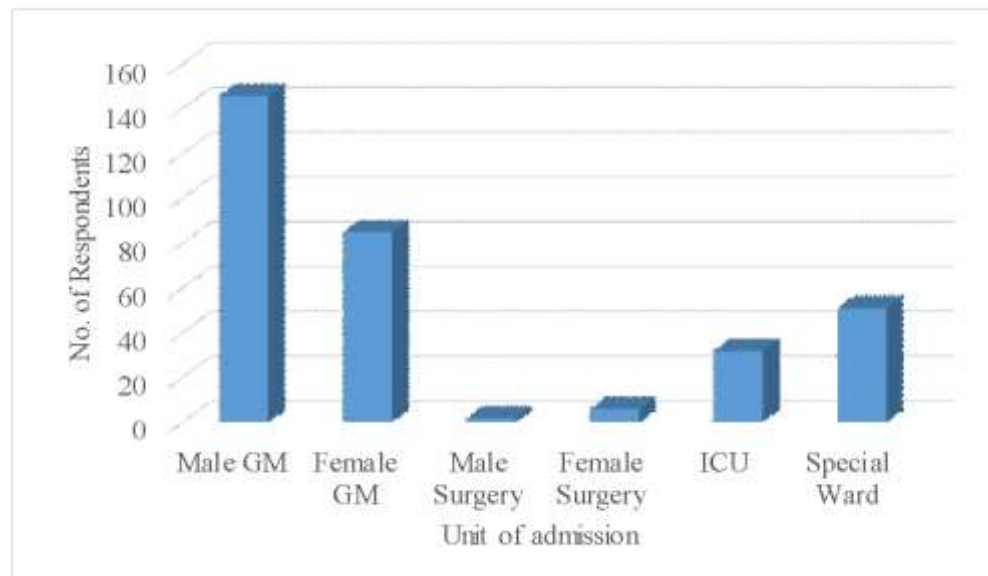


Figure 3: Unit of admission of respondents of the study

Concerning with unit used in hospital, Male GM and Female GM are the most commonly used units with 45.3% (146) and 26.4% (85) respectively as seen in Table (3) and Figure (3). By agreement, male surgery and female surgery are less popular with 0.6%(2) and 1.9% (6) accordingly. While the number of special ward is 15.8% (51), the third level in the given data, the figure for ICU is 9.9% (32). Overall, male GM is dominant.

Table 4: Past Medical History of respondents of the study

Past Medical History	Frequency	Percent
Nil	90	28.0
Hypertension	125	38.8
General	31	9.6
Hypothyroidism	13	4.0
Hyponatremia	1	.3
HTN and Hypothyroidism	5	1.6
T2DM,HTN	37	11.5
COPD	17	5.3
TB	1	.3
CAD	2	.6
Total	322	100.0

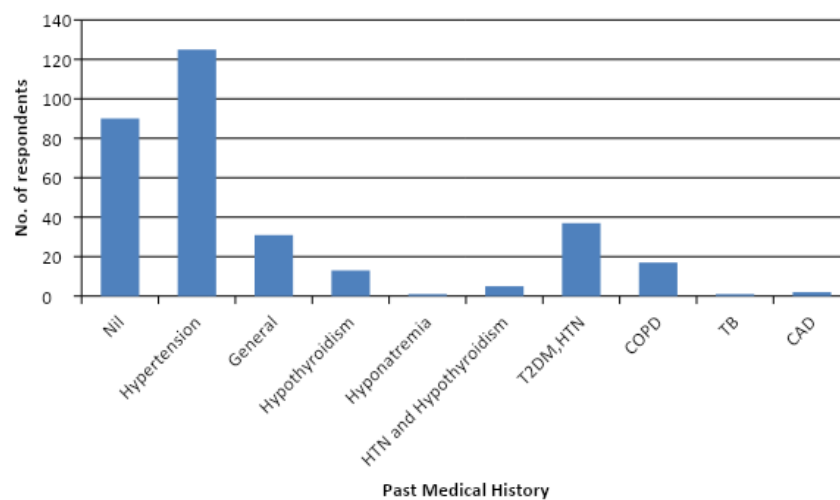


Figure 4: Past Medical History of respondents of the study

The medical history of 322 respondents with more than ten health problems was studied. It's evident from the given result Table(4) that, **hypertension is prominent amongst other diseases with 38.8%(125)**. It is followed by *T2DM, HTN and General problem* with 11.5%(37), and 9.6% (31) respectively. Interestingly, people with no historical health issues stood at 28% (90), the second-high number recorded. The other diseases such as COPD, Hypothyroidism, and Hyperthyroidism are less found in these respondents.

Table 5: Demographic data of hypertensive patients based on social habits			
Social Habits	Assessment	Frequency	Percent
Vegetarian	Yes	29	9.0
	No	293	91
Smoking	Yes	152	47.2
	No	170	52.8
Alcoholic	Yes	107	33.2
	No	215	66.8
Non-Vegetarian	Yes	293	91
	No	29	9.0

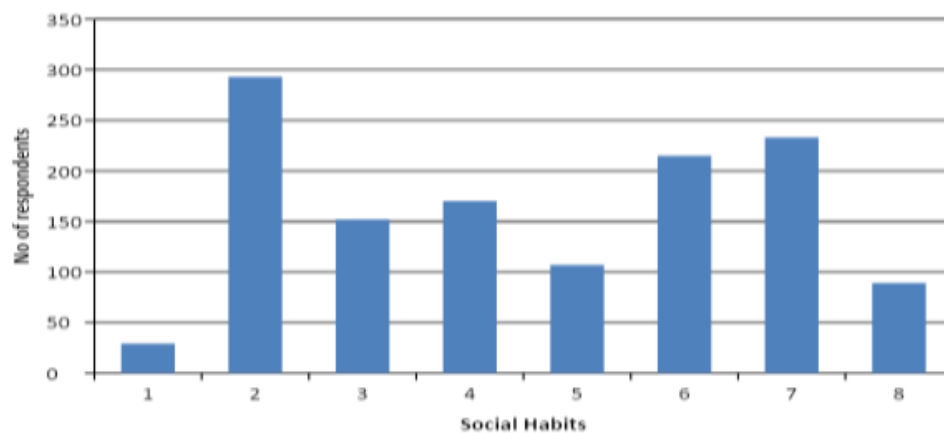


Figure 5: Demographic data of hypertensive patients based on social habits

When 322 people were asked about whether they are vegetarian or non-vegetarians, 91%(293) of them answered “no” and only small percentage (9%) (29) for yes. **Therefore, most of these patients are non-vegetarians.**

In terms of smoking issues, 52.8%(170) of respondents didn’t smoke while 47.2%(152) smoked. Although the number of non-smoking people are slightly more than the number of smoking ones, the two groups are quite equivalent in number. When 322 people were asked about whether they consumed alcohol or not, 66.8%(215) of them answered “no” and 33.2% (107) percentage for yes. **Therefore, more than half of these patients did not consume alcohol**

Table 6: Co-Morbidities of the respondents of the study		
Co-Morbidities	Frequency	Percent
Nil	68	21.1
Hypothyroidism	25	7.8
COPD	26	8.1
Diabetes mellitus	115	35.7
Hyperthyroidism	48	14.9
TB	8	2.5
Coronary Artery disease	25	7.8
Diabetes mellitus, Hypothyroidism	1	.3
Diabetes mellitus, Coronary Artery disease	1	.3
Diabetes mellitus, TB	1	.3
Hypothyroidism, COPD	1	.3
Diabetes mellitus, COPD	2	.6

Hypothyroidism, Coronary Artery disease	1	.3
Total	322	100.0

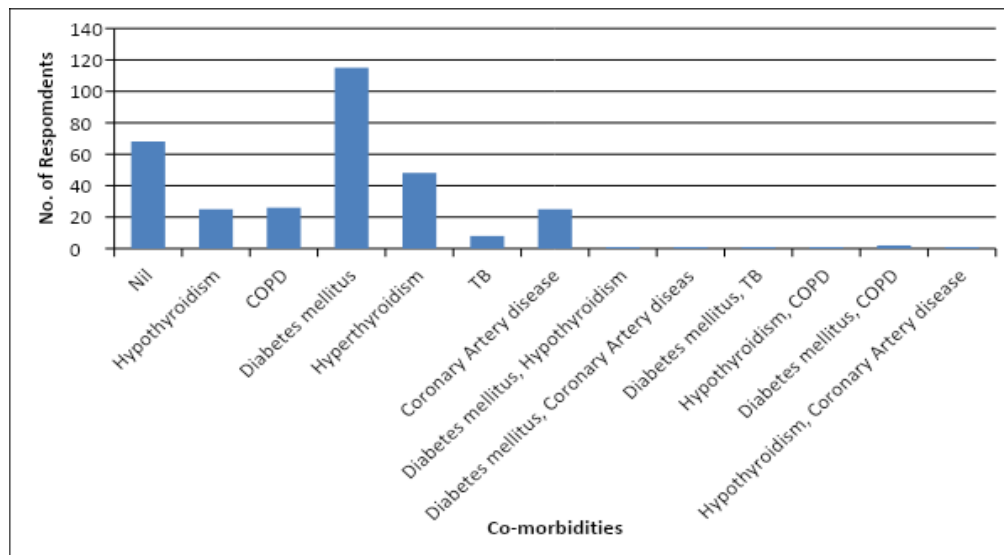


Figure 6: Co-Morbidities of the respondents of the study

To continue the study, the researcher listed out a wide variety of diseases which are likely to accompany with Hypertension. It can be seen from the Table (6) that Diabetes mellitus occurred most frequently at 35.7% (115) and it is followed by “no previous history” at 21.1% (68). Hypothyroidism, COPD and Coronary Artery diseases are less prominent with Hypertension, standing at 8% approximately. The other diseases such as Diabetes mellitus, Hypothyroidism, Diabetes mellitus, TB and Hypothyroidism, Coronary Artery have less chance to come with the original disease at very small portions (less than 1%).

Table 7: Anti-Hypertensive Class of the respondents of the study		
Anti-Hypertensive Class	Frequency	Percent
ACE inhibitors	100	31.1
Diuretics	50	15.5
Ca channel blockers (CCBs)	69	21.4
Combinations Therapy	18	5.6
ACE inhibitors	22	6.8
Beta blockers	44	13.7
Angiotensin Receptor Blockers	19	5.9
Total	322	100.0

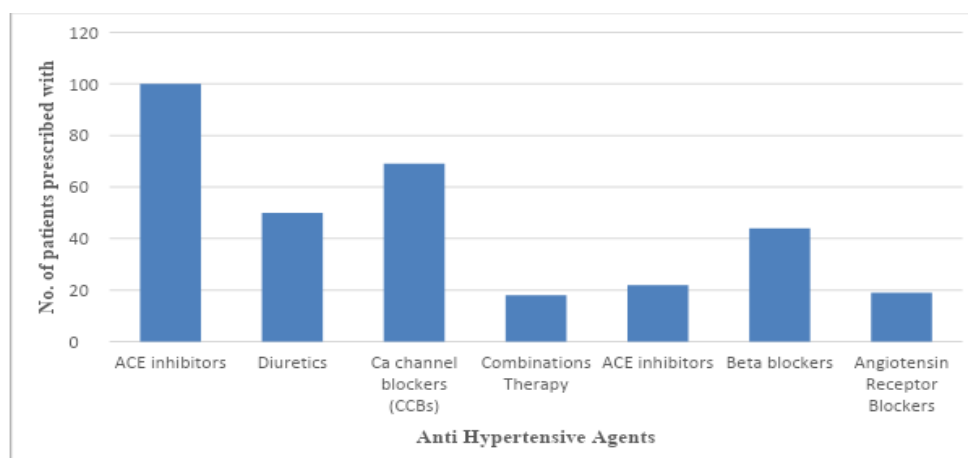


Figure 7: Anti-Hypertensive Class of the respondents of the study

The wide variety of first-line agents available for managing high blood pressure include Diuretics, Beta Adrenergic Receptor Blockers, Alpha Adrenergic Receptor Blockers, Angiotensin Converting Enzyme inhibitors, and Calcium Channel blockers. From the table, ACE inhibitor is the most common used for Hypertension treatment with 31.1% (100). Similarly, Ca channel blocker (CCBs) is also used frequently but in smaller level 21.4% (69). While Diuretics and Beta blockers are applied in quite equivalent frequencies at 15.5(50) and 13.7 (44) respectively, combinations Therapy, ACE inhibitors Angiotensin Receptor Blockers are three drugs less utilized for Hypertensive patients compared to others.

Table 8: Angiotensin Receptor Blockers used by respondents of the study		
Angiotensin Receptor Blockers	Frequency	Percent
Non	303	94.1
Telmisartan	12	3.7
Olmesartan	4	1.2
Losartan	3	.9
Total	322	100.0

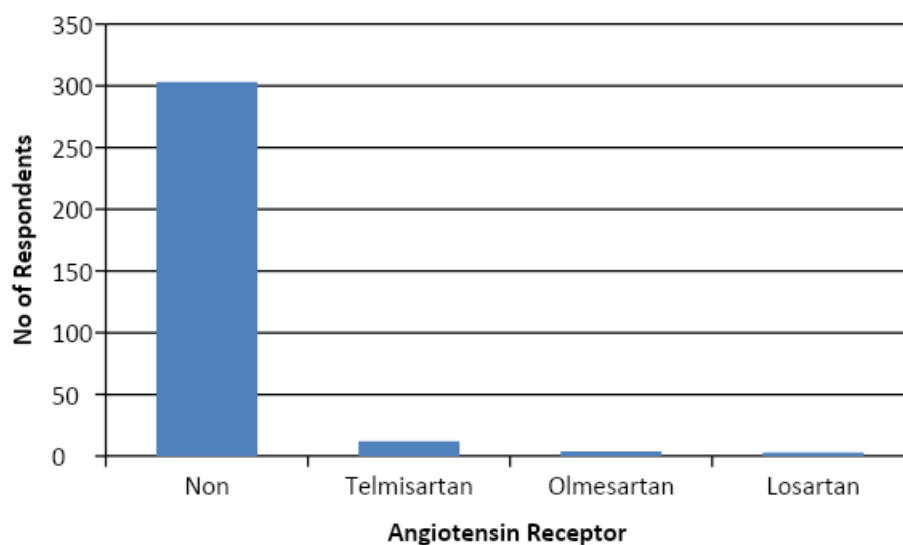


Figure 8: Angiotensin Receptor Blockers used by respondents of the study

As regards to Angiotensin_receptor_blockers, it is found under many brand names. However, as seen in Table (8) most of the respondents did not use blockers of any kind. The three names Telmisartan, Olmesartan and Losartan are less popular in the market and hence hardly used.

Table 9: ACE inhibitors used by the respondents of the study		
ACE inhibitors	Frequency	Percent
Non	200	62.1
Captopril	70	21.7
Enalapril	22	6.8
Ramipril	30	9.3
Total	322	100.0

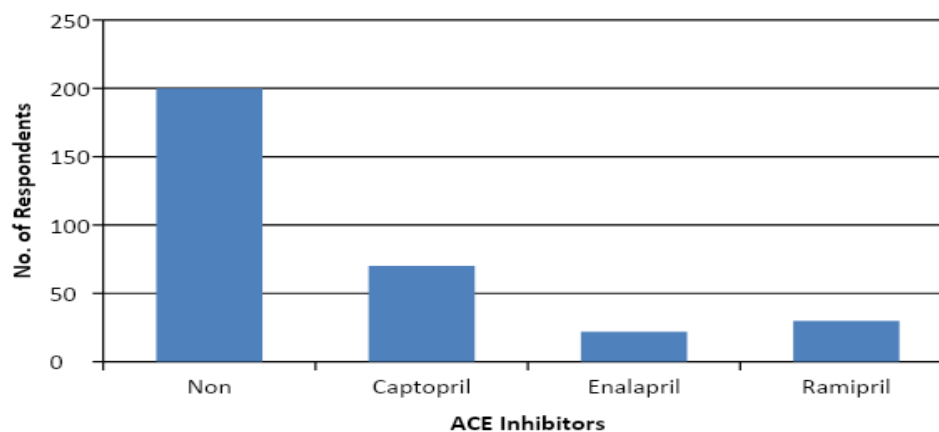


Figure 9: ACE inhibitors used by the respondents of the study

With regard to ACE_Inhibitors, 62% (200) a majority of the respondents did not use any kind of inhibitors. Sometimes people also use it under name Captopril 21% (70). Enalapril and Ramipril are not popularized in comparison with other names.

Table 10: Beta Blockers used by the respondents of the study		
Beta Blockers	Frequency	Percent
Non	278	86.3
Propranolol	9	2.8
Atenolol	35	10.9
Total	322	100.0

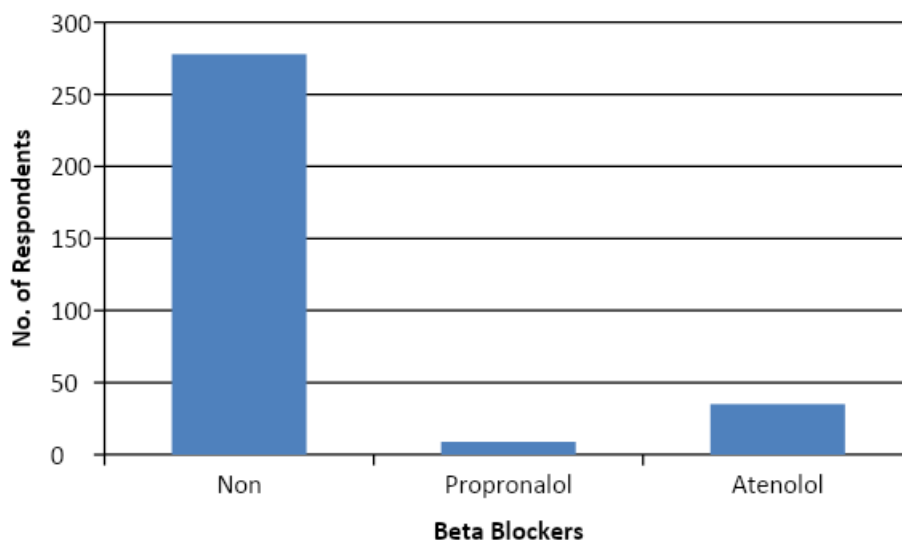


Figure 10: Beta Blockers used by the respondents of the study

When it comes to Beta blockers, most of the respondents 278 (86.3%) did not use any Beta Blocker. Atenolol and Propranolol used are not prominent. However, compared to Propranolol, Atenolol is still taken more regularly.

Table 11: Ca⁺ Channel_Blockers used by the respondents of the study		
Ca⁺ Channel_Blockers	Frequency	Percent
Non	253	78.6
Amlodipine	23	7.1
Nefidipine	46	14.3
Total	322	100.0

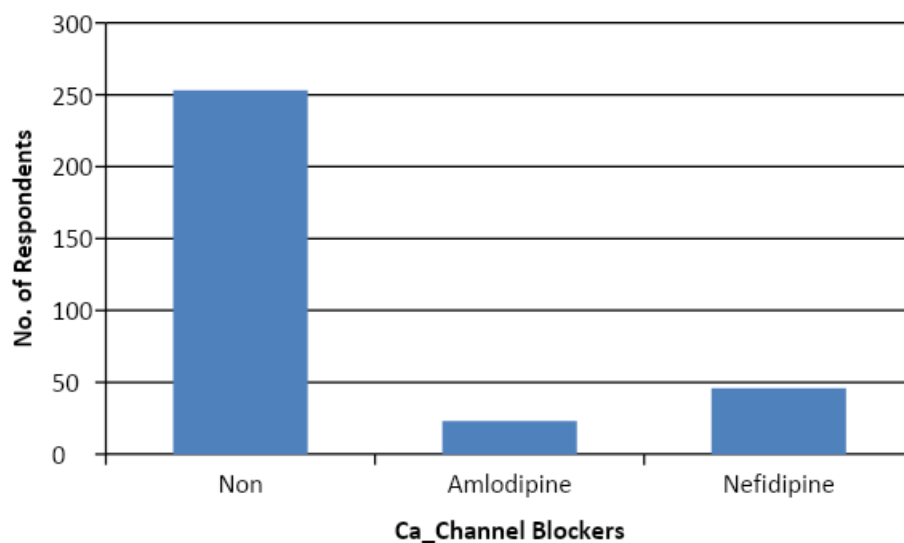


Figure 11: Ca_Channel_Blockers used by the respondents of the study

Regarding to **Ca⁺ Channel_Blockers**, most people 253(78.6%) did not use any of these blockers. Although Nefidipine and Amlodipine are less common, Nefidipine is more prominent than Amlodipine with the doubled percentage recorded.

Table 12: Diuretic used by the respondents of the study		
Diuretic	Frequency	Percent
Non	272	84.5
Hydrochlorothiazide	12	3.7
Furosemide	35	10.9
Mannitol	3	.9
Total	322	100.0

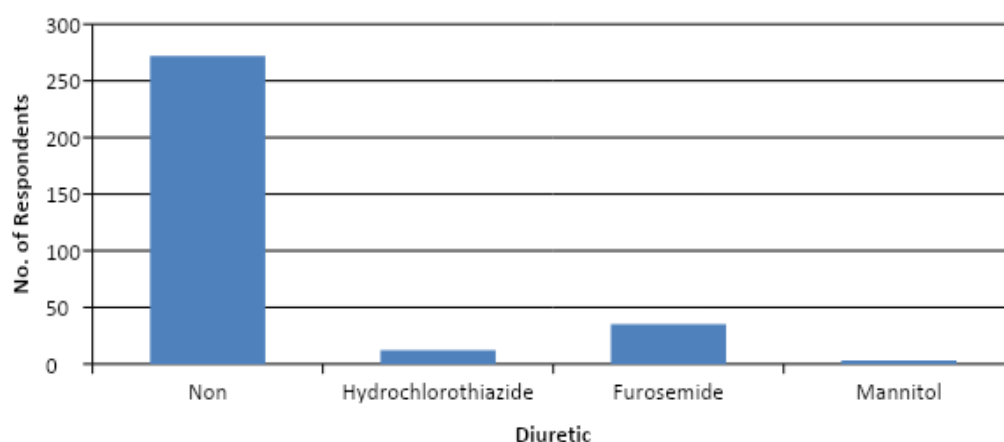


Figure 12: Diuretic used by the respondents of the study

Concerning about **Diuretic**, most respondents **84.6% (272)** did not use diuretic of any type. while Furosemide, Hydrochlorothiazide and Mannitol are less used in this field. It is also noted that Furosemide is still known with 10.9% meanwhile Mannitol is rarely utilized with less than 1%.

Table 13: Combination Therapy used by the respondents of the study		
Combination Therapy	Frequency	Percent
Non	304	94.4
CCB + B-Blockers	9	2.8
ACE + Diuretics	3	.9
CCB + Diuretics	6	1.9
Total	322	100.0

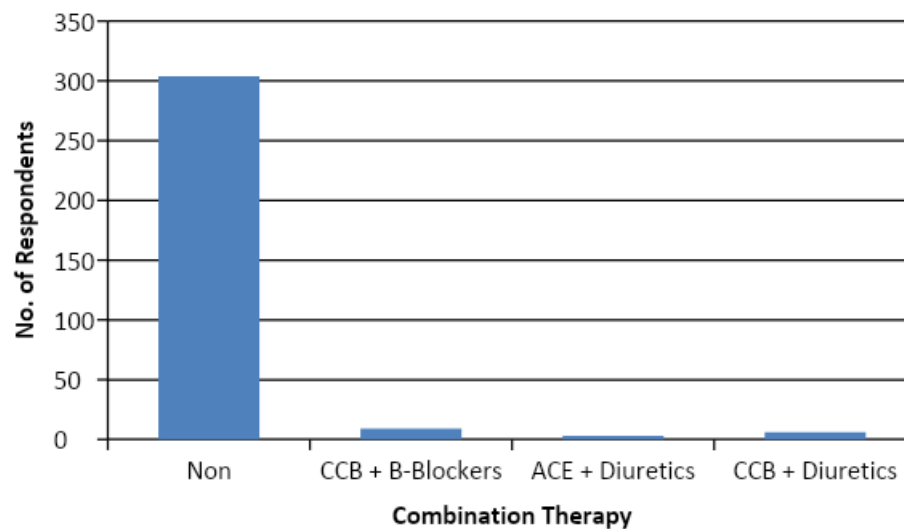


Figure 13: Combination Therapy used by the respondents of the study

In terms of combination therapy methods, most respondents (94.4%) did not use any combination of the blockers. Other methods like CCB + B-Blockers CCB + B-Blockers and CCB + Diuretics are less used.

Table 14: Blood Pressure of the respondents of the study		
Blood Pressure	Frequency	Percent
100/80	1	.3
110/70	1	.3
110/80	1	.3
120/70	2	.6
120/80	20	6.2
120/90	10	3.1
130/70	2	.6
130/80	15	4.7
130/90	39	12.1
130/100	4	1.2
140/80	4	1.2
140/90	96	29.8
140/100	20	6.2
140/110	5	1.6
150/80	1	.3
150/90	23	7.1
150/100	14	4.3
150/110	5	1.6
160/90	5	1.6
160/100	8	2.5
160/110	39	12.1
170/100	5	1.6
170/110	2	.6
Total	322	100.0

Ideal blood pressure is considered to be between 90/60mmHg and 120/80mmHg. **high blood pressure** is considered to be 140/90 mmHg or higher. low blood pressure is considered to be 90/60mmHg or lower.

As can be seen from the above Table (14) majority of the respondents had high blood pressure ranging from 120/90 to 17/110. Only in 1% of the respondents the blood pressure was to be normal.

Table 15: Pulse Rate of the respondents of the study		
Pulse Rate	Frequency	Percent
<70	3	.9
70-80	58	18.0
80-90	60	18.6
90-100	183	56.8
100-110	2	.6
110-120	3	.9
>120	13	4.0
Total	322	100.0

A **normal** resting heart **rate** for adult's **ranges** from 60 to 100 beats per minute. Generally, a lower heart **rate** at rest implies more efficient heart function and better cardiovascular fitness. As seen from the above Table (15) more than 90% of the respondents had a normal heart rate.

Table 16: Body Temperature of the respondents of the study		
Temperature	Frequency	Percent
31	1	.3
33	1	.3
36	10	3.1
37	240	74.5
38	43	13.4
39	21	6.5
40	3	.9
41	2	.6
42	1	.3
Total	322	100.0

Normal body temperatures vary depending on many factors, including a person's age, sex, and activity levels. The normal body temperature for an adult is around 98.6°F (37°C), but every person's baseline body temperature is slightly different, and may consistently be a little higher or lower. As seen from the above Table (16) majority of the respondents had a normal temperature. However, 13.4% had fever, 6.5% high fever and 1.8% very high fever.

Table 17: JNC7 of the respondents of the stud		
JNC7	Frequency	Percent
Stage 1(140-159/90-99)	166	51.6
Pre-Hypertension(120-139/80-89)	96	29.8
Stage 2(>160/>100)	60	18.6
Total	322	100.0

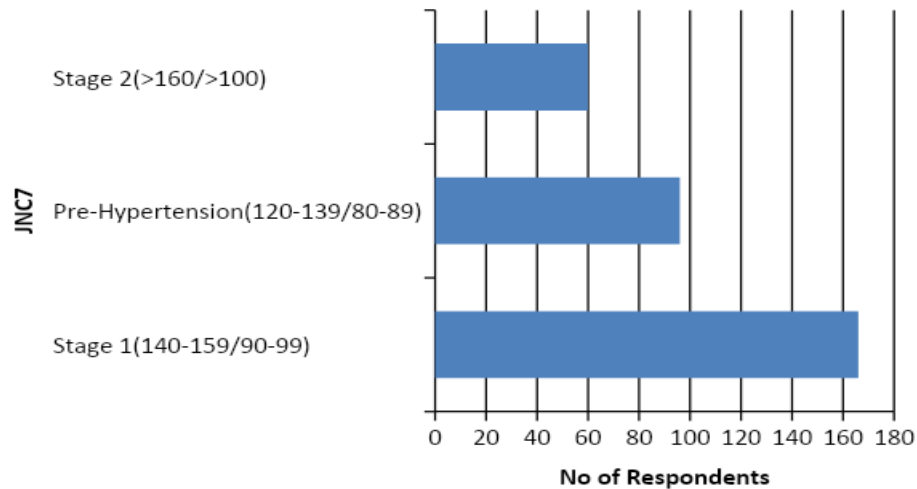


Figure 14: JNC7 of the respondents of the study

JNC 7 suggests that all people with **hypertension** (stages 1 and 2) be treated. The treatment goal for individuals with **hypertension** and no other compelling conditions is <140/90 mmHg. According to the table (17), most of patients are in stage of level 1 with 51.6% and Stage 2 is 18.6% and pre-hypertension is 29.8%

Table 18: Cost of Drug used by the respondents of the study		
Cost of Drug	Frequency	Percent
Rs.0-Rs.50	273	84.8
Rs.51-Rs.100	32	9.9
Rs.101-Rs.150	17	5.3
Total	322	100.0

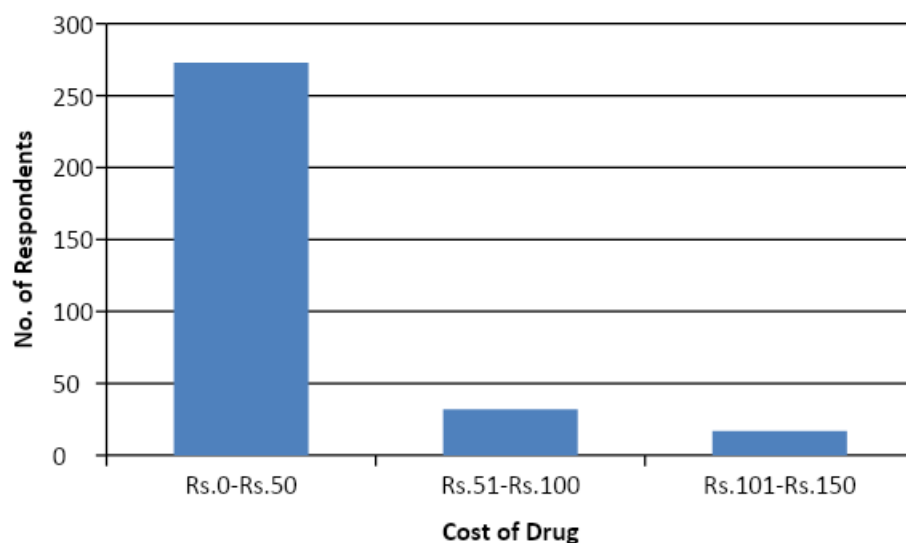


Figure 15: Cost of Drug used by the respondents of the study

While **diuretics** cost between 6 cents and 10 cents a day, it **costs** about \$1.60 daily for a beta-blocker (another drug used to treat high blood pressure) and \$1.46 for an ACE inhibitor. As can be seen from the above table (18) majority of the respondents of the study were on low cost diuretics which costed less than Rs.50 About 5.3% of the respondents were on beta blockers whose cost ranged from Rs.101 to Rs.150 . 9.9% were on ACE inhibitor which were priced in between Rs.51 to Rs.100

Discussion:

The study result reveals that the rate of hypertension in male patients 200(62.1%) was higher than that of female population 122(37.9%) [Table No.1]. This is inline by similar study conducted by Vikas Pandey et al (2014) [1] which also reported the proportion of males was on the higher side as compared with females.

The age categorization of the patients was analyzed. Majority of the patients were in the age group of 40-70 years of age 252 (78.3%). [Table No:2]. A similar study conducted by Popuri Rupa Sindhu et al (2013) [2] also reported that prevalence rates of hypertension among the people above 50 years of age were high. It was seen that Male GM and Female GM are the most commonly used units with 45.3% (146) and 26.4% (85) respectively as seen in [Table No.3]. By agreement, male surgery and female surgery are less popular with 0.6%(2) and 1.9% (6) accordingly. While the number of special ward is 15.8% (51), the third level in the given data, the figure for ICU is 9.9% (32).

In all ten health problems was studied. Table No. 4 shows that, **hypertension is prominent amongst other diseases with 38.8%(125)**. It is followed by *T2DM, HTN and General problem* with 11.5%(37), and 9.6% (31) respectively. The other diseases such as COPD, Hypothyroidism, and Hyperthyroidism are less found in these respondents.

The social history of the respondents of study revealed that most of the respondents 91%(293) were Non-vegetarians, 47.2%(152) were habituated to smoking and 33.2% (107) consumed alcohol as was seen in Table No. 5. A similar study conducted by Arshad H Mohad et al (2012) [3] reported that the prevalence of hypertension risk factors in the general population in which smoking were observed. The co-morbidity of the hypertensive patients was analysed. The study reveals that majority of the study population were suffering from diabetes mellitus 115(35.7%) [Table No: 6]. A similar study conducted by Giri D Rajasekhar et al (2015) [4] also reported that most common comorbid condition among hypertensive population was diabetes mellitus. This report correlates with the current study result. In this present study, ACE inhibitors 100(31.1%), Calcium channel blocker 69 (21.4%) and Beta Blockers 44 (13.7%) were the most commonly prescribed antihypertensive agents [Table No: 7]. A similar study done by Rachana PR et al (2014) [5] reported calcium channel blocker (41.97%) were most frequently used class of antihypertensive drugs. Angiotensin_receptor_blockers is found under many brand names. However, as seen in Table No. [8] most of the respondents did not use blockers of any kind. The three names Telmisartan, Olmesartan and Losartan are less popular in the market and hence hardly used. With regard to ACE_Inhibitors, 62% (200) a majority of the respondents did not use any kind of inhibitors. Sometimes people also use it under name Captopril 21% (70) as seen in Table No. [9]. Enalapril and Ramipril are not popularized in comparison with other names. Most of the respondents 278 (86.3%) did not use any Beta Blocker. Atenolol and Propranolol used are not prominent. However, compared to Propranolol, Atenolol is still taken more regularly Table No. [10]. **Ca_Channel_Blockers** was not used by most people 253(78.6%) as seen in Table No. [11]. Although Nefidipine and Amlodipine are less common, Nefidipine is more prominent than Amlodipine with the doubled percentage recorded. Most respondents **84.6% (272)** did not use **Diuretic** of any type Table No. [12]. Furosemide, Hydrochlorothiazide and Mannitol are less used in this field. It is also noted that Furosemide is still known with 10.9% meanwhile Mannitol is rarely utilized with less than

1%. Combination therapy methods was not used by most respondents (94.4%) Table No. [13]. Combinations like CCB + B-Blockers CCB + B-Blockers and CCB + Diuretics were rarely used.

As seen from Table No. [14] majority of the respondents had high blood pressure ranging from 120/90 to 17/110. Only in 1% of the respondents the blood pressure was to be normal. But the heart rate was normal in most patients 90% as can be seen from Table No. [15]. Table No. [16] shows that majority of the respondents had a normal temperature. However, 13.4% had fever, 6.5% high fever and 1.8% very high fever.

The categorization of patients depending on the JNC 7 classification revealed that more number of patients 166 (51.6%) were in Stage 1 hypertension [Table No: 17]. A similar study conducted by Manasa Cidda et al (2014) [6] revealed that most of the patients were under the category of stage 1 hypertension 204(56.7%).

As seen from the Table N0. [18] majority of the respondents of the study were on low cost diuretics which costed less than Rs.50 About 5.3% of the respondents were on beta blockers whose cost ranged from Rs.101 to Rs.150 . 9.9% were on ACE inhibitors which were priced in between Rs.51 to Rs.100.

Conclusion:

Through the current study, the drug utilization pattern of antihypertensive in general medicine department could be assessed. This study has provided an insight into the prescription patterns of antihypertensive medications with respect to various co-morbidities control. It will help prescribers to pay more attention for specific factors that affect outcome of various co-morbidities. Studies from every now and then are required in drug utilization pattern and standard treatment guidelines to be circulated among prescribing clinicians. There is need of creating awareness about current management of hypertension to clinicians by organizing various workshops. Therefore, educational strategies must be carried out to focus on utilization of antihypertensive medications and overcoming individual risk factor. Also raising patient trust in the physicians, the physicians may improve patient motivation to take prescribed medication.

The trend of hypertension is on the rise, if treated rationally this disease can be overcome. Patients too need to express their interest to know more about the drugs they have been prescribed, and this can promote a safe knowledge on their illness and special care, which would improve their quality of life.

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