

Study of prescribing patterns of antihypertensives in South Indian population

Manasa Cidda¹, Uday Venkat Mateti¹, Murali Krishna Batchu², Srinivas Martha^{1,3*}

¹Department of Pharmacy Practice, St. Peter's Institute of Pharmaceutical Sciences, Kakatiya University, Warangal - 506 001, Andhra Pradesh, India,

²Satya Hospital, Warangal, Andhra Pradesh, India,

³Department of Pharmacology, School of Medicine, College of Health Science, Aksum University, Axum - 1010, Ethiopia

Received: 04 January 2014

Accepted: 02 February 2014

***Correspondence to:**

Dr. Srinivas Martha,
Email: srinivasmrtha@gmail.com

© 2014 Cidda M et al. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: Objective of the study is to study the prescribing pattern of drugs used in the management of hypertension.

Methods: A prospective study was conducted for the period of 6 months in an out-patient department. All patients of either gender with primary essential hypertensive patients who have been diagnosed with hypertension as per Joint National Committee-VII (JNC-VII) guidelines and patients receiving or prescribed with antihypertensive drugs were included. The collected was analyzed for the demographic profile of the patients and the prescribing pattern of antihypertensives drugs used in the treatment of hypertension.

Results: A total of 360 prescriptions were analyzed during the study period, 59% were male and 41% were female. Maximum numbers of the patients were in the age group of 32.2% (50-59) years and 56.73% of the patients were in Stage-I hypertension. The results revealed that, the maximum number of patients underwent dual therapy, followed by 30.24% monotherapy, 13% of patients with triple drug therapy and 8.31% of the patients treated with more than 3 drugs. The results of pharmacotherapy revealed that dual therapy was the most preferred choice of treatment in reducing systolic blood pressure with (25.13%, $p < 0.0001$) Angiotensin receptor-II blocker (ARBs) + β -Blockers than ARBs alone. Whereas in diastolic blood pressure there is a high percentage of reduction was found with (20.24%, $p < 0.0001$) angiotensin converting enzyme inhibitors (ACEIs) + calcium channel blockers (CCBs) compare to ACEIs used alone.

Conclusion: The most common drug classes involved in the study was ARBs 42.24% followed by CCBs 22%. The prescribing patterns of antihypertensive drugs follow the standard treatment as per the algorithm JNC-VII guidelines for hypertension.

Keywords: Antihypertensives, Blood pressure, Prescription

INTRODUCTION

Hypertension affects approximately 972 million people, 333 million in economically developed countries and 639 million in economically developing countries in 2000 and is expected to 156 billion in 2025.¹ Epidemiological studies demonstrate that the prevalence of hypertension is increasing rapidly among Indian urban and rural populations. Prevalence of hypertension in India is reported to vary from 4% to 15% in urban and 2-8% in rural population.^{2,3} Hypertension increase with significant age, obesity, lifestyle, smoking, and alcohol use. These related factors in prevalence of

essential hypertension were seen.⁴ Poor control of this high prevalent disease can lead to the development of ischemic heart disease (IHD), stroke, diabetes and chronic renal failure. This situation is graver in our country since with modernization, we are trading healthy traditional diets for fatty foods; physical jobs for desk bound once and calm rural life for stressful city life. Thus after being referred the diabetic capital; India is also slated to become the hypertension capital. If hypertension left untreated about 50% of the patients will die of coronary, 33% of cerebrovascular stroke, 20% of diabetes and 10-15% chronic renal failure. Therefore, it is important to control the elevated Blood Pressure (BP).⁵

High BP can be treated medically include several classes of drugs, angiotensin converting enzyme inhibitors (ACEIs), Angiotensin II receptor antagonists (angiotensin receptor-II blockers (ARBs)), Beta-blockers (BBs), diuretics, calcium channel blockers (CCBs), α -blockers, peripheral vasodilators are the primary drugs used in treatment and by changing lifestyle factors include losing weight, quitting smoking, eating a healthful diet, reducing sodium intake, exercising regularly, and limiting alcohol consumption or both.^{6,7} In addition to this, some of these drugs are preferred to others depending on compiling indications of the patient (stroke, diabetic, pregnant, etc.). The study of prescribing pattern is a component of medical audit which seeks monitoring, evaluation and necessary modifications in the prescribing practices of the prescribers to achieve rational and cost effective medical care. It is necessary to define prescribing pattern and to identify the irrational prescribing habits to drive a remedial message to the prescribers. The present investigation was carried out to assess the socio-demographic profile of patients suffering from the hypertension and the pattern of prescription of drugs used in the management of hypertension.

METHODS

Study protocol and patient population

A prospective study was conducted from March 1, 2011 to August 30, 2011 in an out-patient setting of Internal Medicine Department at the Sathya Hospital, Warangal. Ethical approval was obtained from the hospital Ethics Committee prior to the study initiation. All patients of either sex with primary essential hypertensive patients diagnosed as per Joint National Committee-VII (JNC-VII) guidelines and those receiving or prescribed with antihypertensive drugs in the above time period were included in the protocol. Exclusion criteria included patients below the age of 18 years, female who were pregnant, those attending the clinic but unwilling to participate in the study and patients with secondary hyperextension. Demographic information including age, gender, educational status, height, weight, and family history of hypertension, clinical findings, laboratory and therapeutic data were collected by direct interview at the time of visit, and from patient case files; treatment chart/medication chart, lab data reports and discharge cards. Details necessary for evaluation regarding concomitant medications, comorbidities, and others were collected. Data was obtained from the patients by scrutinizing the out patients. The collected data was analyzed for the socio-demographic profile of the patients like age, sex, educational status, Body Mass Index (BMI), family history of hypertension, stages of hypertension (JNC-VII) and comorbidities. Prescribing pattern of antihypertensives drugs used for the treatment of hypertension antihypertensive drugs were grouped into seven categories, namely ACEIs, ARBs, BBs, CCBs, diuretics, alpha adrenergic blockers and central

sympatholytic drugs. Multiple treatments of antihypertensive medications fell into the aforementioned seven main drug categories. All the patients were followed for every 3 months for a period of 1 year.

Statistical analysis

The baseline BP and 12th month follow-up BP results were compared statistically by paired student 't' test by using GraphPad Prism software. $p < 0.05$ were considered as statistically significant.

RESULTS

A total of 360 prescriptions were analyzed during the study period. Out of which 212 (59%) were male and 148 (41%) were female. Maximum numbers of the patients were in the age group of 116 (32.2%) 50-59 years, 152 (42.54%) of the patients were belonged to educational status of Grade 2 (Pre University Course), 204 (56.7%) of the patients were in Stage-I hypertension, 256 (71.1%) of the patients had a family history of hypertension and 182 (50.5%) were of normal BMI. Out of 360 patients, 206 (57.2%) of the patients had single comorbidity (71% diabetes mellitus (DM), 10.72% IHD and others) and 46 (12.7%) multiple comorbidities (30.74% DM + IHD, 17.52% DM + congestive heart failure and others) whereas 108 (30.1%) no comorbidities. The results of demographics were summarized in Table 1. The results revealed that, the maximum number of 174 (48.3%) patients underwent dual therapy (the most commonly prescribed dual therapy were diuretics + angiotensin II receptor antagonists (ARBs) 124 (71.3%) followed by diuretics + ACEIs 26 (15.0%) and others), followed by 109 (30.2%) monotherapy (the most commonly prescribed monotherapy were angiotensin II receptor antagonists (ARBs) 46 (42.2%) followed by CCBs 24 (22.0%) and others), 47 (13.0%) of patients with triple drug therapy (the most commonly prescribed triple drug therapy were diuretics + ARBs + BBs 10 (21.2%) followed by diuretics + ARBs + ACEIs 9 (19.1%) and others) and 30 (8.3%) of the patients treated with more than three drugs (the most commonly prescribed with more than three drugs were (ACEIs + α blocker) + (β blockers + hydrochlorothiazide (HCTZ)) 6 (20%), followed by (ARBs + HCTZ) + (diuretics + β Blockers) 6 (20%), (ARBs + diuretics) + (2 diuretics) 6 (20%) and others). The results of detailed Pharmacotherapy were summarized in Table 2. The results of monotherapy revealed the most preferred choice of treatment in reducing systolic blood pressure (SBP) ((20.62%), $p < 0.0001$) and diastolic blood pressure (DBP) ((13.13%), $p < 0.0001$) with angiotensin II receptor antagonists (ARBs), followed by others were summarized in Table 3. The results of combination therapy revealed the most preferred choice of treatment in reducing SBP ((25.16%), $p < 0.0001$) and DBP ((20.2%), $p < 0.0118$) with Angiotensin II receptor antagonists (ARBs) + β blockers, followed by others were summarized in Table 4.

Table 1: Demographic details of the patients.

Demographics	No. (%)
1. Age	
20-39	30 (8.33)
40-49	70 (19.44)
50-59	116 (32.22)
60-69	108 (30)
70-89	36 (10)
2. Sex	
Male	212 (58.88)
Female	148 (41.11)
3. Educational status	
Grade 0 (uneducated)	60 (16.66)
Grade 1 (up to 9 th class)	78 (21.66)
Grade 2 (PUC)	152 (42.22)
Grade 3 (Graduate/PG)	70 (19.44)
3. Family history of hypertension	
Father	106 (29.44)
Mother	82 (22.77)
Both	20 (5.55)
Others	48 (13.33)
No history	104 (28.88)
4. Body mass index (kg/m ²)	
Under weight (<20)	10 (2.77)
Normal weight (20-27.5)	182 (50.55)
Over weight (>27.5)	168 (46.66)
5. Stages of hypertension (JNC-7)	
Prehypertension (80-89 mmHg)	22 (6.11)
Stage-I (90-99/140-159 mmHg)	204 (56.66)
Stage-II (>/100/>160 mmHg)	134 (37.22)
6. Comorbidities	
Single	206 (57.22)
Multiple	46 (12.77)
No comorbidities	108 (30)

Table 2: Pharmacotherapy of the patients.

Pharmacotherapy	No. (%)
1. Monotherapy	
ARBs	46 (42.20)
CCBs	24 (22.01)
ACEIs	18 (16.51)
Diuretics	12 (11)
Beta blockers	9 (8.25)
2. Triple therapy	
Diuretics+ARBs+ACEIs	9 (19.14)
Diuretics+ARBs+Beta blockers	10 (21.27)
Diuretics+ARBs+diuretics	7 (14.89)
Diuretics+ARBs+CCBs	7 (14.89)
Diuretics+ARBs+Alfa blockers	3 (6.38)
Diuretics+ACEIs+CCBs	3 (6.38)
Diuretics+ACEIs+Beta blockers	5 (10.63)
Diuretics+Beta blockers+Alfa blockers	3 (6.38)
3. Dual therapy	
Diuretics+ARBs	124 (71.26)
Diuretics+ACEIs	26 (14.94)
Diuretics+Beta blockers	8 (4.59)
ACEIs+CCBs	6 (3.44)
ACEIs+Beta blockers	2 (1.14)
ARBs+CCBs	2 (1.14)
ARBs+Beta blockers	4 (2.28)
β blockers+CCBs	2 (1.14)
4. More than three drug therapy	
(ARBs+diuretics) + (2 diuretics)	6 (20)
(ARBs+HCTZ) + (2 diuretics)	4 (13.33)
(ACEIs + α blocker) + (β blockers+HCTZ)	6 (20)
(ARBs+HCTZ) + (diuretics+CCBs)	4 (13.33)
(ARBs+HCTZ) + (diuretics + β blockers)	6 (20)
(ARBs+HCTZ) + (β blockers+CCBs)	2 (6.66)
(ARBs+HCTZ) + (α blocker+CCBs)	2 (6.66)

DISCUSSION

Our study results reveal that out of 360 patients, 59% of the patients were males and 41% females, careful literature review reveals that there is no consistency in the gender distribution of patients suffering from hypertension because some of studies have reported a higher percentage of hypertension in males and some of studies have reported a higher percentage hypertension in females.^{3,8,9} In the present study, maximum numbers of patients were in the age group of 50-59 years these results were similar to the earlier study and 71.1% of the patients had a family history of hypertension reinforces the fact that there is a strong genetic predisposition in hypertension.^{3,9} 50.5% of the patients were of normal BMI followed by 46.7% of the patients were overweight and 2.8% of the patients were underweight, our results were not consistency with a similar study of Pittrow

et al.¹⁰ In the present study, it was observed that the higher rates of 51.66% Combination therapy of antihypertensives were prescribed than 48.33% monotherapy and compared to previous studies of Kulkarni et al. who reported the most common drug combination therapy seems to be a rational approach to reduce the cardiovascular morbidity.¹¹ The recommendations of several studies demonstrated that combination therapy was necessary in at least 70% of cohort to achieve optimal BP control.^{12,13} Maximum number of patients underwent 48.3% dual therapy followed by 30.2% monotherapy, 13% triple therapy, and 8.3% more than three drugs. It was also observed that out of the patients who underwent multiple drug therapy maximum numbers of patients were prescribed with fixed dose combinations. The higher choice of fixed dose combination products offer a potential means of reducing pill burden and cost for the patient convenience and compliance.¹¹

Table 3: Comparison of systolic blood pressure and diastolic blood pressure in monotherapy.

Drug class	BSBP	SBP	Reduction of SBP (%)	P value	BDBP	DBP	Reduction of DBP (%)	P value
ARBs	159.68±10.57	126.86±8.61	20.62	<0.0001	98.64±6.89	85.64±6.23	13.13	<0.0001
CCBs	157.25±11.67	129.47±9.64	17.83	<0.0001	96.22±6.12	86.82±6.88	9.37	<0.0001
ACEIs	157.23±12.5	139.5±11.62	12.02	<0.0001	95.62±7.45	87.42±6.25	8.33	<0.0011
Diuretics	154.6±13.5	134.1±10.8	9.33	<0.0005	92.31±6.5	86.88±4.6	5.43	<0.274
β blockers	149.50±11.6	136.3±10.8	13.54	<0.0237	96.28±6.3	88.54±5.2	7.29	<0.0118

BSBP: Baseline systolic blood pressure, BDBP: Baseline diastolic blood pressure

Table 4: Comparison of systolic blood pressure and diastolic blood pressure in combination therapy.

Drug class	BSBP	SBP	Reduction of SBP (%)	P value	BDBP	DBP	Reduction of DBP (%)	P value
Diuretics+ARBs	158.3±11.5	130.4±11.5	17.67	<0.0001	97.64±6.89	85.64±5.83	12.23	<0.0001
Diuretics+ACEIs	163.4±15.8	133.7±14.53	18.41	<0.0001	95.82±6.12	81.12±7.88	15.58	<0.0001
Diuretics+β blockers	161.8±14.3	135.12±11.75	16.14	<0.0011	97.62±8.45	80.42±6.95	18.31	<0.0011
ACEIs+CCBs	160.7±11.6	126.78±11.0	20.62	<0.0004	99.71±10.21	80.18±7.32	19.61	<0.274
ARBs+β blockers	165.3±8.4	120.14±8.2	25.16	<0.0001	100.1±6.6	81.44±5.4	20.22	<0.0118

BSBP: Baseline systolic blood pressure, BDBP: Baseline diastolic blood pressure

In our study, the most commonly prescribed monotherapy were ARBs followed by CCBs, Diuretics and β blockers. Similar pattern of prescribing ARBs, CCBs and ACEIs were found in the previous study.¹⁴ The most commonly prescribed dual therapy were diuretics + angiotensin II receptor antagonists (ARBs) followed by diuretics + ACEIs and others. Earlier studies have shown that diuretic and ACEIs can alone or in combination with different antihypertensives drugs can be used.¹⁴ The most commonly prescribed triple drug therapy was diuretics + ARBs + BBs followed by diuretics + ARBs + ACEIs and others. This indicates that diuretics are used as first line therapy which complies with JNC-VII guidelines and the previous studies have also shown the same results.¹⁵ In comparison of the reduction of SBP in monotherapy versus combination therapy there is a higher percentage of reduction was found in combination therapy ARBs + β blockers than ARBs used alone. Whereas in DBP there is a higher percentage of reduction was found with ACEIs + CCBs compared to ACEIs used alone.

Limitations of the study

The duration of the study was only a period of 6 months. This study was conducted at a single hospital setup.

CONCLUSION

This study revealed that among the different approaches of treatment, diuretics + angiotensin II receptor antagonists (ARBs) dual therapy was found to be the most preferred choice of treatment. The reduction of SBP in monotherapy versus combination therapy there is a higher percentage of reduction was found in combination therapy ARBs + β

blockers than ARBs used alone. Whereas in DBP there is a higher percentage of reduction was found with ACEIs + CCBs compared to ACEIs used alone. The prescribing patterns of antihypertensive drugs follow the standard treatment as per the algorithm JNC-VII guidelines for hypertension.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: Not required

REFERENCES

- Kearney PM, Whelton M, Reynolds K, Muntner P, Whelton PK, He J. Global burden of hypertension: analysis of worldwide data. *Lancet.* 2005;365(9455):217-23.
- Gupta R, Gupta VP. Hypertension epidemiology in India: lessons from Jaipur heart watch. *Curr Sci.* 2009;97(3):349-55.
- Tasneem S, Vamsi Krishna E. Survey of prescription pattern of anti-hypertensive drugs in hypertensives and hypertension associated diabetics. *Int J Pharma Bio Sci.* 2010;1(4):23-6.
- Mili J, Rao BS, Khan GM. Study of drug use in essential hypertension and their compliance. *KUJSET.* 2006;2(6):1-13.
- Sushil KB, Vartika S, Sunil DK, William KG, Richard WW, Deepak G. The prevalence of hypertension and hypertension risk factors in a rural Indian community: a prospective door-to-door study. *J Cardiovasc Dis Res.* 2012;3(2):117-23.
- Sepehri G, Talebizadeh N, Mirzazadeh A, Mohsenbeigi M. The patterns of antihypertensive drug prescription by cardiologists in Kerman province of Iran, 2006. *Pharmacoepidemiol Drug Saf.* 2008;17:180-5.
- Chiang CW, Chen CY, Chiu HF, Wu HL, Yang CY. Trends in the use of antihypertensive drugs by outpatients with diabetes in Taiwan, 1997-2003. *Pharmacoepidemiol Drug Saf.* 2007;16:412-21.
- Preethi GP, Jnaneshwara S, Narendranath S. Prescribing patterns of antihypertensive drugs in a South Indian tertiary

- care hospital. *Drug Invent Today*. 2011;3(4):38-40.
9. Jackson JH, Sobolski J, Krienke R, Wong KS, Frech-Tamas F, Nightengale B. Blood pressure control and pharmacotherapy patterns in the United States before and after the release of the Joint National Committee on the Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7) guidelines. *J Am Board Fam Med*. 2008;21(6):512-21.
 10. Pittrow D, Kirch W, Bramlage P, Lehnert H, Hoffer M, Unger T, et al. Patterns of antihypertensive drug utilization in primary care. *Eur J Clin Pharmacol*. 2004;60:135-42.
 11. Kulkarni SK, Tiwari H, Kumar A. Prescription monitoring of antihypertensive drug utilisation at the Punjab University Health Centre in India. *Singapore Med J*. 2004;45(3):117-20.
 12. Susheela SH, Narendranath S, Somashekar HS, Reshma SR, Keerthi SJ, Ramachandra K. Prescriptive pattern of antihypertensives in tertiary care hospital using DU-90%. *Int J Pharm Res Dep*. 2012;4(1):107-13.
 13. Andros V, Egger A, Dua U. Blood pressure goal attainment according to JNC 7 guidelines and utilization of antihypertensive drug therapy in MCO patients with type 1 or type 2 diabetes. *J Manag Care Pharm*. 2006;12:303-9.
 14. Jun M, Lee KV, Randall SS. Changes in antihypertensive prescribing during US outpatient visits for uncomplicated hypertension between 1993 and 2004. *Hypertension*. 2006;48:846-52.
 15. Fischer MA, Avorn J. Economic implications of evidence-based prescribing for hypertension: can better care cost less? *JAMA*. 2004;291(15):1850-6.

doi: 10.5455/2319-2003.ijbcp20140409

Cite this article as: Cidda M, Mateti UV, Batchu MK, Martha S. Study of prescribing patterns of antihypertensives in South Indian population. *Int J Basic Clin Pharmacol* 2014;3:303-7.