



Received on 11 August, 2015; received in revised form, 23 November, 2015; accepted, 16 January, 2016; published 01 February, 2016

## DRUG UTILIZATION EVALUATION OF ANTI-HYPERTENSIVE AGENTS IN A MEDICAL CARE HOSPITAL

Zahra Eslampanah

Department of Pharmacy Practice, The Oxford College of Pharmacy, Rajiv Gandhi University of Health Science, Bangalore, Karnataka, India.

### Keywords:

Anti-Hypertensive, Utilization, Evaluation, Furosemide, Single Drug Therapy, Multiple Drug Therapy

### Correspondence to Author:

**Zahra Eslampanah**

Department of Pharmacy Practice, The Oxford College of Pharmacy, Rajiv Gandhi University of Health Science, Bangalore, Karnataka, India.

**E-mail:** eslampanah\_zahra@yahoo.com

**ABSTRACT:** Blood Pressure (BP) is defined as the product of the cardiac output (CO) and Total Peripheral Resistance (TPR). Hypertension is defined by persistent elevation of arterial blood pressure. Any drug that is indicated for decreasing/normalizing the elevated blood pressure is considered as an Anti-Hypertensive drug. **Objective:** To assess the utilization pattern of anti-hypertensive agents in the General Medicine department of The Oxford Medical College, Hospital and Research Center, Bangalore. **Methodology:** The study was Simple Prospective Observational study which was carried out for a period of six months. **Results:** In the study period, 200 hypertensive cases were collected. Of these, 134 (67%) were males and 66 (33%) were females who underwent anti-hypertensive therapy. Among the various anti-hypertensive drugs, only 6 major classes were used in the study sample. They were Diuretics (Ds), Calcium Channel Blockers (CCBs), Angiotensin Receptor Blockers (ARBs), Beta Adrenergic Blockers (BABs), Alpha Adrenergic Blockers (AABs) and Angiotensin Converting Enzyme Inhibitors (ACEIs). Diuretics were used the highest in 112 (40.14%) prescriptions and AABs in 7 (2.50%) prescriptions being the least. **Conclusion:** Among diuretics, Furosemide was the most frequently utilized anti-hypertensive drug (30.95%) and Ramipril was the least utilized drug (1.36%). Evaluation of utilization of anti-hypertensive agents and implementation of effective strategies can greatly aid in improving the quality use of anti-hypertensive agents.

**INTRODUCTION:** Hypertension is defined by persistent elevation of arterial blood pressure. The Seventh Joint National Committee on the Detection, Elevation, and Treatment of High Blood Pressure (JNC7) classifies adult blood pressure as shown in **Table 1**.

**TABLE 1: JNC 7 HYPERTENSION CLASSIFICATION**

Classification	Systolic (mm Hg)	and	Diastolic (mm Hg)
Normal	< 120		< 80
Prehypertension	120 – 139	or	80 – 89
Stage 1 Hypertension	140 – 159	or	90 – 99
Stage 2 Hypertension	Greater than or equal to 160 or greater than or equal to 100		

A hypertensive crisis (blood pressure greater than 180/120 mm Hg) may be categorized as either a hypertensive emergency (extreme blood pressure elevation with acute or progressing target organ damage) or a hypertensive urgency (severe blood pressure elevation without acute or progressing target organ injury).<sup>1</sup>

QUICK RESPONSE CODE	DOI: 10.13040/IJPSR.0975-8232.7(2).862-67
	Article can be accessed online on: www.ijpsr.com
DOI link: <a href="http://dx.doi.org/10.13040/IJPSR.0975-8232.7(2).862-67">http://dx.doi.org/10.13040/IJPSR.0975-8232.7(2).862-67</a>	

Pathophysiologically, hypertension can be classified into two main groups.

1. Essential or Primary Hypertension – where the cause for rise in blood pressure is not known.
2. Secondary Hypertension – where rise is due to renal disease e.g. chronic diffuse glomerulonephritis, pyelonephritis; due to some vascular disease e.g. renal artery disease or due to some endocrinal disorders e.g. pheochromocytoma, Cushing's syndrome and primary aldosteronism.

Clinically, hypertension can be divided into three stages e.g. mild, moderate and severe hypertension. The diastolic blood pressure between 90 – 104 mm Hg is graded as mild, 105 – 114 mm Hg is graded as moderate and above 115 mm Hg is graded as severe hypertension. The person having systolic blood pressure more than 160 mm Hg with low diastolic blood pressure is termed as 'Isolated Systolic Hypertension' commonly seen in elderly person.<sup>2</sup>

A Drug Use Evaluation (DUE) or Medication Use Evaluation (MUE) program is a planned, criteria-based systematic process for monitoring, evaluating, and continually improving medication use, with the ultimate aim of improving medication-related outcomes for a group of patients or consumers. The improvement process of MUE has its application in all settings where pharmaceutical care is provided. Pharmacists play a major role in the overall process of a DUE program because of their experience in the area of pharmaceutical care. Due affords the pharmacists the opportunity to identify the trends in prescribing in patients such as those with asthma, diabetes, or

high BP. Pharmacist then along with the physician and other health care teams take required action to improve the drug therapy.<sup>3</sup> Regular evaluation of the antihypertensive prescribing patterns are essential these days due to the growing epidemic of hypertension, increasing number of new antihypertensive drugs and the increasing number of drug combinations that are introduced into the market each year together with alteration in guidelines.<sup>4</sup> The current study aims at study of antihypertensive drug utilization pattern in tertiary care hospital.

### MATERIALS AND METHODS:

In this study, 200 cases were collected in which antihypertensive drugs were administered for various indications. The study was Simple Prospective Observational study which was carried out for a period of six months (July to December, 2014) at The Oxford Medical College, Hospital and Research Centre, Bangalore - 560068. The patients were involved in the study based on inclusion and exclusion criteria. In this study, the type of antihypertensive drugs mostly administered to patients whether single or in combination was evaluated. The gender, age of the patients, type of anti-hypertensive prescribed were analyzed and reported.

### RESULTS:

In this study 200 cases involving antihypertensive administration were included. **Table 2** gives demographic characteristics of patients to whom antihypertensives were administered based on age and gender. Maximum number of antihypertensives was administered in the age group of 59-68 years (33.5%) (Illustrated in Fig.1) and among 200 cases, males constituted 134 (67%) and females 66 (33%) (Illustrated in **Fig. 2**)

**TABLE 2: DEMOGRAPHIC CHARACTERISTICS OF PATIENTS UNDERGONE ANTIHYPERTENSIVE ADMINISTRATION**

Patient Characteristics	Number of Cases		Percentage	
	Males	Females	Males	Females
Age In Years				
18 – 28	1	0	0.74%	0%
29 – 38	5	7	3.73%	10.60%
39 – 48	29	9	21.64%	13.63%
49 – 58	30	12	22.38%	18.18%
59 – 68	44	23	32.83%	34.84%
69 – 78	18	11	13.43%	16.66%
>79	7	4	5.22%	6.06%
<b>Gender</b>				
Male	134		67%	
Female	66		33%	

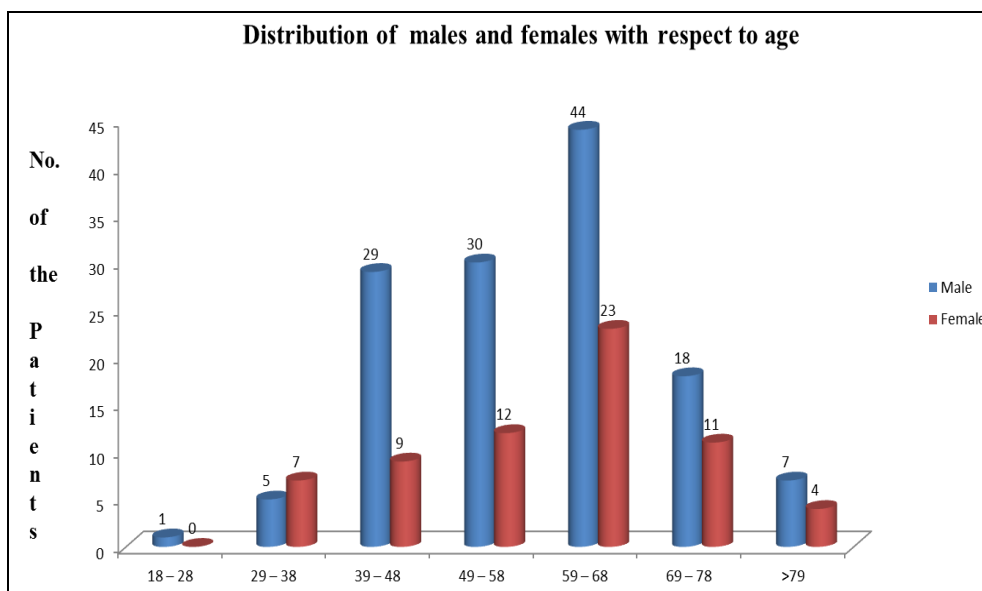


FIG. 1: DISTRIBUTION OF MALES AND FEMALES WITH RESPECT TO AGE

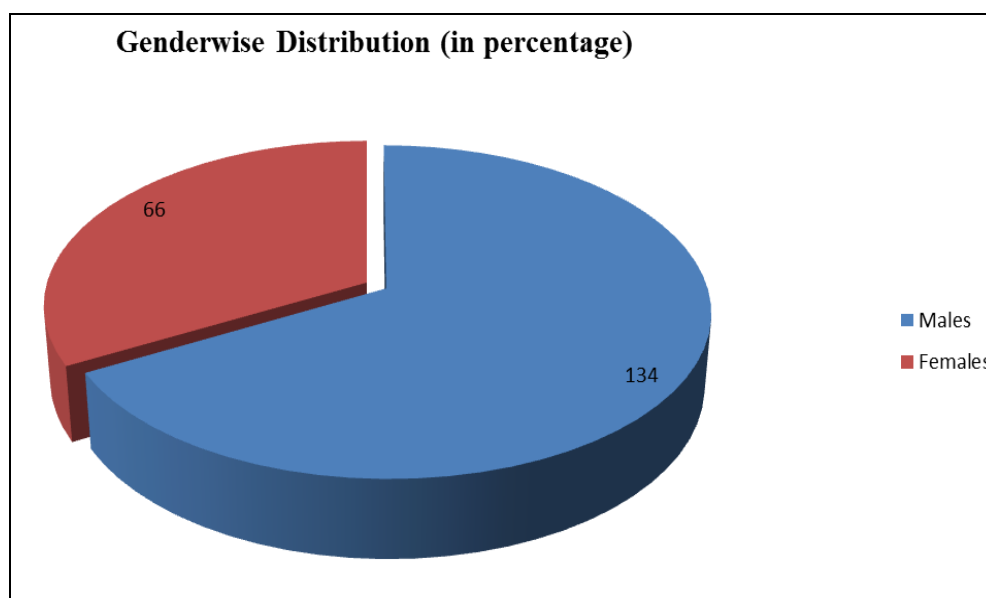


FIG. 2: GENDER DISTRIBUTION

Classifications of antihypertensive drugs prescribed are given in **Table 3**. Diuretics (Ds) were the highest prescribed class of anti-hypertensive drugs among all the 200 cases constituting 79 (28.31%) among males and 33 (11.82%) among females,

followed by CCBs 42 (15.05%) among males and 23 (8.24%) among females. The least prescribed class of anti-hypertensive drugs was found to be AABs constituting just 7 cases.

TABLE 3: CLASSIFICATION OF ANTIHYPERTENSIVE DRUGS PRESCRIBED

Classification	Number of Cases		Percentage	
	Males	Females	Males	Females
Diuretics (Ds)	79	33	28.31%	11.82%
Calcium Channel Blockers (CCBs)	42	23	15.05%	8.24%
Angiotensin Receptor Blockers (ARBs)	41	17	14.69%	6.09%
Beta Adrenergic Blockers (BABs)	20	7	7.16%	2.50%
Angiotensin Converting Enzyme Inhibitors (ACEIs)	8	2	2.86%	0.71%
Alpha Adrenergic Blockers (AABs)	6	1	2.15%	0.35%

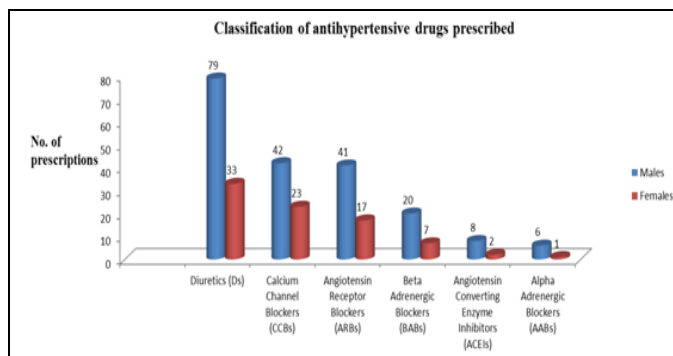


FIG. 3: CLASSIFICATION OF ANTIHYPERTENSIVE DRUGS PRESCRIBED

The detailed description of type of antihypertensive therapy used in the medical care hospital is in **Table 4**. They are categorized into single drug therapy and multidrug therapy. When the cases were screened thoroughly, the number of cases of single drug therapy as well as multidrug therapy was found to be 66% and 33% respectively.

TABLE 4: SINGLE ANTIHYPERTENSIVE THERAPY vs. MULTIDRUG ANTIHYPERTENSIVE THERAPIES

Drug therapy	No. of Prescriptions	% of Prescriptions prescribed
Single Drug therapy	133	66%
Multidrug therapy	67	33%
Two drug therapy	42	21%
Three drug therapy	23	11.5%
Four drug therapy	2	1%

**Fig. 4** gives a pictorial representation of comparative preference of various types of antihypertensive therapies at the medical care hospital.

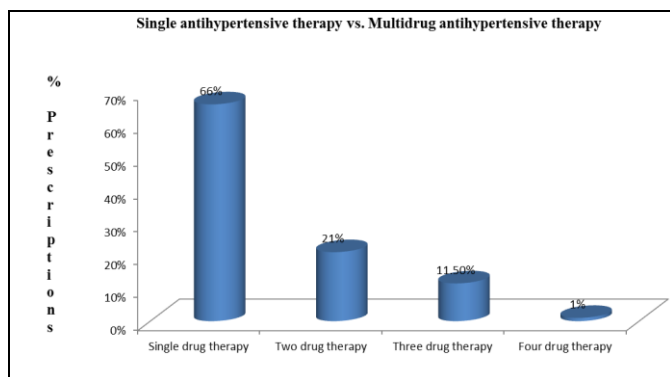


FIG. 4: SINGLE ANTIHYPERTENSIVE THERAPY vs. MULTIDRUG ANTIHYPERTENSIVE THERAPY

A total of 67 (33%) patients received combination of antihypertensive agents (**Table 4**). The most prevalent combination of drug was a two drug therapy of ARB + CCB which was found to be 16.4% followed by ARB + D (11.94%). Among the three drug combinations, ARBs, Calcium channel blockers and Diuretics comprised the most commonly prescribed combination (**Table 5**) The following table (**Table 5**) gives the detailed patterns of use of antihypertensive combination therapies among hypertensive patients.

TABLE 5: PATTERNS OF USE OF ANTIHYPERTENSIVE COMBINATION THERAPY AMONG HYPERTENSIVE PATIENTS

Combination therapy drug regimen	No. of Prescriptions	Percentage (%) receiving combination therapy
<b>Two drug combination</b>	<b>42</b>	<b>21%</b>
ARB + CCB	11	16.41%
ARB + D	8	11.94%
CCB + D	7	10.44%
D + D	7	10.44%
ACEI + CCB	2	2.98%
BAB + BAB	2	2.98%
ACEI + BAB	2	2.98%
ARB + BAB	1	1.49%
ACEI + D	1	1.49%
BAB + D	1	1.49%
<b>Three drug combination</b>	<b>23</b>	<b>11.5%</b>
ARB + CCB + D	7	10.44%
ARB + ARB + D	4	5.97%
BAB + D + D	3	4.47%
CCB + D + D	3	4.47%
ARB + D + D	2	2.98%
BAB + CCB + D	2	2.98%
ACEI + D + D	1	1.49%
AAB + CCB + D	1	1.49%
<b>Four drug combination</b>	<b>2</b>	<b>1%</b>
ARB+BAB+D+D	1	1.49%
ARB+CCB+D+D	1	1.49%

The frequency of antihypertensive drugs used in the medical care hospital is shown in **Table 6**. The most common antihypertensive drug used was found to be Furosemide among both males (30%) and females (15%) and the least used antihypertensive drug was found to be both Losartan and Ramipril with 1.5% in males and 0.5% in females.

TABLE 6: FREQUENCY OF ANTI-HYPERTENSIVE DRUGS USED

Antihypertensive Drug	Number of Cases		Percentage (%)	
	Males	Females	Males	Females
Furosemide	60	31	30%	15%
Amlodipine	43	23	21.5%	11.5%
Telmisartan	37	16	18.5%	8%
Torasemide	14	1	7%	0.5%
Spironolactone	16	3	8%	1.5%
Propranolol	6	5	3%	2.5%
Atenolol	9	2	4.5%	1%
Metoprolol	6	1	3%	0.5%
Enalapril	5	1	2.5%	0.5%
Prazosin	6	1	3%	0.5%
Losartan	3	1	1.5%	0.5%
Ramipril	3	1	1.5%	0.5%

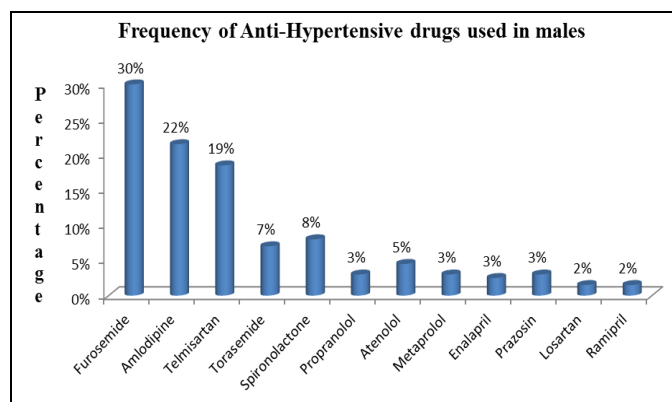


FIG. 5: FREQUENCY OF ANTIHYPERTENSIVE DRUGS USED IN MALES

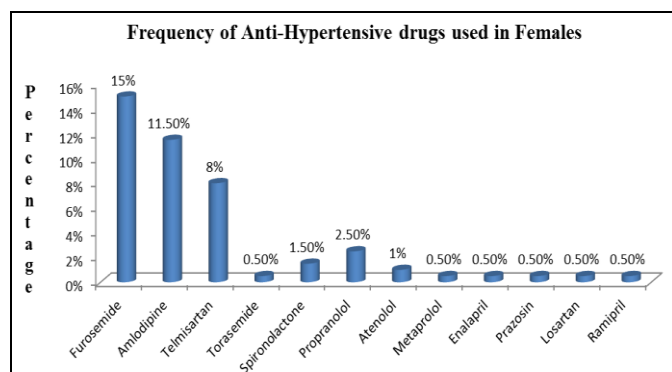


FIG. 6: FREQUENCY OF ANTIHYPERTENSIVE DRUGS USED IN FEMALES

**DISCUSSION:** A total of 200 case sheets were collected of which the percentage of males with hypertension was 67% (134 patients) whereas that of females was 33% (66 patients).

In age analysis, the highest percentage rate of hypertensive patients were found between the age group of 59-68 years (33.5%). The least percentage rate of the patients were found between the age group of 18-28 (0.5%) followed by the age group of patients > 79 yrs.

Among the 200 patients, 133 patients received monotherapy the same observation was noticed in the study conducted by Jeschke E.<sup>5</sup> and other 67 patients received a combination therapy. Diuretics constitute the most frequently prescribed antihypertensive drug class in this study. The most prevalent combination of drug was a two drug therapy of ARB+CCB which was found to be 16.41%. The results are in different to study conducted by Anand Kale where diuretic with angiotensin receptor blocker (29.5%) and beta blocker with calcium channel blocker (22.1%) were the most commonly prescribed combinations.<sup>6</sup> The JNC 7 report recommends that in the absence of any specific indications, a diuretic or  $\beta$ -blocker should be selected as the initial therapy for hypertension.<sup>7</sup> In another study Shah J et al where CCB was second most frequently prescribed drug followed by beta blocker and diuretic.<sup>8</sup> Among all diuretics, Furosemide was the most commonly prescribed anti-hypertensive drug. Almas A *et al.*, conducted at tertiary care hospital shown that Calcium Channel Blocker- Amlodipine is the most commonly used antihypertensive monotherapy.<sup>9</sup>

The average number of antihypertensive medicines prescribed per prescription is only 1.4 in our study, which is in proximity to 1.9 as reported earlier.<sup>10</sup> The prescribing pattern of antihypertensives in the medical care hospital seems to be in compliance with JNC 7 guidelines.

The mean age group of the 200 patient case sheets collected, was found to be 57.9 years it was similar to another study.<sup>11</sup> Total number of different anti-hypertensive agents used was 12. Seven out of twelve drugs (58.33%) were found in the WHO



List of Essential Medicines. Among the 200 case sheets, 22% involved administration of anti-hypertensive drug through IV route.

Further research is needed to qualify rationale for choice of drug based on demographic data, economic status, concomitant conditions and complications to give additional insight into prescribing patterns of antihypertensive agents in India.

**CONCLUSION:** As there is a strong epidemic rise in hypertension in our country, the present prospective study was carried out to assess the current trends in utilization patterns of antihypertensive drugs in the treatment of hypertension. In this study, post analysis of 200 case sheets, denoted that the physicians preferred single drug therapy more than multiple drug therapy and the most frequently prescribed class was Diuretics class of anti-hypertensive agents. Among diuretics, Furosemide was the most frequently utilized anti-hypertensive drug. The most prevalent combination of drug was a two drug therapy of ARB + CCB which was found to be 16.41% followed by ARB + D (11.94%). The importance of educating hypertensive patients is appreciated by pioneering clinicians to keep themselves abreast of the latest development in the field of hypertension treatment would also contribute in the effective management of hypertension. The treatment of hypertension keeps changing and newer drugs are being added at a rapid pace. It is recommended that regular continuing educations should be provided to prescribers on rational use of drugs in hypertension and comorbid conditions.

**ACKNOWLEDGEMENT:** My greatest regards to God and my beloved partners for their manual,

strength and help for everything place. I express my sincere thanks to department of pharmacy practice of the Oxford College of Pharmacy, Bangalore. I sincerely thank to my best friend Anudeep Manne.

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### How to cite this article:

Eslampanah Z: Drug Utilization Evaluation of Anti-Hypertensive Agents in a Medical Care Hospital. Int J Pharm Sci Res 2016; 7(2): 862-67. doi: 10.13040/IJPSR.0975-8232.7(2).862-67.

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