

Original Article

Adherence To JNC-VII and WHO-ISH guidelines of antihypertensive medications prescribed to hypertensive patients with co-morbid conditions

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Abstract

The present study aims at comparing the prescribing pattern of antihypertensive drugs in essential hypertension with specific co-morbid conditions with JNC-VII and WHO-ISH guidelines. Adult patients of both sex, who were attending medicine OPD of Shri Krishna Hospital, Karamsad, Gujarat since last 6 months and being prescribed antihypertensive drug/s for hypertension, were selected for the study. Hypertensive patients with co-morbidities diabetes mellitus, ischemic heart diseases, congestive heart failure, and chronic renal diseases were included in the study. Adherence to JNC-VII guideline and WHO-ISH guidelines with respect to prescribing antihypertensive drugs in patients with diabetes mellitus were found to be 97% and 40.81% respectively, while it was found to be 72.27% to both the guidelines in patients with IHD. Similarly in cases of hypertension with CHF, adherence to prescribing antihypertensive were found to be 93.62% and 38.30% respectively, whereas for CKD patients, adherence to both guidelines was found to be same i.e. 33.33%. There is need of following such authentic guidelines in managing hypertension like chronic disease since these guidelines are based on various clinical trials and successful attainment of target BP in patients will be much easier by implementing them.

Introduction

Hypertension is an important public health challenge in both developing and developed countries. Raised blood pressure is one of the leading behavioral and physiological risk factors to which 13% of global deaths are attributed. Hypertension is reported to be the fourth contributor to premature death in developed

countries and the seventh in developing countries (1). In India, cardiovascular diseases (CVDs) are estimated to be responsible for 1.5 million deaths annually (2). Hypertension has been identified as a major risk factor for CVDs, including stroke and myocardial infarction by the INTERSTROKE and INTERHEART study teams (3), and its burden is increasing disproportionately in developing countries as they undergo demographic transition (4). The prevalence of hypertension in the last six decades has increased from 2% to 25% among urban residents and from 2% to 15% among the rural residents in India. According to Directorate General of Health Services, Ministry of Health and Family Welfare,

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(Received on January 16, 2014)

Government of India, the overall prevalence of hypertension in India by 2020 will be 159.46/1000 population (5).

As hypertension often exists with other co-morbid conditions such as diabetes mellitus, myocardial infarction, congestive cardiac failure (CHF) and chronic kidney disease (CKD), the antihypertensive therapy should be chosen according to specific individual variables including the cardiovascular risk factor profile, the presence of target organ damage, clinical cardiovascular disease and diabetes mellitus. The presence of coexisting disorders may either favour or limit the use of particular antihypertensive drugs (6). To treat hypertension associated with these co-morbid conditions various guidelines have been issued. Seventh report of Joint National Committee (JNC) (7) and guidelines by WHO- International Society of Hypertension (WHO-ISH) (8) are important ones. These guidelines are important tools to improve the clinical approach of the physician in the daily treatment. They are aimed to provide indications for clinical practice based on rigorous scientific evidence. However, their use in decision making in clinical practice is largely neglected by physicians (9, 10). The compliance of physicians to such evidence-based medicine and recommendations of guidelines has not been fully investigated.

Keeping in view, the present study was conducted the study on various facets of antihypertensive drugs prescribing at present scenario in Shri Krishna Hospital, a tertiary care teaching rural hospital attached to Pramukhswami Medical College, Karamsad with objectives of studying prescribing pattern of antihypertensive drugs in essential hypertension with some specific co-morbid conditions and compare the same with JNC-VII and WHO-ISH guidelines in the outpatients attending the Department of Medicine.

Methods

This was an observational, cross sectional study conducted in Department of Medicine in a tertiary care teaching hospital of central Gujarat, over a period of one year from August 2012 to August 2013 after approval from Institutional Ethics Committee. Total 899 patients were enrolled in the study from all the three different medicine units equally. Adults patients of both sex and different age groups,

attending medicine out-patient department (OPD) since atleast last 6 months and were prescribed antihypertensive drug/s for essential hypertension, were included for the study. Hypertensive patients with co-morbidities diabetes mellitus, ischemic heart diseases, congestive heart failure and chronic renal diseases were also included in the study. Patients with hypertensive emergency and cerebral stroke were excluded from this study. Patient with any concurrent acute medical condition eg acute myocardial infarction, acute left ventricular failure were also excluded from this study.

The diagnosis and line of treatment to be given were decided by the physician. Physicians were kept blinded for the study. Written informed consent was taken from each patient before including him or her into the study. Identity of patient was kept confidential.

Data like name, age, sex, general examination, laboratory investigation, concurrent diseases, and ongoing treatment were recorded from patient’s case-sheet. Data were analyzed and Z-score was applied to compare adherence of prescribed antihypertensive drugs to JNC-VII guideline and WHO- ISH guideline. P value less than 0.05 considered as significant.

Results

Out of 899 patients, 474 (52.72%) were male and 425 (47.27%) were female. Maximum patients i.e. 616 (68.52%) belonged to the age group of more than 59 years-, followed by age group 49-59 years-161 (17.91%) and age group 39-49 years-96 (10.68%). Mean age of male and female patients were found to be 62.68±13.46 and 63.20±11.00 years respectively.

Out of 899 hypertensive patients, 429 were having co-morbid conditions. Majority of the patients i.e. 337 (37.49%) were suffering from hypertension with diabetes mellitus (Table I).

TABLE I: Co-morbid Conditions of study patients.

<i>Co-morbid Condition</i>	<i>Number of patients (%)</i>
Diabetes mellitus	337 (37.49%)
Ischemic heart disease	64 (7.12%)
Congestive heart failure	18 (2.00%)
Chronic kidney disease	10 (1.11%)

It was noted that number of antihypertensive agents prescribed were ranging from 1 to 4. Out of 899 patients, 45.60% were prescribed single drug followed by two drugs (29.48%) and three drugs (20.24%). Only 4.67% patients received four drugs. Within the group of patients of hypertension alone, mean number of antihypertensive drugs was found to be 1.90. In this group of patients 47.23% received one antihypertensive drug. 22.98% patients were prescribed two drugs. 22.55% and 7.23% patients of this category received three and four drugs respectively. In the group of patients of hypertension with diabetes mellitus, ischemic heart disease, CHF and CKD mean number of antihypertensive was 1.68, 1.86, 2.61 and 3.0 respectively. In the group of hypertension with diabetes mellitus 47.18% patients were on monotherapy while 37.68% and 15.13% patients received two and three drugs in this category. In the group of hypertension with ischemic heart disease, highest number of patients (45.31%) were prescribed single drug while 29.69% patients were prescribed two drugs (Table II).

Among the antihypertensive groups, calcium channel blocker was the most commonly prescribed

antihypertensive group (51.83%), followed by beta blockers (44.94%) and ACE inhibitors (39.82%). Loop diuretics (6.67%) and alpha agonist (2.33%) were the least prescribed antihypertensive groups.

Hypertensive patients without any co-morbidities were prescribed with calcium channel blockers most commonly (58.94%) while 45.32% of these patient group received beta blockers. Thiazide diuretics and ACE inhibitors were the 3rd and 4th most common antihypertensive groups in this category of patients. Thiazides were advised in 29.15% while ACE inhibitors were given 27.45% of patients. In 4.47% of these patients alpha agonist were given.

In group of patients of hypertension co-morbid with diabetes mellitus, 175(51.93%) and 164(48.66%) patients were prescribed with calcium channel blockers and ACE inhibitors respectively.

76.56% patients of hypertension with ischemic heart disease (IHD) were prescribed with beta blockers while 57.81% and 9.37% were prescribed with ACE inhibitors and thiazide diuretics. All patients of hypertension with congestive heart failure (CHF) were

TABLE II: Total number of antihypertensive drugs prescribed per prescription.

Number of antihypertensive in prescription	No of patients of Hypertension Alonen=470	No of patients of Hypertension Co-morbid DM n=337	No of Patients of Hypertension Co-morbid with IHD n=64	No of Patients of Hypertension Co-morbid with CHF n=18	No of patients Hypertension Co-morbid with CKD n=10	Total No of patients n=899
1	222(47.23%)	159(47.18%)	29(45.31%)	0	0	410(45.60%)
2	108(22.98%)	127(37.68%)	19(29.69%)	7(38.89%)	4(40%)	265(29.48%)
3	106(22.55%)	51(15.13%)	12(18.75%)	11(61.11%)	2(20%)	182(20.24%)
4	34(7.23%)	0	4(6.25%)	0	4(40%)	42(4.67%)
Total antihypertensive drugs prescribed	892	566	119	47	30	1654
Mean antihypertensive drugs prescribed	1.90	1.68	1.86	2.61	3.0	1.84

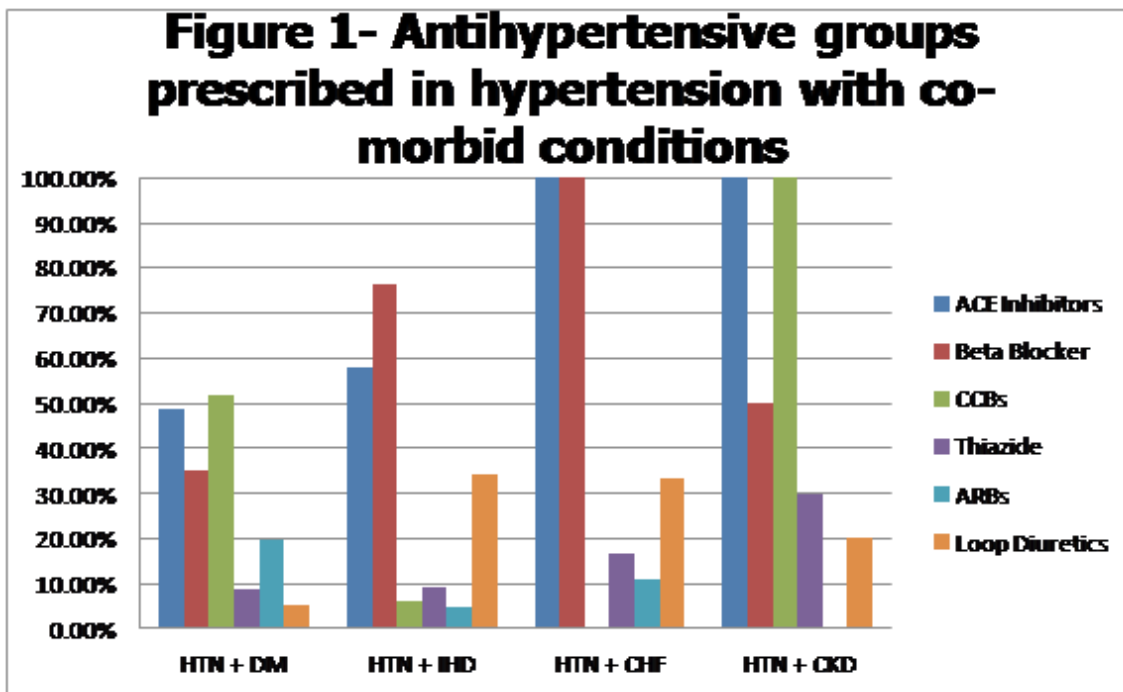
TABLE III: Adherence of the antihypertensive drugs Prescribed With JNC-VII Guidelines and WHO- ISH Guidelines.

Hypertension with co-morbid conditionn=429	Total antihypertensive drugs prescribed	Number of antihypertensive drugs following JNC-VII guidelines (%)	Number of Antihypertensive drugs following WHO guidelines (%)	Z-score
Hypertension with DM	566	549(97.00%)	231(40.81%)	20.41 (p value<0.0001)
Hypertension with IHD	119	86(72.27%)	86(72.27%)	0
Hypertension with CHF	47	44(93.62%)	18(38.30%)	5.65 (p value<0.0001)
Hypertension with CKD	30	10(33.33%)	10(33.33%)	0

prescribed with ACE inhibitors and beta blockers whereas patients of hypertension with chronic kidney diseases (CKD) were prescribed with ACE inhibitors and CCBs, only 50% i.e. 5 were given beta blockers (Fig. 1).

In hypertension with diabetes mellitus adherences to JNC-VII and WHO-ISH were found to be 97% and

40.81% respectively. Z-score was calculated 20.41 between these two adherence (p value <0.0001). In cases of hypertension with CHF cases, adherences to JNC VII guideline and WHO-ISH guideline were found to be 93.62% and 38.30 % respectively. Z score was calculated 5.65 between these two adherence (p value <0.0001) There was no difference in adherence of antihypertensive drugs to JNC-VII



guidelines and WHO-ISH guidelines in cases of hypertension with ischemic heart disease and chronic kidney disease. In case of hypertension with IHD, adherence was seen in 72.27% of cases while it was 33.33% in co-morbid with CKD (Table III).

In this study, amlodipine was the most commonly used antihypertensive drug (51.83%) in study patients. Enalapril was prescribed in 25.58% of patients while atenolol was used in 26.14% of patients commonly. Hydrochlorothiazide and losartan were prescribed in 16.80% and 12.12% of patients respectively (Table IV).

Present study revealed that prescribed daily dose (11) of enalapril was 11.28 mg, that of atenolol was 66.05 mg, amlodipine (7.68 mg), hydrochlorothiazide (28.56) and metoprolol (73.85 mg) were observed.

TABLE IV : Commonly used antihypertensive drugs in study patients.

Antihypertensive group	Drug	No. of patients	% of patients
ACE inhibitor	Enalapril	230	25.58
	Ramipril	128	14.24
Beta blocker	Atenolol	235	26.14
	Metoprolol	156	17.35
	Carvedilol	13	1.45
Alpha2 agonist	Clonidine	21	2.33
Calcium channel blocker	Amlodipine	466	51.83
Diuretic	Hydrochlorothiazide	151	16.80
	Chlorthalidone	28	3.11
	Furosemide	50	5.56
	Torsemide	10	1.11
Angiotensin receptor blocker	Losartan	109	12.12
	Valsartan	33	3.67
	Telmisartan	30	3.34

Amlodipine having maximum PDD/DDD(15) ratio (1.54) followed by hydrochlorothiazide (1.14), enalapril

(1.13), atenolol (0.88) and metoprolol (0.49) (Table V).

Out of 899 patients, 286(31.81%) were prescribed fixed dose drug combination. Fourteen patients received two FDCs and all of these patients were of hypertension alone. Total six type of FDCs have been prescribed to the patients. Three of them were containing hydrochlorothiazide as one component while other drug was losartan, telmisartan and enalapril respectively (Table VI).

TABLE V : ATC(12), PDD and DDD of antihypertensive drugs.

Drug	ATC code	WHO DDD	PDD	PDD:DDD ratio
Enalapril	C09AA02	10 mg	11.28 mg	1.13
Atenolol	C07AB03	75 mg	66.05 mg	0.88
Amlodipine	C03CA01	5 mg	7.68 mg	1.54
Hydrochlorothiazide	C03AA03	25 mg	28.56 mg	1.14
Metoprolol	C07AB02	150 mg	73.85 mg	0.49

ATC - Anatomical Therapeutic Chemical Classification
 DDD - Defined Daily Dose
 PDD - Prescribed Daily Dose

TABLE VI : Types of antihypertensive FDC prescribed.

Type of FDC	Number of FDCsn=300
Amlodipine + Atenolol	135(45%)
Losartan + Hydrochlorothiazide	30(10%)
Metoprolol + Amlodipine	86(28.67%)
Enalapril + Hydrochlorothiazide	31(10.33%)
Telmisartan + Hydrochlorothiazide	14(4.67%)
Metoprolol + Ramipril	4(1.33%)

Discussion

Hypertension is a chronic disease requiring lifelong treatment. This study analysed the prescribing pattern in hypertensive patients attending the outpatient department in a tertiary care hospital attached to our institute.

In this study, prevalence of hypertension was found to be slightly higher in male 474(52.7%) as compared to female 425(47.3%). Other study by Sandozi and Emani (13) have found 47% male and 53% female and Queen Mary Utilization of Antihypertensive Drugs Study (QUADS) (14) conducted in 2004 observed 48% male and 52% female in the study. Most common

age group involved in our study was more than 59 years (68.52%), followed by 49-59 years (17.91%) and 39-49 years (10.68%). Pai et al (15) also found most common age group 60-69 years (34%) followed by 70-79 years (23%) and 40-49 years (22%). Study conducted by Tiwari et al (16) found most common age group 50-59 years (33.3%) followed by 60-69 years and 40-49 years(26.7%).

In our study, mean age of study participants were 62.92±12.35) years with 62.68±13.46 years in male and 63.20±11.00 years in female. Pai et al (15) found mean age in study subject 63.1 years with 62.72 years in male and 63.48 years in female. Etuk et al (17) has found mean age in study subject 52.3±14.6 years.

The results of present study revealed that 47.72% of hypertensive patients were suffering with co-morbid conditions while study done by Amira et al (18) found 36.6% patients were suffering with comorbid conditions. In our study, 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%). Pai et al (15) reported diabetes mellitus (47.5%), ischemic heart disease (16.5%), renal diseases (7.5%) & cardiovascular accidents (16%) as concurrent diseases in his study.. Sakthi S et al(19) reported diabetes mellitus (35%) as the most frequent co-morbidity followed by asthma (5%) and ischemic heart disease (1.6%). Such patients are at greater risk of developing complications. Among the various diseases, cardiovascular diseases pose a major threat. Multiple drugs are required for their management. Polypharmacy is associated with a high cost, increased risk of side effects, drug interaction and noncompliance (20).

In this study 45.60% patients were stabilized on monotherapy whereas Pai et al (15) reported monotherapy in 49% of hypertensive patients and Etuk et al (17) found monotherapy was used only in 20% cases of hypertension.

In this study, the average number of antihypertensive drugs prescribed in patients of hypertension alone

was 1.90 which was almost similar to average number of antihypertensives in comorbid IHD cases (1.86). In these cases majority of patients were on single antihypertensive drugs. In hypertension with DM, average number of antihypertensive was 1.68 found to be lower than that in above two groups of cases. This may be explained by 7.23% and 6.25% cases of hypertension alone and with IHD have been prescribed four antihypertensive drugs while maximum number of antihypertensive prescribed to comorbid DM cases was three. Average number of antihypertensive was higher in co-morbid CHF and CKD cases which was more than 2.5 in each condition. This can be justified that because hypertension comorbid with these condition is difficult to treat and require multiple drug therapy. All these patients received two or more than two antihypertensive drugs. Because hypertension is associated with various concurrent diseases and its complications, polypharmacy was quite prevalent.

Majority of patients (54.4%) were on multiple drug therapy. There is a favourable disposition to combination therapy in recent years particularly in patients with more difficult to control BP (often encountered in tertiary or referral settings) (21). There is rational justification for such therapy because of multifactorial nature of hypertension. Achievement of target BP tends to be better, and the risk of side effects owing to use of maximal doses of monotherapeutic agents is reduced.

Of the various group of antihypertensives, ACE inhibitors (48.66%) were found the most commonly prescribed group in patients of hypertension with diabetes mellitus in this study. This finding is in consonance with study by Sandozi and Emani (18) who reported 50% of diabetic hypertensive patients were on ACE-inhibitors. One study conducted by Jhonson (22) at USA found the same results. Prescribing of ACE inhibitors in hypertension comorbid with diabetes mellitus seems justifiable because this group of drugs favorably affect the progression of diabetic nephropathy and reduce albuminuria (23,24). In addition, they decrease retinopathy progression in type 1 diabetics and attenuate the progression of renal insufficiency in patients with a variety of nondiabetic nephropathies

(25). A recent analysis from the National Health and Nutrition Examination Survey (NHANES) (26) revealed that in elderly diabetics only 39.2% were taking ACEI or ARB. Our figures are more encouraging. In this study, all cases of hypertension with CHF, ACE inhibitors were prescribed. Jackson (27) also found ACE inhibitors were prescribed in 74.70% cases of hypertension with CHF cases. ACE inhibitors attenuate increased left ventricular end diastolic and end systolic volume and reverses the natural history of the disease (25). In this study, all patients of hypertension alongwith chronic kidney diseases received ACE inhibitors. Property of ACE inhibitors of dilating renal efferent arterioles helps in reducing elevated arterial pressure and reducing glomerular injury (25). Several large, randomized trials of participants with nondiabetic kidney disease determined that regimens including ACE inhibitors are more effective in reducing the occurrence of kidney endpoints compared to regimens not including ACE inhibitors (28).

Beta blocker was the most commonly prescribed antihypertensive drug group (76.56%) in hypertensive IHD cases. Ischemia is caused by either decrease in myocardial oxygen supply or increase in myocardial oxygen demand. Beta blockers reduces myocardial oxygen demand by reducing heart rate and contractility. So, they relieve the clinical features of ischemia along with hypertension. Beta blockers were prescribed in all cases of hypertension comorbid with CHF cases. Beta blockers improve survival in patients of CHF cases and this is due to antagonism of ventricular wall enhancing, apoptosis promoting and pathological remodeling effects of excess sympathetic activity (29).

In this study, CCB (51.83%) was the most commonly prescribed antihypertensive group. Same results were found in QUADS study (14) in which they reported CCBs (65%) were the most commonly prescribed drugs. Pai et al (15) also found reported calcium channel blockers (49%) as the the most commonly prescribed drugs. In our study, CCBs were found the most commonly prescribed group in hypertension with diabetes patients. Teemu Ahola (30) found that beta blocker and ACE inhibitors were the leading class of drug in hypertension co-morbid with diabetes mellitus.

In this study, thiazide diuretics were prescribed in 19.58% of patients. Antihypertensive and Lipid Lowering Treatment to Prevent Heart Attack Trial (ALLHAT) (31) revealed that diuretics have been virtually unsurpassed in preventing the cardiovascular complications of hypertension. Diuretics enhance the antihypertensive efficacy of multidrug regimens, can be useful in achieving BP control, and are more affordable than other antihypertensive agents. Despite these findings, diuretics remain underutilized (32).

Present study found, 31.81% patients received fixed dose combination. FDCs containing beta blocker and CCB were found most commonly used. Amlodipine + atenolol was most commonly prescribed drug combination (45%) followed by metoprolol + amlodipine (28.67%). These FDCs though are recommended by JNC-VII guidelines (7) but they have opposite effect on plasma rennin activity that is beneficial for the patient to keep ADRs in check (25). Pai et al (15) found ARB with diuretic (25.4%) was the most frequently prescribed two drug combination followed by a combination of two diuretics (10.8%) and CCB with beta blockers (9.8%). Etuk et al (17) reported ACEI and diuretic (19.44%) most common two drug combination followed by central sympatholytic and diuretic (11.11%) and CCB and diuretic (9.72%).

In the study, PDD:DDD ratio of amlodipine 1.54 suggests overutilization of this antihypertensive drugs. Metoprolol with PDD: DD ratio of 0.49 was underutilized drug. Atenolol, other beta blocker drug was also found to be underutilized drug in the study. Grimmsmann and Himmel (33) reported ACEIs had most notable PDD:DDD ratio (2.17), followed by the ARBs (1.88), CCB (1.51), thiazide diuretics (1) and beta blockers (0.84). Predicting that the PDD:DDD ratio depends on patient related factors-irrespective of indication or severity of the disease or sociodemographic factors like age or gender-the ratio should not change with a change of the drug. However, factors such as the severity of the hypertension or the doctor's dissatisfaction with the efficacy of a drug might lead to change of drugs or change of dose-seem to be responsible for alteration of PDD:DDD ratio.

Two major authoritative groups have developed treatment guidelines to follow when hypertensive patients are being managed: the World Health Organization-International Society of Hypertension (WHO-ISH) and the Joint National Committee on the Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC). Both guidelines were updated in year of 2003 and based on the results of randomized clinical trials. According to 7th report of JNC, angiotensin converting enzyme (ACE) inhibitors should be preferred in hypertension co-morbid with diabetes mellitus, heart failure, ischemic heart disease (IHD) and chronic kidney diseases while beta blocker in ischemic heart disease and heart failure. According to WHO-ISH, to treat patients of hypertension co-morbid with diabetes, ACE inhibitors and angiotensin receptor blockers (ARB) should be preferred; ACE inhibitors are also preferred in hypertension with IHD and CKD while diuretics and beta blockers should be preferred in hypertension with CHF.

Physician should use these guidelines to treat hypertensive patients for the effective management of hypertension.

In this study, 97% antihypertensive drugs prescribed to diabetic hypertensive patients followed JNC-VII guidelines while only 40.81% followed WHO guideline. The reason of wide gap between adherence to both guidelines is obvious because of wider choice of antihypertensive drugs in JNC guideline for the given condition than WHO guideline. According to JNC VII guideline thiazide diuretics, BBs, ACEIs, ARBs, and CCBs are beneficial in reducing CVD and stroke incidence in patients with diabetes. But ACEI- or ARB-based treatments favorably affect the progression of diabetic nephropathy and reduce albuminuria. WHO guidelines appear to be more stringent to treat it as it recommends only ACE inhibitors or ARBs.

Ischemic heart disease (IHD) is the most common form of target organ damage associated with hypertension. This study revealed that adherence of antihypertensive drugs to both guidelines prescribed in this category is similar (72.27%). JNC-VII

guidelines recommends use of beta blocker as a first choice drug group with alternative of CCBs in patients with hypertension and stable angina pectoris. While WHO-ISH recommends beta blockers and ACEI in this clinical condition.

In hypertension along with CHF cases, JNC VII guideline recommends use of ACEIs, BBs, ARBs and aldosterone receptor antagonists along with loop diuretics. This is somewhat different from WHO-ISH guidelines which recommends use of beta blocker and spironolactone along with diuretics. So, 93.62% antihypertensive prescribed to these patients followed JNC guidelines. But adherence drops to almost to 38.30% to WHO-ISH guidelines.

In present study, all ten patients of hypertension with CKD were prescribed with ACE inhibitors which was in consonance with JNC VII and WHO guidelines. Along with ACE inhibitors all patients were prescribed with CCBs and half of them were prescribed beta blockers- which can not be supported by these guidelines. In all, 60% of antihypertensive prescribed in this group did not follow JNC-VII and WHO guidelines.

Few synergistic antihypertensive drug combinations are recommended by JNC-VII guidelines. Among them, combination ARB+ diuretics and beta blocker + diuretic were prescribed in 76 and 73 prescriptions respectively. ARB, being a vasodilator, causes fluid retention which is counteracted by diuretic if given

concurrently. ARB also reduced plasma renin activity which is increased by concurrently given diuretic (29). Potency of hypotensive action of beta blocker increases when it is combined with diuretic (36).

In our study, beta blockers- amlodipine were the commonest drug combinations prescribed having opposite effect on plasma renin activity that is beneficial for the patient to keep ADR in check (29).

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-VII and WHO-ISH guidelines in different co-morbid conditions. Results of the study to compare with recently issued JNC-VII guidelines (35) is in the process by the authors.

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.

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