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Prescribing Pattern of Anti-Hypertensive Drugs and Adherence to JNC VII Guideline †

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Abstract: Introduction: Hypertension is an important public health concern because of its associated morbidity, mortality and economic impact on the society. It is a significant risk factor for cardiovascular, cerebrovascular and renal complications. A number of national and international guidelines for the management of hypertension have been published. The Joint National Committee (JNC) in 2003 published a series of guidelines recommend the appropriate antihypertensive therapy based on the best available evidence. **Objectives:** This drug utilization study was intended to find out the preferred drug group prescribed either alone or in combinations and their adherence to the JNC7 guidelines. **Methods and Material**: It was the prospective cross-sectional study. Drug utilization data of 100 hypertensive patients, carried out in hospitals in Nepal. The patients who received antihypertensive drugs during their treatment period were reviewed and data were analyzed in SPSS V16. The prescribed drugs were compared with JNC VII guidelines. **Results:** It shows that, 40% patients were males & 60% were females. Most of female hypertensive patients (45.0%) were in the age group of > 60 years & most of male hypertensive patients (45.0%) were in the age group of 40 - 60 years. It was found that 45% of the patients were found with Stage 1 Hypertension, 32% of the patients were with Pre-hypertension stage, 17% of the patient with Stage 2 hypertension and the Normal stage was found to be 6%. The most frequently prescribed antihypertensive drugs groups were ARB (32.44%), ARB+ Thiazide (15.94%), Diuretics (11.59%), CCBs + Beta blockers (9.42%), CCB (8.7%). 39% received monotherapy while remaining 61% received combination therapy. 74% of the total prescription follows JNC VII guidelines. **Conclusion:** There is need of following such authentic guidelines in managing hypertension like chronic disease since these guidelines are based on various clinical trials and successful attainment of target BP in patients will be much easier by implementing them. National health policy makers should consider evaluation and treatment of hypertension as a right in public health system for better outcomes in terms of morbidity and mortality from hypertension.

Keywords: HTN; JNC VIIth Guidelines; anti-hypertensive; drug utilization; ARBs

1. Introduction

Hypertension (HTN) is the commonest cardiovascular disorder and now regarded as major public health problem [1]. HTN is not a disease itself, but it is an important risk factor for cardiovascular mortality and morbidity. HTN remains one of the most important preventable contributors to disease and death [2]. HTN is the single most important cause of referable mortality. It is a key contributory factor in the development of cardiovascular and cerebrovascular disease, and

a major cause of stroke, myocardial infarction, heart failure and kidney disease etc. It leads to death if not detected early and treated appropriately.

Antihypertensive drug therapy has been remarkably improved in the last 56 years. The first Antihypertensive agent which was developed in 1958 as Chlorothiazide, the first thiazide diuretic used in treatment of HTN which is developed from antibiotics sulfanilamide. After the grand success of the Chlorothiazide on treatment of HTN sooner more agents were developed such as beta blockers, calcium channel blockers, angiotensin converting enzyme, angiotensin receptor blockers, and renin inhibitors [3,4]. Due to the increase in number of drugs for the treatment of HTN, different complication and problem has been arising.

To counter back the problem 39 major professional, public, and voluntary organizations and 7 Federal agencies formed a committee which was known as Joint National Committee [5].

1.1. The Key Messages of JNC VII Report:

In persons older than 50 years, systolic blood pressure greater than 140 mmHg is risk factor than diastolic blood pressure. Cardiovascular disease (CVD) risk doubles for each increment of 20/10 mm Hg. Those who are normotensive at 55 years of age will have a 90% lifetime risk of developing hypertension. Pre-hypertensive the systolic BP 120–139 mm Hg or diastolic BP 80–89 mm Hg require lifestyle modifications to prevent the progressive rise in blood pressure and CVD. Hypertension will be controlled only if patients are motivated to stay on their treatment plan. According to JNC VII guidelines the Blood Pressure are classified as below Blood Pressure Classification [5].

In the JNC VII guidelines, Blood Pressure Classification are simplified and reduced to 4 categories. then that of 7 categories defined by JNC VI as in which is given below.

Table 1. Changes in blood pressure classification.

S No.	JNC VII Category	SBP / DBP
1	Normal	<120 / 80
2	Pre hypertension	120 - 139 / 80 - 89
3	Hypertension Stage 1	140 – 159 / 90 – 99
4	Hypertension Stage 2	≥ 160 / ≥ 100

2. Methodology

Study site:

The study was carried out in Lalitpur Heart clinic, Jawalakhel Nepal Heart Care Centre, Jhamsikhel and Kritipur Community Health Centre (Janapoly clinic), Kritipur and Grande Int'l Hospital, Dhapasi. This site was selected since the clinics were specific for cardiac disease and patients can be easily available for our research.

Study period:

Data collection was carried out for 2 months June – July 2014.

Study design:

Prospective, cross-sectional

Study population:

The patients who visited in heart care center and hospital of Kathmandu valley for the treatment of hypertension.

Inclusion criteria:

- The patients who visited in the center and diagnosed with Hypertension and taking antihypertensive medicines.
- Hypertensive patients who agree to share their information and responded to the questionnaire.

Exclusion criteria:

- The patients who visited in the center and diagnosed no hypertension.

Sample size:

The sample sizes were 100, Lalitpur Heart clinic – 26, Nepal Heart Care Centre – 23, Janapoly clinic – 37, and Grande Int'l Hospital – 14.

Data collection tools and techniques:

The data collection form was approved by the supervisor. Data collection forms were filled from the selected sample. Required information was noted from the prescription of the patients in Such as: Name of the patients, age, gender, address, blood pressure, weight of the patient, prescriber name, prescriber office, main drugs used in treatment of hypertension, associated disease and medication for associated disease.

Statistical tools:

All the data collected from different center was coded as per variables and data entry was done in SPSS data sheet and analyzed by the help of statistical software SPSS 16. The analyzed data was expressed in percentage.

3. Result

It shows that, 40 patients (40%) involved were males & 60 (60%) were females indicating 20% higher prevalence of hypertension in female population.

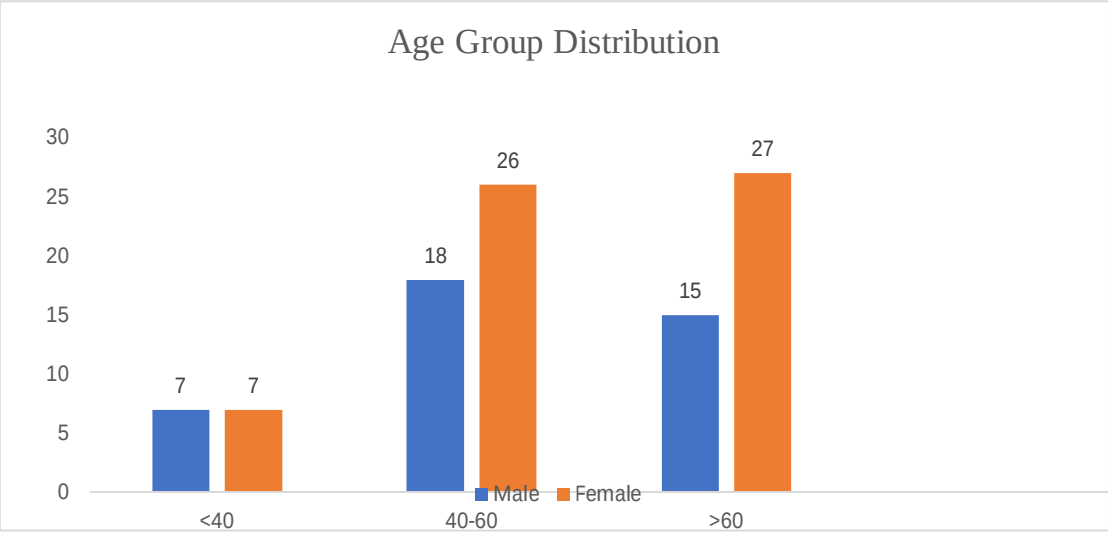

Figure 1. Age Group Distribution of Patients.

From figure 1 it shows that most of female hypertensive patients (45.0%) were in the age group of > 60 years & most of male hypertensive patients (45.0%) were in the age group of 40 - 60 years indicating an earlier onset of hypertension in male population in our study group. The female and male hypertensive patient in age group <40 years were 11.7% and 17.5% respectively which is found less percentage than compare to other age group.

Table 2. Stages of Hypertension.

S. N	Stages of Hypertension	Prevalence (%)
1.	Pre-Hypertension	32
2.	Stage 1 Hypertension	45
3.	Stage 2 Hypertension	17
4.	Normal	6

Table 2 shows the prevalence of stage1 hypertension over other stages of hypertension is higher. Among 100 patients 45% of the patients were found with Stage 1 Hypertension, 32% of the patients were with Pre-hypertension stage, 17% of the patient with Stage 2 hypertension and the Normal stage was found 6%.

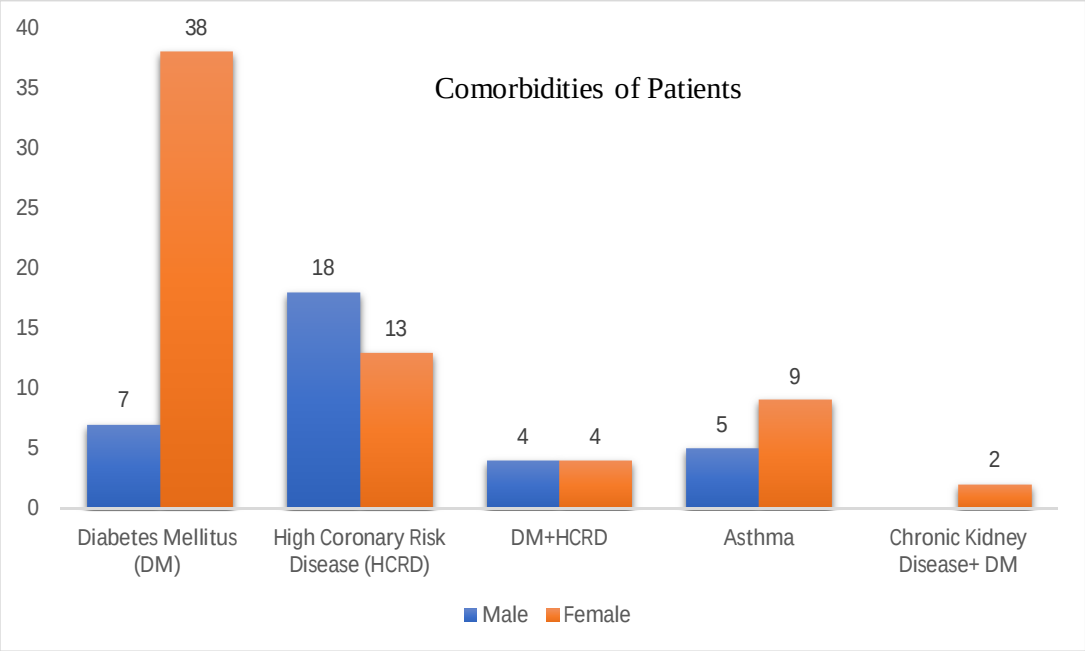

Figure 2. Comorbidities of The Patients.

In figure 2 it shows that male and female patients were found 38% and 7% respectively with diabetes mellitus where High coronary risk diseases were found 13% in female and 18% in male. Similarly, asthma was found 5% in male patients and 9% in female patients. The patient with Diabetes Mellitus with High coronary risk disease were found 4% in both male and female patient and Diabetes Mellitus with Chronic Kidney Disease were found 2 % in female patient.

Table 3. Percentage of Administration of Antihypertensive Drugs.

S. N	Antihypertensive Medicine	Main Medicine Prescribed (%)
1.	Thiazide diuretics	6.52
2.	Angiotensin Coverting Enzyme Inhibitors (ACE)	6.52
3.	Angiontensin Receptors Blockers (ARB)	30.44
4.	Calcium Channel Blockers (CCB)	12.32
5.	Beta Blockers	8.7
6.	ARB+Thiazide	15.95
7.	ARB+CCB	3.62
8.	CCB+ Beta Blockers	9.42
9.	Alpha Blockers	0.72
10.	High Ceiling Diuretics	3.62

11.	Beta Blockers + Thiazide	0.72
12.	High Ceiling + Potassium Spairing	1.45

Table 3 shows that angiotensin receptor blockers were the most commonly prescribed group of antihypertensive drugs in 30.44% patients, followed by ARB + Thiazide in 15.95%, CCB in 12.32%, CCB + beta blockers in 9.42%, beta blockers in 8.7%, Thiazide diuretics and ACE inhibitors in 6.52% respectively, ARB + CCB in 3.62%, Diuretics in combination form in 1.45%, alpha blocker and beta blocker + Thiazide in 0.72% patients respectively.

Table 4. Percentage of Administration of Antihypertensive Drugs in Normal Stage.

S. N	Antihypertensive Medicine	Main Medicine Prescribed (%)
1.	Angiontensin Receptors Blockers (ARB)	42.84
2.	Calcium Channel Blockers (CCB)	14.29
3.	Beta Blockers	14.29
4.	ARB+Thiazide	14.29
6.	High Ceiling + Potassium Sparing	14.29

Table 4 shows that ARB was the most commonly prescribed group of antihypertensive drugs in 42.84% patients in order of physician's prescription, followed by CCB, Beta blocker, Diuretics in combination form and ARB+Thiazide group in 14.29% respectively in Normal Stage.

Table 5. Percentage of Administration of Antihypertensive Drugs in Prehypertension Stage.

S. N	Antihypertensive Medicine	Medicine Prescribed (%)
1.	Thiazide diuretics	15.39
2.	Angiotensin Coverting Enzyme Inhibitors (ACE)	15.39
3.	Angiontensin Receptors Blockers (ARB)	28.21
4.	Calcium Channel Blockers (CCB)	20.51
5.	Beta Blockers	5.13
6.	ARB+Thiazide	7.69
7.	ARB+CCB	2.56
8.	CCB+ Beta Blockers	2.56
9.	High Ceiling + Potassium Spairing	2.56

Table 5 shows that angiotensin receptor blockers were the most commonly prescribed group of antihypertensive drugs in 28.21% patients, followed by calcium channel blockers in 20.51%, Thiazide Diuretics and ACE Inhibitors in 15.39% respectively, ARB + Thiazide in 7.69%, beta blockers in 5.13% &others are 2.56% respectively in Prehypertension Stage.

Table 6. Percentage of Administration of Antihypertensive Drugs in Stage 1 Hypertension.

S. N	Antihypertensive Medicine	Main Medicine Prescribed (%)
1.	Thiazide diuretics	3.13
2.	Angiotensin Coverting Enzyme Inhibitors (ACE)	4.69
3.	Angiontensin Receptors Blockers (ARB)	28.12
4.	Calcium Channel Blockers (CCB)	7.81
5.	Beta Blockers	10.94
6.	ARB+Thiazide	18.75
7.	ARB+CCB	13.13
8.	CCB+ Beta Blockers	18.75
9.	Alpha Blockers	1.56
10.	High Ceiling Diuretics	1.56
11.	Beta Blockers + Thiazide	1.56

Table 6 shows that angiotensin receptor blockers were the most commonly prescribed group of antihypertensive drugs in 28.12% patients, followed by ARB + Thiazide and CCB + Beta Blocker in 18.75% patients respectively, Beta blockers in 10.94% & calcium channel blockers in 7.81% patients in Stage 1 Hypertension. Out of diuretics, Thiazides group was the most commonly used 3.13%.

The percentage of most common single drugs prescribed drugs in stage 1 HTN was ARB 28.12% which is followed by Betablocker 10.94% in our study which is less than that reported in studied conducted in Bangalore in which ARBs (62%) and beta blocker (15%).

Table 7. Percentage of Administration of Antihypertensive Drugs in Stage 2 Hypertension.

S. N	Antihypertensive Medicine	Medicine Prescribed (%)
1.	Thiazide diuretics	4
3.	Angiontensin Receptors Blockers (ARB)	40
4.	Calcium Channel Blockers (CCB)	12
5.	Beta Blockers	8
6.	ARB+Thiazide	24
7.	ARB+CCB	8
9.	High Ceiling	4

Table 7 shows that angiotensin receptor blockers were the most commonly prescribed group of antihypertensive drugs in 40.0% patients, followed by ARB + Thiazide in 24.0%, calcium channel blockers in 12.0%, beta blockers and ARB + CCB in 8.0% respectively and Thiazide diuretics and high ceiling diuretics in 4% patients respectively in Stage 2 hypertension.

The percentage of most common single drugs prescribed drugs in stage 2 HTN was ARB 40% which is followed by CCB 12% in our study which is less than that reported in studied conducted in Bangalore in which ARBs (62%) and CCBs (34.5%). But both Indian and our study had common group which was prescribed most frequently.

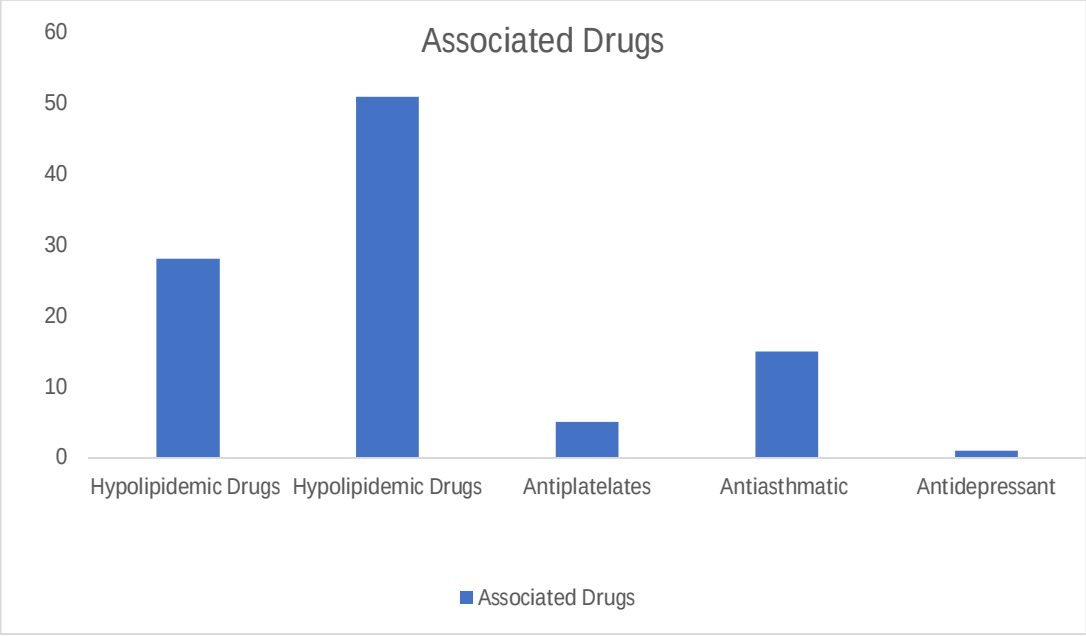

Figure 3. Associated Drugs in Hypertension.

Figure 3 shows that hypertensive patient with Diabetes Mellitus as an associated disease were maximum in number so that hypoglycemic drug was prescribed for 51 patients, similarly hypolipidemic drug in 28 to treat High coronary risk disease, Anti-Asthmatic Drugs in 15 patients

for the treatment of asthma, whereas Antiplatelets and anti-depressant drugs were prescribed in less number i.e. 5 and 1 respectively.

Table 8. Number of drugs prescribed.

S. N	Number of Drugs Prescribed	Prescription Percent (%)
1	One drugs	39
2	Two drugs	48
3	Three drugs	12
4	Four or more drugs	1.0

The pattern of number of drugs prescribed is as shown in table 8 which shows that 39.0% patients received monotherapy and rest 61.0% combination therapy. 48.0% of total patients received two drugs, 12.0 % three drugs & 1.0 % received four or more drugs.

In our study the percentage of two drugs prescribed was found 48% which is more than that the studied conducted in North India (37%) and study conducted in Bangalore. The combination therapy in our study as well as in Indian study was greater than that of monotherapy.

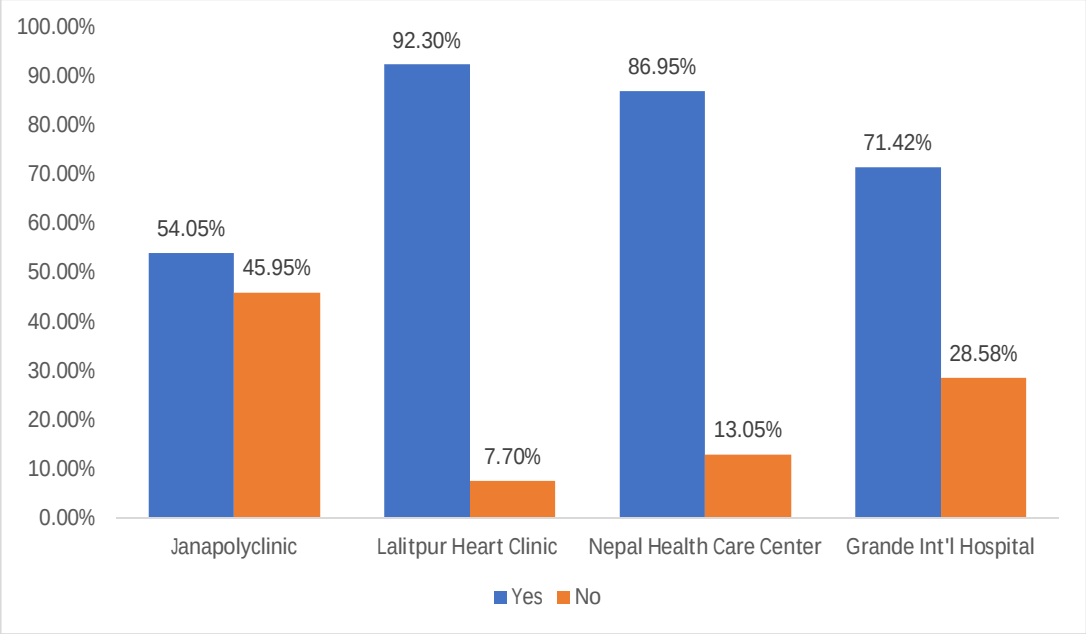

Figure 4. Comply with JNC VII Guidelines.

All the prescription collected from different Heart care Center of the Kathmandu valley were analyzed according to JNC VII guidelines. The figure 4, shows that Lalitpur Heart Clinic, Nepal heart Care Center, Grande Int'l Hospital and Janapoly clinic's prescription followed JNC VII guidelines by 92.3%, 86.95%, 71.42% and 54.05% respectively whereas greater percentage of prescriptions which does not comply with JNC VII guidelines fall on the name of Janapoly clinic's prescription i.e. 45.95% and so on Grande Int'l Hospital, Nepal heart Care Center and Lalitpur Heart Clinic whose percentage were 28.58%, 13.05% and 7.7% respectively.

While doing the cost analysis it shows that most of the patients charge below 1500 rupees per month for treatment of hypertension with associated drugs, only the four-case number 60, 63, 40, and 1 paid more than Rs. 1500 /- per month. Out of which 25% of patients charge below 500 rupee per month for their treatment and next 50% patients charge below 1000 rupees per month for their treatment that means remaining 25% of the patient charge below 1500 rupees per month. Whereas the patients without Comorbidities charge below rupees 600 per month only one case i.e. case number 27 charge more than 600 rupees per month for the treatment of hypertension.

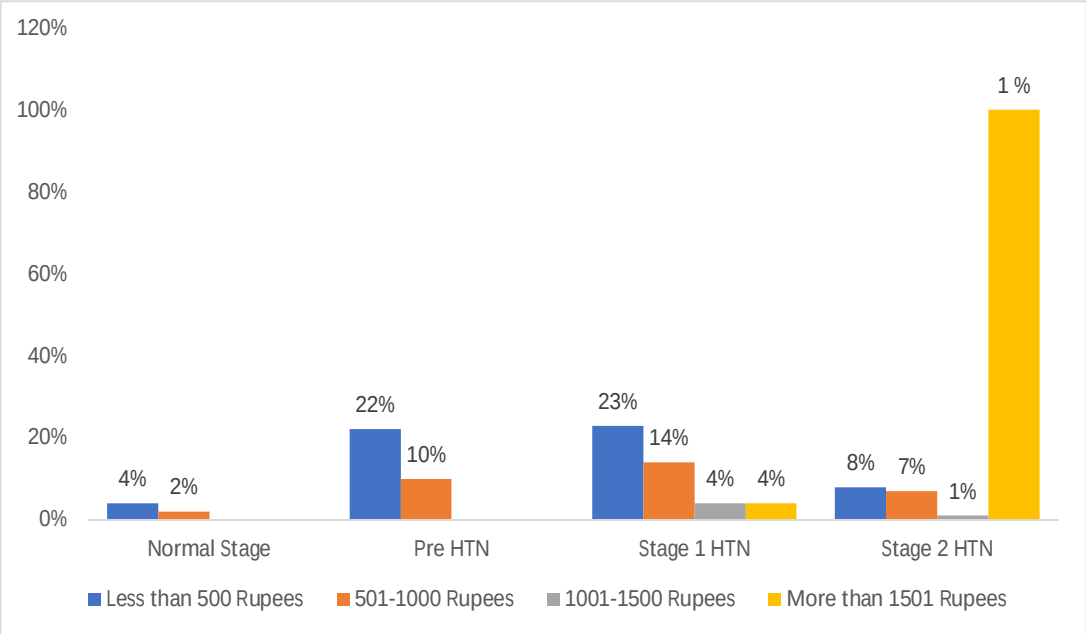

Figure 5. Stage-wise Total Cost analysis of the drugs.

The patients were divided in different category according to their blood pressure and cost of the total drugs which they used during their treatment was analyzed in monthly basis. Our data in figure 5 shows that the 4% normal stage patients charge below 500 where 2% charge 501 to 1000 rupee per month for their treatment, in Pre-hypertensive stage 22% patients charge below 500 and 10% charge 501 to 1000 rupees per month for their treatment, but in both stage 1 hypertension and stage 2 hypertension, maximum patients charge below 500 rupees where there is similar percent of patient who charges 1001 to 1500 rupees and more than 1501rupees.

4. Discussion

Main aim of antihypertensive therapy is to prevent hypertension related morbidity, mortality and complications [6]. As antihypertensive prescription is required lifelong, therefore the side effects, quality of life and cost of drugs are also important aspects. Keeping all factors in mind various prescribing guidelines have been formulated. Guidelines for the treatment can be monitored by several methods. A drug utilization study is also the one of method [6].

Our study group shows higher prevalence of hypertension in elderly patients (i.e. > 40 years). However, most females showed an earlier onset of hypertension than males i.e. 20% more than the male.

Data also revealed that female patient are greater in percentage then male patient who has hypertension along with diabetes mellitus and HTN with asthma, but the percentage of male patient in high coronary risk disease is higher than the female patients. In hypertension along with its Comorbidities the most frequently prescribed group of drugs are ARB. The associated drugs which were mostly prescribed in Comorbidities were hypoglycemic drug because numbers of patient with DM were greater in number. Similarly, hypolipidaemic drug, Anti-Asthmatic Drugs, antiplatelet and anti-depressant drugs were also prescribed for the patient [7].

The hypertension is categorized in different category as given by the JNC VII guidelines and the data were analyzed the result shows that patients with stage 1 hypertension observed in greater number 45%, which is followed by prehypertension 32%, stage 2 hypertension 17% and normal stage by 6% [8].

This study also shows that JNC VII guidelines have been followed in 74% of the study group. ARB are most frequently prescribed drugs alone or in combination with other drugs. In all stage of hypertension, the most frequently prescribed group of drugs were ARB, in prehypertension ARB were followed by CCB, Thiazide, ACE Inhibitor and beta blocker. In stage 1 hypertension also, ARB

was followed by ARB + Thiazide and CCB + Beta blocker. In stage 2 also ARB was highly prescribed which was followed ARB + Thiazide, CCB and beta blocker. More than half i.e. 61% of the total patients in this study received two or more antihypertensive drugs [9-11].

After analyzing all the prescription collected from different Heart care Center of the Kathmandu valley, we found most of the institute follow the VIIth report of Joint National Committee, in general our data shows that 74% of the prescription follow the JNC Guidelines where 26% of the total prescription doesn't follow the JNC VII guidelines [12,13].

Cost analysis shows that 57% patients charge rupees below 500 per month for their treatment. About 33% of total patients charge Rupees 501 to 1000 per month, whereas patients who charge rupees 1001 to 1500 and above rupees 1500 were 5% [14].

5. Conclusion

As we analyzed 100 prescriptions, the results of the current study were partly accordance to the JNC VII guidelines. However, the limitations of this study are single centered and of small sample size. Main limitation of our drug utilization studies is the lack of detailed patient records, lack of information of previously using medication for justifying the prescribed drugs were either based on stage of hypertension or not. Due to lack of previous drug therapy we had consider the many patients as new case in our study. Hence larger extended studies are required to draw noticeable inferences.

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