Antihypertensive Prescription Pattern and Compliance to JNC 7 and JNC 8 at Tertiary Care Government Hospital, Hyderabad, India: A Cross-sectional Retrospective Study

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Abstract

Background: The monitoring of hypertension treatment can provide insight into the rational drug use pattern. The objective of this study was to examine the antihypertensive medication use among South Indian adults with hypertension in compliance with the hypertension treatment guidelines (Seventh Joint National Committee [JNC 7] and JNC 8). **Methods and Results:** A total of 550 hypertensive people aged >25 years were included in this retrospective cross-sectional study. The order of drugs prescribed in the year 2012 was beta blockers (BB) > calcium channel blockers (CCB) > CCB + BB > angiotensin receptor blockers (ARB) > angiotensin-converting enzyme inhibitors (ACEI) > thiazide diuretics, whereas in the year 2014, the order has changed drastically, namely, ACEI > CCB > ARB > BB > thiazide diuretics ($P < .001$). Most notably, there was a large increase in the use of monotherapy (from 56.9% to 82.5%, $P < .001$). The usage of BB has simply moved from the first position to the last position in concordance with JNC 8 guidelines, whereas use of thiazide diuretics was found to be the least preferred drug in the 2012 prescriptions, thus deviating from JNC 7 guidelines. The use of generic names (28.3% vs 11.3%) and National List of Essential Medicines (NLEM) compliance (79.3% vs 60.9%) were significantly more in the calendar year 2012 than in the calendar year 2014 ($P < .001$). **Conclusions:** Antihypertensive medication use has gone through wide variations among south Indian adults with hypertension. Combination therapy regimens must be adopted as per the guidelines for achievement of blood pressure goals.

Keywords

antihypertensive drugs, adherence, prescription pattern, JNC 7, JNC 8, India

Introduction

High blood pressure (BP) is a major public health issue in India and is rampant among both urban and rural populations.¹ It is the key modifiable risk factor for many diseases. Although lifestyle modification is important in hypertension management, most hypertensive individuals require ≥ 2 antihypertensive drugs to reduce their BP and maintain it. In 2003, the National High Blood Pressure Education Program Coordinating Committee published the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7).² These guidelines recommended angiotensin-converting enzyme inhibitors (ACEI), angiotensin receptor blockers (ARB), beta blockers (BB), calcium channel blockers (CCB), or thiazide-type diuretic classes as initial therapy but recommended thiazide-type diuretics as initial therapy for most patients without compelling indication

for another class, and the use of ≥ 2 antihypertensive agents from different drug classes to achieve the goal of BP control (BP of <130/80 mm Hg for patients with diabetes mellitus or chronic kidney disease; and a BP of <140/90 mm Hg for all other hypertensive people). While in 2014, Eighth Joint National Committee (JNC 8) was formulated.³ These guidelines in contrast to the JNC 7 have now set the same preference to the drugs except for BB. The goal BP were revised to <150/90 mm Hg for age ≥ 60 years while <140/90 mm Hg for hypertensive adults with

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diabetes or nondiabetic chronic kidney disease and also for the general hypertensive population younger than 60 years. In connection to this, we conducted a cross-sectional retrospective study in 2 calendar years, namely, 2012 and 2014, to determine rational drug prescription of antihypertensive drugs and to note whether the physicians have adopted the new guidelines.

Materials and Methods

The study was initiated after obtaining approval from Institutional Ethics Committee at National Institute of Nutrition (NIN protocol number: 02/2011/IV bearing ERC No. ECR/351/Inst/AP/2013) and the study center which is Gandhi Hospital (Rc. No. IEC/GMC/2012/dt 18/6 bearing ERC No. ECR/180/Inst/AP/2013).

Following World Health Organization (WHO) guidelines, a schedule for monitoring the prescription profile of antihypertensive drugs was indigenized, pretested, and standardized. The study was carried out in the outpatient block in the Department of General Medicine at Gandhi Hospital during June to December 2012 and July to December 2014. Therefore, the prescription profiles were studied in 2 calendar years, namely, 2012 and 2014. The information was collected from the prescriptions of the patients after consulting the physician, with an age more than 25 years, of either gender who were chronic or de novo hypertensive and agreed to provide the information requested. The standardized schedule encompasses information regarding the sociodemographic details, antihypertensive drugs prescribed, number of comorbidities, and total number of drugs prescribed. The prescription was also analyzed for the usage of generic names. The compliance to National List of Essential Medicines (NLEM) 2011 was also evaluated.⁴ Antihypertensive therapy could be monotherapy or polytherapy where a single active ingredient is used or may have single pill or multiple combinations of active antihypertensive ingredients, respectively.

Descriptive statistics were used to understand the basic characteristics of the study. The prescription profile of antihypertensive therapy was measured in the years 2012 and 2014 using the chi-square test of heterogeneity. The data were also compared to see whether any differences existed between previous and current therapy as the data were collected in a retrospective fashion. The variables captured were age groups, gender, age of hypertension, classes of drugs, use of generic drug names or trade names, type of therapy, NLEM antihypertensive drugs, comorbidity, total number of drugs in the prescription, and calendar year. The Statistical Package for Social Sciences (SPSS) version 16.0 was used for all statistical analyses. All *P* values < .05 were regarded as statistically significant.

Results

A total of 652 hypertensive individuals were initially screened. Of these, 58 patients who were treated with other

classes of antihypertensive agents (α -blockers, vasodilators, and other classes of antihypertensive) due to their fewer numbers were not included for the purpose of study along with 44 patients who were uncooperative and noncompliant. We were left with 550 prescriptions, which were considered for the prescription study.

Majority of the population belonged to less than 50 years of age in both the calendar years (Table 1). The number of males with hypertension attending the outpatient block was higher in the year 2014 (*n* = 217, 79.2%) than in the year 2012 (*n* = 159, 57.6%).

The age of hypertension is defined as the time period from the date of first diagnosis of hypertension till the date of collection of data. It is critical to note that a great proportion of patients were in the less than 1 year group (90.1%) of age of hypertension in the year 2014, indicating more number of people were recently diagnosed with hypertension and are drug naive, whereas 46% belonged to the 1- to 5-year group during the year 2012. The 2012 prescriptions were more compliant with the usage of generic names: previous generic names (24% vs 11.4%, *P* < .001) and current use of generic names (28.3% vs 11.3%, *P* < .001). Similar was the case with NLEM compliance (previous therapy: 79.6% and 61.8%; current therapy: 79.3% and 60.9%, respectively). It was noticed that the majority of study population had only essential hypertension (year 2012: 71% and year 2014: 97.1%, *P* < .001), and few comprised of other comorbidities.

Most importantly, monotherapy was highly preferred in previous (79% vs 52.1%) as well as in the current therapy (82.5% vs 56.9%, *P* < .001) of 2014 prescriptions. It was alarming to have seen as meager as 0.7% in 2012 and 0% in 2014 prescriptions contained thiazide diuretics in the current therapy (Figure 1). Among all antihypertensive drug visits, in the year 2012, BB (previous therapy: 24.1% and current therapy: 21.7%, *P* < .001) were majorly prescribed, while it is striking to notice that BB were least prescribed monotherapy after thiazide diuretics in the year 2014 (Supplementary Table 1). Moreover, ACEI (24.5%) were the first choice of drug during 2014 in the current therapy, whereas CCB was prescribed 23.5% in previous therapy. It is interesting to note that the third choice of drug prescribed during 2012 after CCB (previous therapy: 15.3% and current therapy: 17.4%, *P* < .001) was combination of CCB and BB (previous therapy: 14.8% and current therapy: 13.4%, *P* < .001). Among the combination therapy, CCB were the most commonly combined drug with other antihypertensive drugs (22.4% in 2012 and 13.1% in 2014, *P* < .001).

Discussion

Our study recorded the use of antihypertensive drugs in the order of BB > CCB > CCB + BB > ARB > ACEI in the year 2012, whereas in the year 2014, the order has changed drastically, namely, ACEI > CCB > ARB > BB. In concordance with our 2012 prescriptions, cardiologists of Iran also preferred the use of BB followed by CCB.⁵ Although our study

Table 1. Basic Characteristics of the Prescription Profile of the Antihypertensive Drugs During the Years 2012 and 2014.

Variable	2012 (n = 276)		2014 (n = 274)		Total (N = 550)		P value
	n	%	n	%	n	%	
Age	276	53.22 ± 0.72	274	51.2 ± 0.7	550	52.21 ± 0.504	.045
Age group							NS
<50	97	35.1	114	41.6	211	38.4	
50-59	80	29	77	28.1	157	28.5	
60-69	70	25.4	66	24.1	136	24.7	
≥70	29	10.5	17	6.2	46	8.4	
Gender							.001
Male	159	57.6	217	79.2	376	68.4	
Female	117	42.4	57	20.8	174	31.6	
Age of hypertension, y							.001
<1	94	36	247	90.1	341	63.7	
1-5	120	46	27	9.9	147	27.5	
>5-10	36	13.8	0	0	36	6.7	
>10	11	4.2	0	0	11	2.1	
Generic name usage—previous therapy							.001
Yes	52	24	31	11.4	83	15.1	
No	153	70.5	241	88.6	394	71.6	
Both	12	5.5	0	0	12	2.2	
Type of therapy—previous therapy							.001
Monotherapy	113	52.1	215	79	328	67.1	
Ditherapy	87	40.1	53	19.5	140	28.6	
More than 3	17	7.8	4	1.5	21	4.3	
NLEM compliance—previous therapy							.001
Yes	179	79.6	168	61.8	347	69.8	
No	46	20.4	104	38.2	150	30.2	
Generic name usage—current therapy							.001
Yes	78	28.3	31	11.3	109	19.8	
No	175	63.4	243	88.7	418	76	
Both	23	8.3	0	0	23	4.2	
Type of therapy—current therapy							.001
Monotherapy	157	56.9	226	82.5	383	69.6	
Ditherapy	99	35.9	47	17.2	146	26.5	
More than 3	20	7.2	1	0.4	21	3.8	
NLEM compliance—current therapy							.001
Yes	219	79.3	167	60.9	386	70.2	
No	57	20.7	107	39.1	164	29.8	
Comorbidity							.001
None	196	71	266	97.1	462	84	
1 or more	80	29	8	2.9	88	16	
Total number of drugs							.002
1	67	24.3	43	15.7	110	20	
2	60	21.7	88	32.1	148	26.9	
3	64	23.2	75	27.4	139	25.3	
4	49	17.8	49	17.9	98	17.8	
5 or more	36	13	19	6.9	55	10	

Note. All percentages are across columns. P values represent chi-square tests of heterogeneity comparing the respective proportions across rows during the years 2012 and 2014. NS represents nonsignificance. NLEM = National List of Essential Medicines.

has shown usage of BB the most, other studies conducted in different parts of India, namely, northern,⁶ western,⁷ and southern regions,⁸⁻¹⁰ witnessed CCB as the highly prescribed

drug followed by ACEI except in the study by Pai et al.¹⁰ In contrast to the highly prescribed CCB, a study conducted by Cidda et al have found the use of ARB majorly, followed by

Figure 1. Antihypertensive drugs compared between previous and current therapy during the year 2012 and 2014 in a retrospective cross-sectional study.

Note. Other dithierapy includes BB + ARB, CCB + Diuretics, BB + ACEI, and ACEI + Diuretics. Tritherapy is defined as prescriptions with 3 active antihypertensive ingredients. *P* values are less than .001 which represents chi-square tests of heterogeneity comparing the respective proportions across rows between previous and current therapy during the years 2012 and 2014. ACEI = angiotensin-converting enzyme inhibitors; ARB = angiotensin receptor blockers; CCB = calcium channel blockers; BB = beta blockers; C = current therapy; P = previous therapy.

CCB.¹¹ The international scenario also suggests a similar prescription pattern. In a massive study conducted in China during 2004-2007 and 2011-2015, CCB were the first choice of drug followed by BB and ARB/ACEI, respectively.^{12,13} In contrast, CCB were found to be least prescribed in a study conducted in northern India,¹⁴ Bangladesh,¹⁵ and Mexico,¹⁶ whereas ARB, ARB, and ACEI were most preferred in these areas, respectively. Studies from Nigeria¹⁷ and Istanbul¹⁸ have shown maximum use of ACEI.

Although JNC 7 recommended 5 classes to be considered as initial therapy but recommended thiazide-type diuretics as initial therapy for most patients, it was observed that thiazide-type diuretics were rarely prescribed in most of the studies.^{7,9,14} A similar report was demonstrated by a study conducted in Taiwan by Liu and Wang.¹⁹ This category of drugs does not seem to be the preference of the clinicians, although these are the most cost-effective drugs available.²⁰ There are studies which reported compliance with usage of diuretics such as the data from National Health and Nutrition Examination Survey during 1999-2002²¹ and 2001-2010²² belonging to Caucasian population. Even the Brazilian²³ witnessed usage of diuretics. After updating JNC 7, there were very few studies which have reported antihypertensive drug utilization studies. A north Indian study²⁴ showed higher usage of diuretics (51%) in concordance with a

study conducted in Nigeria (64%)²⁵ and Ethiopia (African population),²⁶ whereas diuretics were the last choice of drug in a south Indian study (3.1%).²⁷ It is interesting to note that in the JNC 8 guidelines, BB were not part of the first line therapy, and the same has reflected in our drug utilization study. A study, ASCOT-BPLA (Anglo-Scandinavian Cardiac Outcomes Trial-Blood Pressure Lowering Arm), showed that BB were associated with greater risk of coronary events and greater risk of stroke when compared with an amlodipine-based regimen.²⁸ In another study conducted in geriatric population, BB monotherapy was not only ineffective, but when combined with diuretics, the benefits of the therapeutic outcome distinctly diminished.²⁹ These reasons may have contributed to removal of BB from the first line therapy in JNC 8. But if you look at the 2012 prescription pattern, BB were highly preferred choice of drug. This clearly indicates that the JNC 8 guidelines were adopted quickly by the clinicians, while the scenario might have not changed to a great extent in other clinical setups. The variations in different prescribing patterns across the world may be attributed to the genetic makeup of the populations. The therapeutic outcome is based on the gene pool of the multiple ethnicities³⁰; therefore, we observe the different recommendations in black and nonblack populations.³ Large studies are necessary to identify the drugs that are more

suitable to the given population, thereby rationalizing the prescription pattern. Furthermore, the prescription data in relation to dynamic activities are barely available to propagate among the physicians. Therefore, the decision is independent most of the time and is influenced by the information provided by the medical representatives.³¹ The socioeconomic profile also plays a crucial role in a country like ours where prescription pattern is dependent.³²

In contrast to the suggested use of combination therapy in various hypertension management guidelines, be it JNC 7 or 8, here we notice that the monotherapy was used profoundly³³; this can be probably attributed to the presence of rather naive hypertensive patients who have recently been diagnosed with high BP. In addition, the fixed drug combinations were not found to be available in the government hospital as they were not quoted in the NLEM list. Although evidence-based studies have found that combination therapy leads to better BP reduction with low-dose combinations, very few studies have adopted it, such as Nigerian study²⁵ with 97.5% use of combinations and 56.1% in a south Indian study.³⁴

The usage of generic names and NLEM compliance are among the different ways to measure the rational drug utilization pattern in the prescription profiles. In our study, prescriptions of the 2012 were found to be more close to these indicators when compared with the calendar year 2014. In another study conducted in India, 65% of adherence to NLEM was noted.³⁵ Even though the adherence shown in 2012 is more than in 2014, it is always the clinicians' discretion that plays a pivotal role in the prescription of the medicines. Furthermore, the results of various studies have shown that adherence to clinical guidelines are not homogeneous; in fact, they have been found to vary with time and region, and patient characteristics and physicians' discretion play a huge role. Therefore, a deviation from the recommendations may always be expected.

Conclusion

In conclusion, our study has revealed that JNC 8 guidelines were followed closely by the clinicians of the tertiary care government hospital. The physicians were up-to-date with the new hypertension guidelines. It was also observed that change in the first choice of antihypertensive therapy is significantly different in both the calendar years of 2012 (BB) and 2014 (ACEI). A regular monitoring of the prescription pattern is essential to keep a tab on the rational drug prescriptions for a better therapeutic outcome.

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Declaration of Conflicting Interests

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Supplementary Material

The supplements for the article are available online.

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