

**DRUG UTILIZATION PATTERNS OF ANTI HYPERTENSIVE MEDICATION IN A TERTIARY CARE HOSPITAL**

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**ABSTRACT: BACKGROUND:** Drug utilization study analyses the prescribing patterns and justifies the rational use of drugs. Clinicians often face challenges in selecting, initiating, and individualizing appropriate drug therapy for patients. Physicians' inability to provide good management of hypertension has been identified as an important contributor to poor BP control in hypertensive patients. We assessed the prescribing trends in hypertensive patients by various physicians. **METHODS:** Data for study was collected from Narayana Medical College and Hospital, Nellore during a period of 10 months from outpatient departments of General Medicine, Cardiology and Nephrology. 2440 hypertensive prescriptions were analyzed. Hypertension was defined as SBP/DBP greater than 140/90 or taking medications for hypertension irrespective of etiologies. **RESULTS:** Both essential and secondary hypertensive prescriptions were analyzed. The mean age of the participants was 51.95± 12.68 yrs. The mean SBP of the participants was 151.98±17.75 and DBP was 93.44±10.55 mm of Hg. We found that 1663 patients were essential hypertensive and 577 were hypertensives due to chronic kidney disease. CCB was the most commonly prescribed 961(42.90%), followed by beta blockers 882(39.38%), Angiotensin receptor blockers (ARB) 646 (28.8%), Angiotensin converting enzyme inhibitors (ACEI) 420(18.75%), diuretics 231(10.3%), clonidine 119(5.3%) and prazosin 96(4.29%). 767(34.2%) were receiving monotherapy, 977(43.6%) on two drugs, 390(17.4%) on three drugs, 88(3.9%) were on four drugs and 5(0.2%) on five drug combinations. 13 (0.60%) were not using any drugs. Only 704 (31.43%) were responders. Among the prescribed drugs, 93% of drugs were prescribed by trade name and 20.64% were fixed-drug combinations. Average number of drugs prescribed was 1.91±0.84. **CONCLUSIONS:** It was observed that majority of drugs were prescribed by brand names on an average two drugs per prescription. CCBs were the most commonly used drugs to treat hypertension among all the age group patient population followed beta blockers ARB, ACEI, Diuretics, Clonidine and Prazosin. It was also found that there was less number of fixed dose combinations. The study suggests that there is immense scope of improvement in prescribing practices in the form of rational drug prescribing for achieving optimal blood pressure control.

**KEYWORDS:** Drug utilization study, essential drug concept, Calcium Channel Blockers, Beta Blockers, Angiotensin receptor blockers-ARB, Angiotensin converting enzyme inhibitors-ACEI.

**INTRODUCTION:** Hypertension is one the leading cause of cardiovascular diseases and deaths globally.<sup>(1)</sup> It is associated with at least 7.6 million deaths per year worldwide (13.5% of all deaths). Eighty percent of global CVD mortality occurs in low- and middle-income countries (LMIC).<sup>(1-3)</sup> The importance of blood pressure (BP) as a modifiable risk factor for CVD is well-recognized and many effective and inexpensive BP lowering treatments are available. There is considerable evidence that

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long-term BP lowering to what is considered either normal or optimal levels reduces the likelihood of CVD and results in several other important health benefits.<sup>(4)</sup>

Drug use evaluation is a system of ongoing, systematic, criteria-based drug evaluation that ensures the appropriate use of drugs. It is a method of obtaining information to identify problems of drug use. Properly developed, it not only provides a means of identifying drug use problems but also provides a means to correct the problem and thereby contributes to rational drug therapy. Drug use evaluation can assess the actual process of medication administration or dispensing and also assess outcomes of treatment.<sup>(5-6)</sup> Our objectives of drug use evaluation were ensuring that drug utilization patterns among doctors, evaluating the effectiveness of drug therapy, identification of areas of practice that require further education of practitioners.

The common rule of halves in hypertension epidemiology suggests that about half of hypertensive populations are diagnosed, half of those diagnosed were treated, and half of those treated are controlled; these estimates may be optimistic in many developing countries. Indeed, poor BP control has been found in these countries.<sup>(7-9)</sup> Physicians' inability to provide good management of hypertension has been identified as an important contributor to poor BP control in hypertensive patients.<sup>(10-13)</sup> Because of the associated morbidity and mortality and the cost to society, hypertension is an important public health challenge. Treatment is based on lifestyle modification and use of drugs like Calcium Channel Blockers (CCB), Diuretics, Angiotensin Converting Enzyme-Inhibitors (ACEI), Angiotensin Receptor Blockers (ARB), Beta-Blockers (BB), Alpha Blockers and Central Sympatholytics are usually considered.<sup>(14-16)</sup> Over the past several decades, extensive research, widespread patient education, and a prompt effort on the part of health care professionals have led to rational use of drug. Hence, Drug utilization patterns need to be evaluated from time to time so as to increase the therapeutic efficacy, decrease the adverse effects and to provide feedback to the prescribers to create awareness towards rational drug use.<sup>(17)</sup>

**METHODS:** This prospective cross sectional study, conducted between February 2012 to November 2012 to evaluate the use of antihypertensive medications of patients attending outpatient departments of Internal Medicine, Cardiology and Nephrology. The necessary permission was obtained from the concerned authorities for data collection. Prescriptions of patients greater 18 yrs, who were known hypertensive (diagnosed on having an average blood pressure of  $\geq 140/90$  mm Hg on at least 2 clinic visit) and were on antihypertensive therapy were analyzed. Those patients who did not have a documented record of the antihypertensive therapy were excluded from the study. The physician diagnosed co morbidities such as diabetes, stroke, ischemic heart disease (IHD), chronic kidney disease (CKD) as documented in the medical records was noted. Data on demographics, type of antihypertensive drug and number of antihypertensive drugs was recorded by trained data collectors. Records of antihypertensive drugs were extracted from the medical record of the patient. No additional measures were used to check compliance. Duplication of data was prevented by using hospital record number. Primary outcome variable was use of single drug, two drug therapy and  $\geq$ three drug therapy. Patients who used an antihypertensive medication with only 1 active ingredient were defined as receiving monotherapy. Those taking more than 1 active ingredient (either in 1 combination pill or in 2 different single pills) were defined as receiving polytherapy. Responders were defined as systolic blood pressure (SBP)  $< 140$  mm Hg or diastolic blood pressure (DBP)  $< 90$  mm Hg.

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**STATISTICAL ANALYSIS:** The data was entered in the Microsoft excel spreadsheet 2007. The statistical analysis was conducted by means of SPSS- Version-16. Descriptive statistics for Continuous data was presented as mean  $\pm$  standard deviation and Categorical data as actual numbers and percentages.

**RESULTS:** A total of 2240 hypertensive subjects participated in the study. The mean age of the participants was  $51.95 \pm 12.68$  yrs. There were 1344 males and 896 females, 848(37.86%) were smokers, 754(33.66%) were alcoholics, 1373(61.30%) were vegetarians. The mean SBP of the participants was  $151.98 \pm 17.75$  and DBP was  $93.44 \pm 10.55$  mm of Hg.

In present study seven anti-hypertensive drugs were prescribed for total 2440 prescriptions. (Table-1) 1440 (64.3%) were treated by general physicians, 223 (10%) by cardiologist and 577 (25.8%) by nephrologists. we found that 1663 patients were essential hypertensive and 577 were hypertensives due to chronic kidney disease. CCB was the most commonly prescribed 961 (42.90%), followed by beta blockers 882 (39.38%), ARB 646 (28.8%), ACEI 420 (18.75%), diuretics 231 (10.3%), clonidine 119(5.3%) and prazosin 96 (4.29%). Among 2240 hypertensive patients, 767 (34.2%) were on monotherapy, 977 (43.6%) on two drugs, 390 (17.4%) on three drugs, 88(3.9%) were on four drugs and 5(0.2%) on five drug combinations. 13 (0.60%) were not using any drugs. Only 704 (31.43%) were responders. Among the prescribed drugs, 93% of drugs were prescribed by trade name and 20.64% were fixed-drug combinations. Average number of drugs prescribed was  $1.91 \pm 0.84$ .

The overall prevalence of hypertension without diabetes was 1197(53.43%). The mean age of presentation was  $49.73 \pm 13.11$ . There were 755 males and 442 females, 427(35.7%) were smokers, 381 (31.76%) were alcoholics. The mean SBP of the participants was  $152.15 \pm 18.4$  and DBP was  $93.43 \pm 11.7$ . Among the various anti hypertensives, CCB was the most commonly prescribed 600 (50.0%), followed by BB 424 (35.3%), ARB 314 (26.2%), ACEI 213 (17.7%), Diuretics 123 (10.3%), Clonidine 80 (6.7%) and Prazosin 68 (5.6%). 383(32.0%) were responders to treatment received. Among Non-Diabetic hypertensive patients, 657 (54.9%) were on monotherapy, 411 (34.3%) on two drugs, 106 (8.9%) on three drugs, 16 (1.3%) were on four drugs and 2 (0.2%) on five drug combinations and 5 patients did not received any treatment. Average number of drugs prescribed was  $2.3 \pm 0.8$  and 383 (32.0%) were responders.

The overall prevalence of diabetes in hypertensives was 1043 (46.65%) and 918 (41%) patients were on various anti-diabetic treatment. The mean age of presentation was  $54.51 \pm 11.61$  yrs. There were 588 males and 455 females, 420 (40.27%) were smokers, 372 (35.67%) were alcoholics. The mean SBP of the participants was  $151.08 \pm 17.0$  and DBP was  $93.5 \pm 9.0$ . Among the various anti-hypertensive, beta Blockers was the most commonly prescribed 458(43.91%), followed by CCB 361 (34.61%), ARB 332(31.8%), ACEI 207 (19.85%), Diuretics 108(10.35%), Clonidine 39 (3.74%) and Prazosin 28 (2.68%). Among diabetic hypertensives 321 (30.78%) were responders to standard treatment. Among 1043 Diabetic hypertensive patients, 110 (10.55%) were on monotherapy, 566 (54.27%) on two drugs, 284 (27.23%) on three drugs, 72 (6.9%) were on four drugs and 3(0.29%) on five drug combinations and 8 patients were not on any drugs. Average number of drugs prescribed was  $2.3 \pm 0.8$  and 321 (30.78%) were responders.

Among 1440 patients treated by Physicians, 608(42.3%) received Beta blockers followed by CCB 537(37.4%), ARB 476(33.1%), ACEI 269(18.7%), Diuretic 134(9.3%), Prazosin 20(1.4%),

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Clonidine 15(1%). However, 473(32.8%) were responders. Among 222 patients treated by Cardiologist, 101(45.3%) received CCB followed by Beta blockers 85 (38.1%), ARB 52 (23.3%), ACEI 52 (23.3%), Clonidine 29 (13%), Diuretic 23 (10.3%), Prazosin 15 (6.8%). However, 70(31.4%) were responders among 577 patients treated by Nephrologist, 332 (55.8%) received CCB followed by Beta blockers 187(32.4%), ARB 118(20.5%), ACEI 98(17%), Clonidine 75 (13%), Diuretic 74 (12.8%), Prazosin 60 (10.4%), However, 161 (27.9%) were responders. (Table-2 & 3)

**DISCUSSION:** Drug utilization studies are powerful exploratory tools to determine the role of drugs in Society.<sup>(18)</sup> They reflect the clinical judgment of the clinicians and the prescribing behavior of the doctors in a tertiary care hospital. However, these Prescribing patterns of drugs were neither based on WHO criteria for rational use of drugs nor totally evidence-based.

The average number of drugs per prescription which was shown to be an important index of the standard of prescribing in this study was 1.91. About 43.6 % of the prescriptions contained at least 2 drugs. It is always preferable to keep the mean number of drugs per prescription as low as possible to reduce the cost of treatment and to minimize the adverse effects and drug interactions and same was followed in our hospital.

Only 7% of drugs were prescribed by generic name. Use of generic names in prescription eliminate the chance of duplication of drug products and also reduce the cost of the patient. Prescribing by generic name helps the hospital pharmacy to have a better control of inventory. This will also help the pharmacy to purchase the drugs on contract basis, as the number of brands is less. It can also reduce the confusion among the pharmacists while dispensing. Prescribing by brand name may be an evidence of vigorous promotional strategies by pharmaceutical companies. Confusion over brand names, severe workload on doctors and pharmacists, cost factor, patient attitudes, erratic supply of drugs, can lead to irrational use of drugs. However, Physician prefers to write brand names of drugs of repute rather than by generic names. One of the possible reasons for such an opinion is that prescribing by generic name may results in purchase of drugs of uncertain bioavailability due to lack of awareness about generic drugs, bioequivalence and regulatory that control generic drugs.

In present study seven drugs were prescribed in total 2440 prescriptions. We also found that 704(31.4%) patients were responders to the antihypertensive drug prescribed. The average numbers of drugs/ Prescription are  $1.91 \pm 0.84$ . The average total cost / Prescriptions is below Rs. 140. The prevalence of DM in hypertension is 46.65% and 41% patients were on Anti-diabetic drugs in addition to antihypertensives. Interestingly, we found that Beta blockers were the second commonly prescribed drugs among antihypertensive agent among diabetic patients. Possible explanations include presence of coronary artery disease, experience and knowledge of house surgeons and post graduates about hypertensive medications who were considered as general physicians.

**CONCLUSION:** Majority of drugs were prescribed by Brand names on an average two drugs. CCBs are the most commonly used drug to treat hypertension. It was also found that there was less number of fixed dose combinations. Most of them were from hospital essential drug list. The study suggests that there is immense scope of improvement in prescribing practices in the form of rational drug prescribing for achieving optimal blood pressure control. Additionally the prescribers should be educated about generic prescribing which may have a multitude of benefits including cost minimization. The Drug and Therapeutics Committee of the hospital should take the leading role in rationalizing the prescribing and dispensing pattern in the hospital.

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Descriptive	Total	%	HTN	%	HTN+DM	%	P value
N	2240	100	1197	53.43	1043	46.56	
Age	51.95±12.68	-	49.73±13.11	-	54.51±11.65	-	0.000
Male/ Female	1344/896	-	755/442	-	560/453	-	0.02
Smoking	848	37.86	427	35.7	420	40.27	0.02
Alcohol	754	33.66	381	31.76	372	35.67	0.05
CCB	961	42.90	600	50.0	361	34.61	0.000
BB	882	39.38	424	35.3	458	43.91	0.000
ARB	646	28.8	314	26.2	332	31.83	0.004
ACEI	420	18.75	213	17.7	207	19.85	0.18
DIU	231	10.3	123	10.3	108	10.35	0.95
CLO	119	5.3	80	6.7	39	3.74	0.002
PRA	96	4.29	68	5.6	28	2.68	0.001
SBP	151.98±17.75	-	152.15±18.4	-	151.8±17	-	0.62
DBP	93.44±10.55	-	93.43±11.7	-	93.5±9	-	0.93
No drugs	13	0.6	5	0.4	8	0.8	0.27
Monotherapy	767	34.2	657	54.9	110	10.55	0.000
Dual Therapy	977	43.6	411	34.3	566	54.27	0.000
Triple Therapy	390	17.4	106	8.9	284	27.23	0.000
Quadruple	88	3.9	16	1.3	72	6.90	0.000
5 Drugs	05	0.2	2	0.2	3	0.29	0.54
Avg number of Drugs	1.91±0.8	-	1.56±0.73		2.30±0.79	-	0.000
Responders	704	31.4	383	32.0	321	30.78	0.53

CCB=Calcium Channel Blocker, ACEI=Angiotensin converting enzyme inhibitors, ARB=Angiotensin receptor blockers, CLO=Clonidine, DIU=Diuretics, PRA=Prazosin, BB=Beta Blocker, SBP=Systolic Blood Pressure, DBP=Diastolic blood pressure

**Table 1: Demographic, hemodynamic and antihypertensive prescribing patterns among hypertensive patients**

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Drugs	Physician		Cardiologist		Nephrologist		Total	
	N	%	N	%	N	%		%
BB	608	42.3	85	38.1	187	32.4	880	39.3
CCB	537	37.4	102	45.3	322	55.8	960	42.9
ACEI	269	18.7	52	23.3	98	17.0	419	18.7
ARB	476	33.1	52	23.3	118	20.5	646	28.8
Clonidine	15	1.0	29	13.0	75	13.0	119	5.3
Diuretic	134	9.3	23	10.3	74	12.8	231	10.3
AB	20	1.4	15	6.8	60	10.4	95	4.2
Responders	473	32.8	70	31.4	161	27.9	704	31.4
<b>Total</b>	<b>1440</b>	<b>100.0</b>	<b>223</b>	<b>100.0</b>	<b>577</b>	<b>100.0</b>	<b>2240</b>	<b>100.0</b>

Table 2: Anti-Hypertensive prescribing patterns by various physicians and responders to Treatment

	Physician		Cardiologist		Nephrologist		Responders		Total	
	N	%	N	%	N	%	N	%	N	%
0	8	0.6	1	0.4	4	0.7	6	0.9	13	0.6
1	518	36.0	72	32.3	177	30.7	299	42.5	767	34.2
2	593	41.2	107	48.0	277	48.0	302	42.9	977	43.6
3	256	17.8	35	15.7	99	17.2	86	12.2	390	17.4
4	63	4.4	6	2.7	19	3.3	10	1.4	88	3.9
5	2	0.1	2	0.9	1	0.2	1	0.1	5	0.2
<b>Total</b>	<b>1440</b>	<b>100.0</b>	<b>223</b>	<b>100.0</b>	<b>577</b>	<b>100.0</b>	<b>704</b>	<b>100.0</b>	<b>2240</b>	<b>100.0</b>

Table 3: Total number of antihypertensives prescribed by various physicians and responders to Treatment

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