



Research Article

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Prescription Pattern and Therapeutic Response of Various Anti Hypertensive Drugs for the Hypertensive Patients at Private Hospitals in Tamilnadu, India

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ABSTRACT

The present study was conducted in order to establish the therapeutic responses and prescription pattern of various antihypertensive agents in patients with mild, moderate and severe hypertension. Prospective and comparative study was carried out on 500 patients attending the cardiology out patients department at private hospitals in Tamilnadu, India. Patients of either sex aged between 18-60 years suffering from hypertension and to evaluate the characterization, drug therapy (mono or combination) of five major categories of antihypertensive drugs in patients with hypertension. Out of 500 patients, males (49.29 ± 6.5) and females (50.63 ± 6.5) participated in the study. This study revealed that most of the patients were on mono therapy (43%, Male and 28% Female) and in combination therapy (17% male and 12% Female). In mono therapy, five classes of drugs were used. These were diuretics (33%), beta-blockers (20%), calcium channel blockers (19%), ACE inhibitors (17%) and angiotensin II receptor blocker (11%). Among mono therapy of drugs, diuretics were prescribed most whereas angiotensin II receptor blocker were least used, In combination therapy, angiotensin II receptor blocker and thiazide diuretic was given to the majority of the patients (42%), beta blocker and thiazide diuretic were (32%), calcium channel blocker and beta blocker were (15%) and ACE Inhibitor and calcium channel blocker were (10%). The present study represents the current prescribing pattern of anti-hypertensive drugs and it highlights certain shortcomings in the existing prescribing practice. There is a considerable scope for improvement on patient's interaction with pharmacist and doctors and needs to improve pharmaceutical care on disease and drug knowledge for the effective blood pressure control.

Keywords: Hypertension, anti-hypertensive agents, prescription pattern, therapeutic response.

INTRODUCTION

Hypertension is a leading contributor to the global burden of cardiovascular morbidity and mortality. Prevalence of hypertension in India in 2000 was 60.4

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million males and 57.8 million females and projected to increase to 107.3 million and 106.2 million respectively in 2025. Hypertension is vary from 4-15% in urban and 2-8% in rural population. [1]

Apart from unhealthy lifestyles, lack of awareness about hypertension, distorted public health systems, physicians treating hypertension also lag behind in treating hypertension according to standard guidelines. Non compliance to antihypertensive therapy is also a reason for uncontrolled hypertension. [2] A number of drugs in various combinations [3-5] are generally used for effective long-term management. Therefore, drug

utilization studies, which evaluate, analyze the medical, social and economic outcomes of the drug therapy, are more meaningful and observe the prescribing pattern of doctors with the aim to provide drugs rationally. [6-7] The objective of the study was to evaluate the prescribing pattern of antihypertensive drugs and assess blood pressure control at rural hospitals in south Indian population so as to better understand the pattern of antihypertensive care and potential opportunities for improvement in hypertension management and also this study identifies the lacunae in the present prescribing practice of doctors and pharmaceutical care and help in improving the patient health care.

MATERIALS AND METHODS

Most of the patient’s visit was conducted during the first two weeks of every month, from May 2012 to October 2014.

It was a cross sectional study conducted in a rural health institution in south India. The protocol for the study was approved by the Independent Ethics Committee, Madurai, Tamilnadu. Out of 500, 44 patients were excluded from the study since they are Pre-hypertensive so remaining 456 patients treated with anti hypertensive drugs consented to participate in the study. The eligibility criteria are as follow:

1. They had a confirmed diagnosis of hypertension using anti hypertensive drugs.
2. Those who were ability to speak and write in Tamil.
3. They were at least 18 to 60 year old.

Informed consent form was taken from the patient before participating the study and blood pressure readings were obtained in the sitting position after 5 min rest.

Generally, the doctors writes the prescription after examining the patients, the pharmacist dispenses the medication. The following drugs were prescribed during this study such as diuretics (Hydrochlorothiazide), beta-blockers (Atenolol, Metoprolol), calcium channel blockers (Amlodipine), ACE inhibitors (Enalapril) and angiotensin II receptor blocker (Losartan and Telmisartan).

Data analysis

The data collected were analyzed with statistical tools of Graphad Prism. All data were expressed as the mean ± Standard Deviation (SD). For statistical analysis of the data, one way of Analysis of Variance (ANOVA) was performed to assess the blood pressure variables and rate of compliance among different age groups. The statistically significant was accepted at a level of $p < 0.05$

RESULTS

During the whole study period 500 patients were recruited, out of 500 patients males (49.29 ± 6.5) and females (50.63 ± 6.5) and their BMI, for males 25.45 ± 2.7 and females 23.03 ± 2.76 participated in the study and 44 patients were excluded from the study as they are

pre hypertensive and they were not treated with drugs so the results are not mentioned here and remaining 456 patients were from stage-I and stage-II were treated with drugs,. The percentage of hypertensive patients showed that 6.6% male (33) and 2.2% (11) female were from pre hypertension, (40.2%) male (201) and (21.4%) female (107) were from (stage-I) and (17.8%) male (89) and (11.8%) female (59) patients were from (Stage-II) We observed that hypertension was more prevalent in males than in females. In Monotherapy (43%) male (197) and (28%) female (127) and combination therapy (17%) male (76) and (12%) female (56) were observed. In overall (71%) male and female of mono therapy and (29%) male and female of combination therapy prescribed was observed.

In follow up visits, 9% of patients who treated with mono therapy were changed to combination therapy because of their blood pressure value was not fall within normal range (i.e.) In overall 71% patients were treated with mono therapy and 29% patients treated with combination therapy during the screening visit was observed. In follow up visits 62% of patients were treated with mono therapy and 38% patients treated with combination therapy was observed (Fig. 1).

The present study revealed that thiazide diuretics were the drugs of choice for hypertensive patients as a single drug therapy followed by β-blockers, calcium channel blocker, ACE Inhibitor and angiotensin II receptor blocker. Thiazide diuretics must be used at appropriate optimal doses to achieve the optimal antihypertensive effect with the smallest occurrence of side effects, including alterations in glucose and lipid profiles and hypokalemia. [8]

These results showed blood pressure could be adequately controlled with the help of mono therapy as only 9% of patients in our study changed from mono therapy to combination therapy and also pharmaceutical care helped the blood pressure control to normal level (Table 1).

Dizziness, weakness, gastric irritation, constipation, dyspnea, bradycardia was mostly observed adverse events. Erectile dysfunction is the common adverse events of beta blockers but we observed in only few patients. The reported adverse events for each class of drugs are mentioned (Table 2).

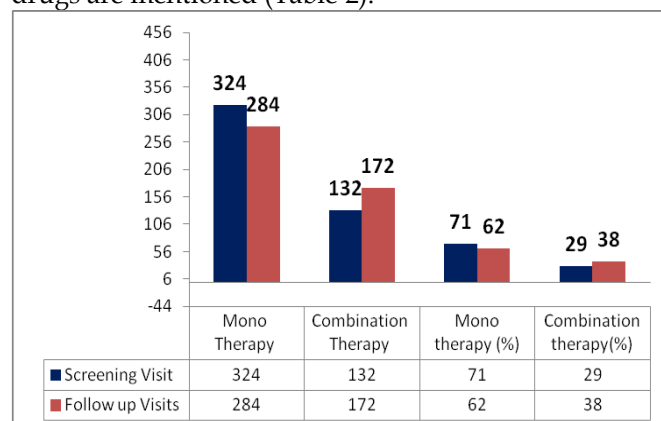


Fig. 1: Mono Therapy Vs Combination Therapy

Table 1: Blood pressure control between usual care and pharmaceutical care

	Category	(Screening)*	(Follow up-1)**	(Follow up-2)**	(Follow up-3)**	ANOVA
SBP (Male)	Mean	148.978	138.204	128.359	123.879	< 0.0001
	STD	10.2776	8.57168	7.16495	6.5665	
	SEM	0.571863	0.476941	0.39867	0.36537	
DBP (Male)	Mean	99.2879	90.7616	87.4272	82.9659	< 0.0001
	STD	11.918	5.58298	3.90375	4.79668	
	SEM	0.663133	0.310645	0.21721	0.26689	
SBP (Female)	Mean	150.215	138.729	128.475	124.412	< 0.0001
	STD	9.83265	8.4069	7.62701	7.40657	
	SEM	0.739067	0.631902	0.57328	0.55671	
DBP (Female)	Mean	100.271	90.661	87.0396	83.0734	< 0.0001
	STD	11.7287	5.77202	3.88377	4.50129	
	SEM	0.881583	0.433852	0.29192	0.33834	
Rate of Drug Compliance (Male)	Mean	60.3276	66.0379	73.0931	81.7345	< 0.0001
	STD	4.89611	4.55211	8.09641	10.288	
	SEM	0.28751	0.267309	0.47544	0.60413	
Rate of Drug Compliance (Female)	Mean	60.241	65.7952	72.3855	80.6807	< 0.0001
	STD	4.2926	4.06838	7.86682	10.8516	
	SEM	0.333171	0.315768	0.61058	0.84225	

*-Usual Care of Patients, **-Pharmaceutical Care of Patients

DISCUSSION

With increasing economic growth rate, India is not only facing the epidemic of Coronary Artery Disease but also of obesity, diabetes mellitus, and hypertension. Prevalence of hypertension has remained stable or has decreased in developed countries during the past decade; it has dramatically increased in developing countries like India. [9-10]

A prescription based study is considered to be one of the most effective methods to assess and evaluate the prescribing pattern of doctors and dispensing practice of pharmacists. [11] It is also important to consider the recommendations of international bodies on hypertension that help to improve prescribing practice of the doctors and ultimately, the clinical standards. A continuous follow up is really required through such kinds of systematic approach that provide feedback from the doctors and help to promote rational use of drugs.

The present study consists 4 visits that include, screening visit, follow up visit-1 to follow up visit-3. The patient was requested to visit and meet the doctors in every month and update their compliance status and if any Adverse events occurred during the previous visit.

Out of 500 patients only 456 patients were treated with either mono therapy or combination therapy of drugs were observed, remaining 44 patients were excluded from this study however they were treated with lifestyle modification but we did not show their results here.

In our study shows that mono therapy and also combination therapy seems to be a better approach to reduce the blood pressure to normal level but when high blood pressure cannot be controlled by mono therapy, doctors employ combination therapy. Combination therapy is recommended for hypertensive patients to facilitate prompt maintenance of blood pressure. In our study most of the patient's blood pressure was controlled by mono therapy.

Patients are from Pre-Hypertension (8.8%) followed by stage-1(61.6) and stage-2(29.6%). Since majority of the patients (61.6%) falls under stage-1 category so (71%) of the patients were treated with mono therapy of drugs. single drug as mono therapy (71%) was mostly prescribed compared to combination therapy (29%).

In overall, these drugs such as hydrochlorothiazide (thiazide diuretic) (33.33%), amlodipine (calcium channel blocker) (19.13%), enalapril (ACE Inhibitor) (16.97%), metoprolol (beta blocker) (13.88%), telmisartan (angiotensin II receptor blocker) (6.17%), atenolol (beta blocker) (5.86%) and losartan (angiotensin II receptor blocker) (4.62%) were prescribed.

In drug combinations, hydrochlorothiazide + telmisartan (thiazide diuretic + angiotensin II receptor blocker) (37.12%), hydrochlorothiazide + metoprolol (thiazide diuretic + beta blocker) (31.81%), amlodipine + atenolol (calcium channel blocker + beta blocker) (15.15 %), enalapril + amlodipine (ACE Inhibitor + calcium channel blocker) (10.6%) and Losartan + hydrochlorothiazide (angiotensin II receptor blocker + thiazide diuretic) (5.3%) were prescribed.

We measured rate of compliance to the patients in every visit. The patient should reach $\geq 70\%$ for compliance in all the visits, we was noticed that pharmacists who distribute the medicines did not give adequate written or oral instructions and also the patients were not aware about the knowledge of disease and medication so the patients were not compliance initially However, rate of compliance was improved from the follow up visit after the principal researcher educated the patients and the pharmacist about the medication knowledge and importance of compliance (Table 3).

The objective of the present prospective study was to evaluate the current trends in prescribing patterns of antihypertensive drugs and blood pressure control in the treatment of hypertension and the study shows that diuretics were the most frequently prescribed class of antihypertensive drugs in our rural tertiary hospital. In

overall, the rate of controlled BP among hypertensive patients was low at initial stage because lack of pharmacist interaction with patients and lack of instruction provided to the patients by pharmacist and doctors.

Table 2 : Name of adverse events

Hydrochlorothiazide(Thiazide Diuretic)			
Name of Adverse Events	Male	Female	%
Dizziness	28	9	34.25
Headache	22	1	21.29
Weakness	15	3	16.66
Frequency of urination	10	6	14.81
No Events	3	6	8.33
Erectile dysfunction	5	NA	4.62
Amlodipine (Calcium Channel Blocker)			
Name of Adverse Events	Male	Female	%
Constipation	8	4	19.35
Gastric irritation	5	6	17.74
Wheezing	4	5	14.51
Dizziness	3	5	12.9
Coughing	3	4	11.29
Headache	4	2	9.67
Hypotension	4	0	6.45
No Events	2	1	4.83
Bronchospasm	1	0	1.61
Fatigue	1	0	1.61
Enalapril (ACE Inhibitor)			
Name of Adverse Events	Male	Female	%
Dry Cough	15	5	36.36
Hypotension	10	3	23.63
No Events	5	7	21.81
Dizziness	6	4	18.18
Atenolol (Beta Blocker)			
Name of Adverse Events	Male	Female	%
Fatigue	5	1	31.57
Dyspnea	2	2	21.05
Bradycardia	3	1	21.05
Dryness of mouth	0	2	10.52
Erectile dysfunction	1	NA	5.26
Bronchospasm	0	1	5.26
Sexual dysfunction	1	0	5.26

Metoprolol (Beta Blocker)			
Name of Adverse Events	Male	Female	%
Bradycardia	7	3	22.22
Dyspnea	4	3	15.55
Fatigue	4	2	13.33
Bronchospasm	3	3	13.33
Dryness of mouth	2	3	11.11
Weakness	3	1	8.88
Erectile dysfunction	2	NA	4.44
No	1	1	4.44
Sexual dysfunction	1	0	2.22
Dizziness	1	0	2.22
Vomiting	0	1	2.22
Telmisartan (Angiotensin II receptor Blocker)			
Name of Adverse Events	Male	Female	%
No	7	0	35
Insomnia	5	0	25
Back pain	2	0	10
Rash	2	0	10
Hypotension	1	1	10
Dry Cough	1	1	10
Losartan (Angiotensin II receptor Blocker)			
Name of Adverse Events	Male	Female	%
Insomnia	3	1	26.66
Rash	1	1	13.33
Dry Cough	1	1	13.33
No		2	13.33
Back pain	1		6.66
Dizziness	1		6.66
Frequency of urination	1		6.66
Gastric irritation		1	6.66
Diarrhea	1		6.66

Table 3: Rate of compliance in individual visits

Visits	Rate of Compliance (%)		Male	%	Female	%
	Compliance (%)	Compliance (%)				
Screening Visit	>65	>70	31	6.79	17	3.72
Follow up visit-I	>70	>70	0	0	0	0
Follow up visit-II	>70	>70	20	4.38	12	2.63
Follow up visit-III	>70	>70	99	21.71	58	12.71
			146	32.01	73	16

Table 4: Prescription pattern of mono therapy of drugs

Mono Therapy					
Name of Drugs	No of Patients	Name of Drugs	No of Patients	Total no of Patients	%
Hydrochlorothiazide	76	Hydrochlorothiazide	32	324 patients treated with mono therapy	33.33
Amlodipine	35	Amlodipine	27		19.13
Enalapril	30	Enalapril	25		16.97
Metoprolol	23	Metoprolol	22		13.88
Losartan	10	Losartan	5		4.62
Atenolol	11	Atenolol	8		5.86
Telmisartan	12	Telmisartan	8		6.17

Table 5: Prescription pattern of combination therapy of drugs

Combination Therapy					
Name of Drugs	No of Patients	Name of Drugs	No of Patients	Total no of Patients	%
Amlodipine + Atenolol	17	Amlodipine + Atenolol	3	132 patients treated with combination therapy	15.15
Hydrochlorothiazide + Telmisartan	24	Hydrochlorothiazide + Telmisartan	25		37.12
hydrochlorothiazide + Metoprolol	21	hydrochlorothiazide + Metoprolol	21		31.81
Enalapril + Amlodipine	11	Enalapril + Amlodipine	3		10.6
Losartan + hydrochlorothiazide	3	Losartan + hydrochlorothiazide	4		5.3

Table 6: Category of mono therapy drugs vs combination therapy of drugs

Category of Mono therapy drugs	No of Patients	%	Category of Combination Therapy of drugs	No of Patients	%
Thiazide Diuretic	108	33	Calcium Channel Blocker+ Beta Blocker	20	15
ACE Inhibitor	55	17	Angiotensin II receptor Blocker + Thiazide Diuretic	56	42
Angiotensin II receptor Blocker	35	11	Beta Blocker + Thiazide Diuretic	42	32
Beta Blocker	64	20	ACE Inhibitor + Calcium Channel Blocker	14	11
Calcium Channel Blocker	62	19			

Good adherence to antihypertensive drugs was a significant factor for achieving blood pressure control but most of them were poor compliance and poor knowledge on disease and medication at initial stages however that was improved by pharmaceutical care in follow up visits. There is need for effective measures to improve adherence and educate them about the disease and medication knowledge among patients with Hypertension.

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REFERENCES

1. Lawes CM, Vander Hoorn S, Rodgers A. Global burden of blood pressure related disease, 2001. *Lancet* 2008; 3(371):1513-8.
2. Egan BM, Zhao Y, Axon RN. US trends in prevalence, awareness, treatment, and control of hypertension, 1988-2008. *JAMA*. 2010; 303: 2043-50.
3. Hansson L, Dahlof B, Gudbrandsson T, Hellsing T, Kullman S, Kuylentierna J. Antihypertensive effect of felodipine or hydralazine when added to beta-blocker therapy. *J Cardiovasc Pharmacol*. 1988; 12:94-101.
4. Kjeldsen SE, Farsang C, Sleigh P, Mancia G. International Society of Hypertension. *J Hypertens*. 2001; 19:2285-8.
5. Ramsay LE. British Hypertension Society Guideline for hypertension management. *Br Med J*. 1999; 319:630-5.
6. Kapoor B, Raina RK, Kapoor S. Drug prescribing pattern in a teaching hospital. *Ind J Pharmacol*. 1985; 1:168.
7. Pradhan SC, Shewade DG, Shashindran CH, Bapna JS. Drug utilization studies. *National Med J India*. 1988; 1:185.
8. Salvetti A, Ghiadoni L. Thiazide Diuretics in the Treatment of Hypertension: An Update. *Journal of the American Society of Nephrology*. 2006; 17(4): S25-S29.
9. Psaty BM, Lumley T, Furberg CD, Schellenbaum G, Pahor M, Alderman MH. Health outcomes associated with antihypertensive therapies used as first-line agents: A systematic review and meta-analysis. *Journal of the American Medical Association*. 1997; 277:739-45
10. Chaturvedi M, Jindal S, Kumar R. Lifestyle modification in hypertension in the Indian context. *J Indian Acad Commun Med*. 2009; 10:46-51.
11. Yuen YH, Chang S, Chong CK, Lee SC, Critchlev JA, Chan JC. Drug utilization in a hospital general medical outpatient clinic with particular reference to antihypertensive and antidiabetic drugs. *J Clin Pharm Ther*. 1998; 23:287-94.

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