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Original Research Article

An assessment of antihypertensive drug prescription patterns and adherence to joint national committee-8 hypertension treatment guidelines among hypertensive patients attending a tertiary care teaching hospital

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ABSTRACT

Background: The new guidelines issued by the joint national committee on prevention, detection, evaluation, and treatment of high blood pressure (JNC-8) emphasize that aggressive blood pressure (BP) control is essential to reducing morbidity and mortality. Patient non-adherence is a serious obstacle to the effective treatment of many acute and chronic disorders. Successful treatment and outcome of a chronic disease such as hypertension depend on many factors, including resources (e.g., funds, space, and people), avoidance of serious adverse events, patient adherence with treatment plans, and the availability of effective therapies. The aim of this study is to assess the antihypertensive drug prescription patterns and adherence to joint national committee (JNC-8) hypertension (HT) treatment recommendations among hypertensive patients attending a tertiary care teaching hospital.
Methods: An observational and cross-sectional prospective prescription audit study was carried over a period of 1 year in ambulatory patients attending medicine OPD. A total of 500 prescriptions prescribed to diagnose HT were analyzed. Drug prescription patterns, and their adherence to JNC-8 report was assessed.
Results: Out of 500 patients, 299 (59.8%) were male and 201 (40.2%) were female. Mean age of male and female patients were found to be 57.68±15.32 and 61.29±12.65 years respectively. As per present study, most of the physicians prescribed single drug (monotherapy, 34.6%) to control BP followed by two-drug combination (18.4%), three-drug combination (11.8%) and four-drug combination (3%). Two drugs regimen was prescribed in 18.4% of the hypertensive patients. Angiotensin receptor blocker + diuretic combination (4.4%) was mostly used in two drug combination therapy followed by Angiotensin receptor blockers + Diuretics (3.6%) and Calcium channel blocker + ACEIs combination (2.6%). No combination of ACEIs + ARBs was prescribed in any prescription. The overall rate of adherence was 16.5 % (Pre-hypertension); 87.90% (Stage 1 hypertension); and 68.20% (Stage 2 hypertension).
Conclusions: In conclusion, present study demonstrated that physicians are not completely adhering to standard guidelines while treating hypertension with comorbid conditions.

Keywords: Adherence, Anti-hypertensive drugs, Hypertension, Joint national committee-8 guidelines, Prescription patterns

INTRODUCTION

Hypertension, also known as high or raised blood pressure, is a global public health issue**.** It contributes to the burden of heart disease, stroke and kidney failure and premature mortality and disability. It disproportionately affects populations in low- and middle-income countries where health systems are weak.[1] Hypertension rarely causes symptoms in the early stages and many people go undiagnosed. Those who are diagnosed may not have access to treatment and may not be able to successfully control their illness over the long term.[1-3]

Globally cardiovascular disease accounts for approximately 17 million deaths a year, nearly one third of the total.[4] Of these, complications of hypertension account for 9.4 million deaths worldwide every year.[5] Hypertension is responsible for at least 45% of deaths due to heart disease (total ischemic heart disease mortality), and 51% of deaths due to stroke (total stroke mortality).[4] In 2008, worldwide, approximately 40% of adults aged 25 and above had been diagnosed with hypertension; the number of people with the condition rose from 600 million in 1980 to1 billion in 2008.[6]

The prevalence of hypertension is highest in the African Region at 46% of adults aged 25 and above, while the lowest prevalence at 35% is found in the Americas. Overall, high-income countries have a lower prevalence of hypertension- 35% - than other groups at 40%.[7]

Drug prescription in HT is complex and many factors such as polypharmacy, comorbid conditions, pharmacokinetic and pharmacodynamic variability, and noncompliance make this group a high risk as far drug safety is concerned.[8-10] To inform healthcare providers and to provide pragmatic clinical suggestions and recommendations, international, regional, and national hypertension guidelines have been developed by expert groups globally. Most major hypertension treatment guidelines currently suggest that clinicians should strive to treat adults to a blood pressure target of ≤140/90 mm Hg.[3,11-16]

The Joint National Committee (JNC-8) is considered the "gold standard" consensus guidelines for the management of hypertension. About goals of older individuals, a 2014 report from panel members of the Eighth Joint National Committee (JNC8) suggested that in patients aged ≥60 years, blood pressure should be targeted to <150/90 mm Hg.[14]

Hypertension guidelines, in large part, are evidence based and are usually dictated by randomized controlled trial data and observational studies. In 2013, panel members of the Eighth Joint National Committee published the results of their evidence review and deliberations about the prevention, detection, evaluation, and treatment of high blood pressure.[14] In contrast to the 2003 JNC 7 guideline recommendation, the 2014 guideline is driven by a systematic review of clinical trial evidence.[3,14]

The 2014 guideline offers recommendations for the management of hypertension in[14]:

- People older or younger than age 60 years
- People aged ≥18 years with chronic kidney disease
- People aged ≥18 years with diabetes
- Black and nonblack populations

SPRINT trial results may eventually contribute to a revision of JNC8 recommendations, but for now most experts urge a go-slow treatment approach and continued adherence to the 2014 guidelines.[17]

Table 1: Classification of hypertension as per JNC-8 guideline.

Category	Systolic		Diastolic
Normal	<120	and	<80
Pre-hypertension	120-139	or	80-89
High blood pressure/Hypertension			
Stage 1 Hypertension	140-159	or	90-99
Stage 2 Hypertension	≥160	or	≥100

Although studies are available analyzing prescription trends about anti-HT across various age groups from Western and Indian setup, but there is no single study available in the literature regarding prescription trends and adherence to JNC-8 guidelines while prescribing of anti-HT drugs among Indian hypertensive patients.[18-29]

The overall principles common to these guidelines are to implement life style modifications in addition to pharmacotherapy to control BP in patients with hypertension. Patient's optimal adherence with antihypertensive drug therapy is essential for preventing serious complications with hypertension over the long term.

Hence, the current study was carried to evaluate antihypertensive drug prescription patterns and adherence to Joint National Committee (JNC7-8) HT treatment

recommendations among hypertensive patients in a tertiary care teaching hospital in Central India.

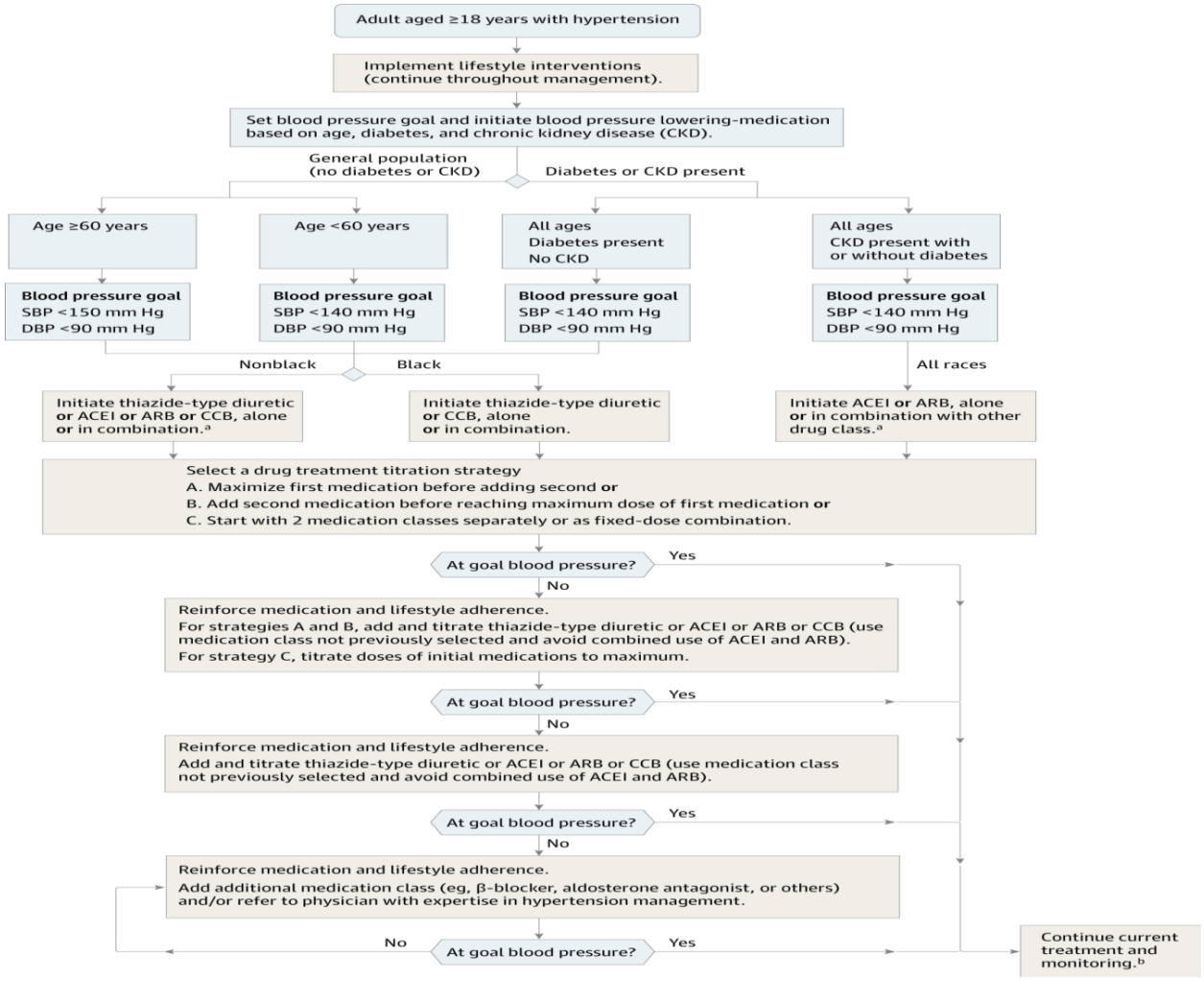
METHODS

An observational and cross-sectional prescription audit study was carried out over a period of one year from September 2015 to August 2016 after approval from Institutional Ethics Committee in teaching care tertiary hospital of Central India. A total of 500 prescriptions prescribed to diagnose HT, were collected for one point analysis.

Antihypertensive drugs were categorized according to the eighth report of the JNC on prevention, detection, evaluation, and treatment of high blood pressure (JNC8).[14] Detail epidemiological profile, presence or absence of any comorbid conditions, antihypertensive drug prescription patterns/trends and their adherence to available clinical practice guidelines/recommendations issued under JNC8 were assessed.[14]

A total of 500 prescriptions were collected from hypertension patients. Each prescription includes the drug, quantity, duration, and date of dispensing. The criterion for obesity was satisfied by applying the Ideal Body Weight (IBW) formula for men and women which is given below:

• IBW (men) = 50 kg±1kg/2.5 cm above or below 150 cm in height (Brahmankar et al).[30]
• IBW (women) = 45 kg ± 1kg/2.5 cm above or below 150 cm in height (Brahmankar et al).[30]



[SBP indicates systolic blood pressure; DBP, diastolic blood pressure; ACEI, angiotensin-converting enzyme; ARB, angiotensin receptor blocker; and CCB, calcium channel blocker. aACEIs and ARBs should not be used in combination. bIf blood pressure fails to be maintained at goal, reenter the algorithm where appropriate based on the current individual therapeutic plan.]

Figure 1: 2014 Hypertension guideline management algorithm.[14]

Any person whose body weight was more than 25% above the IBW was considered obese. The patients were classified in accordance to three different age groups; <40 years, in between 40-60 years, > above 60 years of age.

Data regarding anti-HT monotherapy, dual combination and triple combination were recorded. The prescriptions were collected by an independent person by clicking the picture by mobile outside the medical outpatient department and interviewing the patients without the knowledge of prescriber to avoid any bias after taking written. Each antihypertensive medication was categorized into one of the following classes: thiazide-type diuretics, angiotensin converting enzyme inhibitors (ACEIs) or angiotensin receptor blockers (ARBs), calcium channel blockers (CCBs), β-blockers and other antihypertensive agents. Medication Adherence was assessed by comparing with JNC-8 treatment guidelines shown in Figure 1.[14] The JNC 8 guidelines adherence for the management of hypertension was studied by taking into consideration that the drugs recommended as the first line therapy by JNC8 should be the most frequently prescribed classes of drugs and should have high utilization pattern among the patients. The information about the drug prescribing pattern was derived from the patient's medical record as well as from the interview of the patients and their representatives.

The statistical analysis was carried out using SPSS Version 17 for windows. Data were expressed in n (%). Chisquare test was applied for some of the parameters to prove their statistical significance. P<0.05 was considered to be significant.

RESULTS

Five hundred prescriptions were collected randomly in the duration of one year to assess medication adherence. The demographic and clinical characteristics were shown in Table 2.

Table 2: Baseline demographic and clinical characteristics of hypertensive patients (n=500).

	Males [n=299]	Females [n=201]	Test	P value
Age (Mean ± SD)	57.68±15.32	61.29±12.65	t-test	0.0059
<40 years	74 (24.75%)	51 (25.37%)	X^2	0.8754
40-60 years	132 (44.15%)	69 (34.32%)	X^2	0.0281
Above 60 years	93 (31.10%)	81 (40.3%)	X^2	0.0344
Systolic Blood Pressure (Mean ± SD) [mm Hg]	148.5±14.52	151.6±15.03	t-test	0.0214
Normal (<120 mmHg), n (%)	17 (5.7%)	13 (6.5%)	X^2	0.7126
Pre HTN (120-139 mmHg), n (%)	46 (15.4%)	49 (24.4%)	X^2	0.0120
Stage 1 HTN (140-159 mmHg), n (%)	117 (39.13%)	88 (43.4%)	X^2	0.3414
Stage 2 HTN (≥160 mmHg), n (%)	119 (39.8%)	51 (25.4%)	X^2	0.0009
Diastolic Blood Pressure (Mean ± SD) [mm Hg]		95.60±9.53	t-test	<0.0001
Normal (< 80 mmHg), n (%)	29 (9.7%)	18 (8.95%)	X^2	0.7783
Pre HTN (80-89 mmHg), n (%)	69 (23.08%)	37 (18.41%)	X^2	0.2108
Stage 1 HTN (90-99 mmHg), n (%)	103 (34.44%)	79 (39.3%)	X^2	0.2686
Stage 2 HTN (≥100 mmHg), n (%)	98 (32.8%)	67 (33.33%)	X^2	0.9018

Table 3: Co-morbid conditions of study participants.

Co-morbidities	Male [n=299]	Female [n=201]	Total [n=500]	Percentage (%) [n=500]
Diabetes Mellitus (%)	28 (9.36%)	18 (8.96%)	46	9.2
Cardio vascular diseases (%)	42 (14.05%)	27 (13.43%)	69	13.8
Renal diseases (%)	7	4	11	2.2
Liver Diseases (%)	3	1	4	0.8
Hypothyroidism (%)	5	8	13	2.6
Lungs (%)	6	3	9	1.8
Acid peptic disease	23 (7.69%)	15 (7.46%)	38	7.6
Obesity/overweight	15 (5.02%)	19 (9.45%)	34	6.8
Dyslipidemia	35 (11.70%)	27 (13.43%)	62	12.4
Others (%)	11	17	28	5.6

Out of 500 patients, 299 (59.8%) were male and 201 (40.2%) were female. Mean age of male and female patients were found to be 57.68±15.32 and 61.29±12.65 years respectively. Hypertension was classified according to JNC-8 guidelines and found 95 (19%) (Pre-hypertension/pre-HTN), 205 (48%) (Stage 1 hypertension), and 33% (stage 2 hypertension) cases.[14] The mean systolic blood pressure was 148.5±14.52 mm Hg (males) and 151.6±15.03 mm Hg (females) (Table 2).

Table 4: Antihypertensive medications used by hypertensive patients (males and females) in mono and combination therapies.

Treatment	Percentage [n=500]
Mono-therapy	173 (34.6)
ACE Inhibitor (ACEI)	33 (6.6)
Angiotensin Receptor Blocker (ARBs)	28 (5.6)
Diuretics	51 (10.2)
Calcium channel blockers	38 (7.6)
Beta blockers	18 (3.6)
Alpha agonists	05 (1)
Two-drugs regimen	92 (18.4)
Angiotensin receptor blockers + Diuretics	18 (3.6)
Calcium channel blockers + β-blockers	10 (2)
Diuretics + calcium channel blockers	08 (1.6)
ACE inhibitors + Diuretics	22 (4.4)
Diuretics + β-blockers	05 (01)
Calcium channel blockers + ARBs	11 (2.2)
Calcium channel blockers + ACEIs	13 (2.6)
ACEIs/ARBs + β-blockers	4 (0.8)
Calcium channel blockers + α-agonists	1 (0.2)
ACEs + ARBs	0
Three Drugs Regimen	59 (11.8)
CCBs + ACEIs/ ARBs + Diuretics	21 (4.2)
ARBs + Diuretics + Diuretic	12 (2.4)
ACEIs/ARBs + BBs + CCBs	17 (3.4)
ACEIs/ARBs + BBs + diuretics	09 (1.8)
Four Drugs Regimen	15 (3)
Diuretics + Calcium channel blockers + β-blockers	06 (1.2)
Angiotensin receptor blockers + diuretics + calcium channel blockers	09 (1.8)
Combination with other drugs	161 (32.2)

Diabetes mellitus (9.36%, males; 8.96%, females), other cardiovascular diseases (14.05%, males; 13.43%, females), acid peptic disease (7.69%, males; 7.46%, females) and dyslipidemia (11.70%, males; 13.43%, females) are the most common co-morbidities in hypertension patients (Table 3).

The highest number of male hypertensive patients 132 (44.15%) [n=299] belonged to the age group of 40-60 years while the highest number of female hypertensive patients 81 (40.3%) [n=201] belonged to the age group of above 60 years suggesting the earlier onset of hypertension in males than in females in this particular area where the study has been conducted. The average number of drugs prescribed to each patient was 4-6 (64%).

Table 4 shows the mono and combination therapies for the treatment of hypertension. As per present study, most of the physicians prescribed single drug (monotherapy, 34.6%) to control BP followed by two-drug combination (18.4%), three-drug combination (11.8%) and four-drug combination (3%). About 32.2% cases anti-HTN drugs were prescribed with other drugs in combination. Diuretics (10.2%) are most widely prescribed drugs followed by calcium channel blockers (7.6%), ACE Inhibitors (6.6%) and ARBs (5.6%) in monotherapy. In some cases beta blockers (3.6%) and alpha agonists (1%) also prescribed (Table 4).

Two drugs regimen was prescribed in 18.4% of the hypertensive patients. Angiotensin receptor blocker + diuretic combination (4.4%) was mostly used in two drug combination therapy followed by Angiotensin receptor blockers + Diuretics (3.6%) and Calcium channel blocker + ACEIs combination (2.6). There was different other combinations also prescribed in the hypertensive patients with or without co-morbidities like Calcium channel blockers + β-blockers (2%), Diuretics + β-blockers (1%), ACEIs/ARBs + β-blockers (0.8%) and Calcium channel blockers + alpha agonists (0.2%) (Table 4).

Three drugs combination as an antihypertensive mainly tried CCBs+ACEIs/ ARBs+Diuretics (4.2%) followed by ACEIs/ARBs+BBs+CCBs (3.4%). In few prescriptions it was also observed that four drugs regimen like Angiotensin receptor blockers+Diuretics+Calcium channel blockers combinations (1.8%) also prescribed in uncontrolled hypertensive patients. Majority of the patients were prescribed combination anti-HTN drugs with other drugs (32.2%) may be due to address associated co-morbidities (Table 4).

Among the combination therapy amlodipine + atenolol, amlodipine + losartan, amlodipine + enalapril, atenolol+ chlorthalidone, nebivolol + hydrochlorothiazide, enalapril + hydrochlorothiazide, lisinopril + hydrochlorothiazide, ramipril + hydrochlorothiazide, telmisartan + hydrochlorothiazide and losartan + hydrochlorothiazide were found maximally prescribed in our study population. Amlodipine+hydrochlorthiazide+ telmisartan, amlodipine + hydrochlorthiazide + olmesartan and amlodipine + hydrochlorthiazide + telmisartan + metoprolol were the frequently prescribed triple and four

drug combinations, respectively. There was a tendency noticed of prescribing newly introduced antihypertensive drugs and their combinations such as benidipine, clinidipine, felodipine, lerkanidipine, benazepril, olmesartan, valsartan, irbesartan, nebivolol, carvedilol, candesartan + hydrochlorothiazide, irbesartan + hydrochlorothiazide, and valsartan + hydrochlorothiazide. No combination of ACEIs + ARBs was prescribed in any prescription.

Table 5: Adherence to JNC-8 hypertension treatment recommendations.

JNC-8 HTN Classification	Recommendations	Non-adherence rate (%)	Adherence rate (%)	P-Value (Chi-Square Test)
Pre-HTN				
No drug indicated	83.5	16.5	P<0.0001	
Stage 1 HTN	Thiazide type diuretics for most For many consider ACEIs ARBs BBs CCBs	12.10	87.90 24.14 31.10 11.10 21.56	P<0.0001
Stage 2 HTN	2 Drug combinations for most (usually thiazide type) ACEIs + Diuretics ARBs + Diuretics BBs + Diuretics CCBs + Diuretics	31.80	68.20 22.95 32.75 4.95 7.55	P<0.0001

The overall rate of adherence was 16.5 % (Pre-hypertension); 87.90% (Stage 1 hypertension); and 68.20% (Stage 2 hypertension) presented in Table 5. Almost 100% adherence rate among the patients of hypertensive emergency and urgency with the JNC8 guidelines.

The prescription pattern of these anti-hypertensives were found to be considerately in adherence to the seventh report of Joint National Committee (JNC 8) for the prevention, detection, evaluation and treatment of hypertension, which recommends that the initial choice of treatment for hypertension i.e., stage I (B.P>20/10 mm of Hg than the normal pressure) should be ACEIs, ARBs, thiazide diuretic, and CCBs alone or in combination. Start one drug, titrate to maximum dose, and then add a second drug. Start one drug, then add a second drug before achieving maximum dose of first.[14] Begin 2 drugs at same time, as separate pills or combination pill. Initial combination therapy is recommended if BP is greater than 20/10 mm Hg above goal.[14] Interview of patients and their representatives suggested that patient compliance to the medication was moderate and was better in females as compared to males.

DISCUSSION

Hypertension is a chronic disease requiring lifelong treatment. This study analysed the prescribing pattern in hypertensive patients and its adherence with JNC 8 guidelines for the management of hypertension, attending the outpatient department in a tertiary care teaching hospital. Choice of an antihypertensive drug should be driven by likely benefit in an individual patient, taking into account concomitant diseases such as diabetes mellitus, problematic adverse effects of specific drugs, and cost. The overall goal of treating hypertension is to reduce hypertension associated morbidity and mortality.[31]

The results of this study suggests that hypertension is more prevalent in males (59.8%), compared to females (40.2%). The above pattern is analogous to studies conducted by (Jhaj et al; Malhotra et al; Kothari et al; Murti et al) in India.[32-35] However the above pattern is anomalous to other studies conducted by (Tiwari et al; Surapaneni et al) in India, Pittrow et al in Germany and (Lee et al, in China have reported higher prevalence of hypertension in females than in males.[18,26,29,30] This study also reveals that hypertension is more prevalent in elderly patients belonging to age group 40-60 or more. Study conducted by Tiwari et al found most common age group 50-59 years (33.3%) followed by 60-69 years and 40-49 years (26.7%).[29]

Present study results showed Diabetes mellitus (9.36%, males; 8.96%, females), other cardiovascular diseases (14.05%, males; 13.43%, females), acid peptic disease (7.69%, males; 7.46%, females) and dyslipidemia

(11.70%, males; 13.43%, females) are the most common co-morbidities in hypertension patients. Study done by Amira et al and Kothari et al found 36.6% and 47.72% patients respectively were suffering with comorbid conditions.[34,38] Sakthi S et al reported diabetes mellitus (35%) as the most frequent co-morbidity followed by asthma (5%) and ischemic heart disease (1.6%).[39] Such patients are at greater risk of developing complications. Among the various diseases, cardiovascular diseases pose a major threat. Kothari N et al, reported majority of the patients were suffering from hypertension with diabetes mellitus (37.49%) followed by other associated conditions like ischemic heart diseases (7.12%), congestive heart failure (2%), and chronic kidney diseases (1.11%).[34] Pai et al reported diabetes mellitus (47.5%), ischemic heart disease (16.5%), renal diseases (7.5%) and cardiovascular accidents (16%) as concurrent diseases in his study.[19]

It also shows that most frequently prescribed classes of drugs are thiazides alone or in combination. Since the eighth report of Joint National Committee (JNC 8) on detection, evaluation prevention and treatment recommends the use of ACEIs, ARBs, thiazide diuretic, and CCBs alone or in combination for the management of early stage hypertension, thus suggesting that the above trend is in conformity to the recommendations of JNC 8 guidelines.[14] Diuretics (10.2%) are most widely prescribed drugs followed by calcium channel blockers (7.6%), ACE Inhibitors (6.6%) and ARBs (5.6%) in monotherapy. In some cases beta blockers (3.6%) and alpha agonists (1%) also prescribed. Hence this drug utilization data corroborates adherence to JNC 8 guidelines. Angiotensin receptor blocker + diuretic combination (4.4%) was mostly used in two drug combination therapy followed by Angiotensin receptor blockers + Diuretics (3.6%) and Calcium channel blocker + ACEIs combination (2.6%). Three drugs combination as an antihypertensive mainly tried CCBs + ACEIs/ ARBs + Diuretics (4.2%) followed by ACEIs/ARBs + BBs + CCBs (3.4%). However, the results of current study were not fully in accordance to the study of Tiwari et al as far as drug prescription rate of BBs is concerned.[29] They recorded 46.2% of prescriptions to have BBs, which is extremely high in comparison to present study which recorded only 3.6% but almost comparable to Tandon VR et al which recorded 2.8%.[20] This might be due to the changing drug prescription trends as the study was of year 2015. Furthermore, fear of adverse drug reactions associated with BBs in elderly might be another reason for under prescribing of BBs. The role BB is more in HT with heart failure, acute coronary syndromes, and arrhythmias. The number of such patients was not very high in present study.

ACE inhibitors and ARBs prescription rates in their study were almost in comparison to present study. This might be because of recently gained popularity of ARBs and ACEIs. In combination therapy, a two drug combination consisting of BBs and CCBs was given to the majority of the patients like our study. The study of Dhanaraj et al recorded highest prescription rates of ACE inhibitors (59%) followed by ARBs (52%), CCBs (29%), diuretics (27%), and BBs (14%).[40] The results are unlike the current study as far as preference of ACEI over ARBs and BBs and diuretics are concerned. This may be because the study population in this study was HT with diabetes mellitus. Thiazides were the most preferred agents used, either as monotherapy or combination therapy in hypertensive patients with or without comorbidities in accordance to our study.[41]

The overall rate of adherence was 16.5% (Pre-hypertension); 87.90% (Stage 1 hypertension); and 68.20% (Stage 2 hypertension) in the present study. Almost 100% adherence rate among the patients of hypertensive emergency and urgency with the JNC8 guidelines. Drugs are often used in combination to achieve a preferred therapeutic goal or to treat coexisting diseases. Because of the risk related to concomitant use of drugs, co-medication has become a general concern and an important concept in term of prescribing appropriateness. Some combinations may result in undesired pharmacodynamic or pharmacokinetic interactions, resulting in under-treatment or harmful effects.[42,43] The consequences of drug-drug interactions (DDIs) can range from no untoward effects at all, to drug-related mortality.[42,43]

This study had some limitations also. Data were collected from only one institution, therefore population is relatively homogenous. Large studies involving heterogeneous population are required. Despite these limitations, the strength of the data collected is such that it revealed several important aspects of the antihypertensive drug utilization pattern and adherence of these drugs to JNC-VIII guidelines in different co-morbid conditions.

CONCLUSION

Present results reveals that antihypertensive medication adherence to JNC-7 guidelines is suboptimal. Therefore, physicians should follow JNC-8 guidelines to improve the patients care because suboptimal adherence leads to adverse clinical outcomes. In conclusion, present study demonstrated that physicians are not completely adhering to standard guidelines while treating hypertension with comorbid conditions.

It is evident that prescribing guidelines should be followed for better health outcome and improvement in quality of life of patients suffering from hypertension with co-morbidities because these guidelines are based on vigorously conducted various clinical trials. Physician should use these guidelines to treat hypertensive patients for the effective management of hypertension. Diuretics (10.2%) are most widely prescribed drugs followed by calcium channel blockers (7.6%), ACE Inhibitors (6.6%) and ARBs (5.6%) in monotherapy. Angiotensin receptor

blocker + diuretic combination (4.4%) was mostly used in two drug combination therapy followed by Angiotensin receptor blockers + Diuretics (3.6%) and Calcium channel blocker + ACEIs combination (2.6%). Amlodipine, telmisartan, losartan as monotherapy while amlodipine + atenolol and telmisartan + hydrochlorothiazide were maximally prescribed combinations. Adherence rates to JNC 8 were adequate in Stage 1, hypertensive emergency and urgency and inadequate in case of pre-HT and Stage 2 HT. BBs were under prescribed as this is not in the first line drug for initial management of hypertension. Polypharmacy, FDCs, debated rationality anti-HT combinations prescribing, were some of the common pharmacologically considered irrationality noticed in present study.

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