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EVALUATION OF ANTI-HYPERTENSIVE DRUG PRESCRIPTION PATTERN ACCORDING TO JOINT NATIONAL COMMITTEE-8, ASSESSMENT OF MEDICATION ADHERENCE AND DRUG RELATED PROBLEM IN TYPE-2 DIABETES MELLITUS PATIENTS

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ABSTRACT

The aim of the study is evaluation of anti-hypertensive drug prescription pattern according to Joint National Committee-8, assessment of medication adherence and drug related problem in type-2 diabetes mellitus patients. The objectives of the study is to evaluate the prescribing pattern of anti-hypertensive drugs in type 2 diabetic patients according to JNC-8 guidelines, to assess medication adherence to treatment, to assess major drug-drug interactions, and to assess drug inappropriateness. A prospective and hospital based study was conducted on in-patients admitted in a tertiary care teaching hospital. Data regarding patient's demographic details, diagnosis, complete prescription, and any other information will be collected in a predesigned pro forma. The study reveals that males (58%) were more likely to have reported with hypertension and diabetes. Among all medications the major class of drugs prescribed were calcium channel blockers (44.48%) and diuretics (32.65%). The most common anti-hypertensive drugs prescribed were amlodipine (43.67%), Lasix (27.75%). Out of 339 drug-drug interactions, 53(4.61%) were major, 906 (78.85%) were moderate and 190(16.53%) were minor. Morisky medication adherence scale analysis showed fair adherence to the treatment. The present study concluded that the prescribing pattern of antihypertensive drugs showed less adherence to current JNC-8 guideline. However, further studies are needed to identify the rationale in the prescribing pattern. The study also tried to depict the drug related problems in the patients. Hence, the study reveals a lot of potential for pharmaceutical care services and the relevance of having clinical pharmacist on the wards to access patients drug-related needs.

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INTRODUCTION

Diabetes and high blood pressure are so closely related that they can be seen as causes and consequences of each other. Diabetes with hypertension requires lifelong management and careful drug selection. Management of hypertension is of paramount importance to diabetics to reduce cardiovascular and other complications.

The purpose of this study is to evaluate prescribing patterns of antihypertensive drugs in patients with hypertensive type 2 diabetes and to evaluate them in comparison with the 8th Joint National Committee (JNC8) Treatment Guidelines for Hypertension[1].

Hypertension

Hypertension, otherwise called high or raised pulse, is a condition where the veins have relentlessly raised strain. Blood is conveyed from the heart to all parts of the body in the vessels. Each time the heart beats, it siphons blood into the vessels. Pulse is made by the power of blood pushing against the dividers of veins (supply routes) as it is siphoned by the heart. The higher the strain, the harder the heart needs to siphon[2].

Diabetes mellitus

Diabetes is a chronic illness that occurs both when the pancreas doesnot supply insulin or when the body can't effectively employ the insulin it produces. Insulin is a chemical that controls glucose level in the body. Hyper glycaemia, or raised glucose, is a typical impact of uncontrolled diabetes and after some time prompts genuine harm to a large number of the body's frameworks, particularly the nerves and blood vessels[3].

PRESCRIPTION PATTERN

Prescription pattern clarifies the degree and profile of medication use, patterns, nature of medications, and consistence with provincial, state or public rules like standard treatment rules, use of medications from fundamental medication rundown and utilization of nonexclusive drugs [4].

Despite the fact that medications are by all account not the only helpful intercessions, which give a beneficial wellbeing level, judicious utilization of them assumes a significant part in the adequacy of remedial medications. Sane medication use implies that every individual gets the right medication, in a sufficient portion for a satisfactory length, with proper data and follow-up treatment, and at a reasonable expense.

The normal utilization of medication works on persistent's personal satisfaction. Unreasonable and improper remedies bring about extreme outcomes. The investigation of medication use is important to advance normal medication use in creating countries[5].

PRESCRIPTION PATTERN OF ANTIHYPERTENSIVE DRUGS IN TYPE 2 DIABETIC PATIENTS

The American Diabetes Affiliation suggests an objective BP under 140/80 mmHg in patients with Diabetes[6]. Angiotensin Converting Enzyme Inhibitors (ACEIs) are the primary line in administration of hypertension, and can be supplanted by angiotensin II receptor blockers (ARBs) ,assuming that patients can be given one of them or a mix of both.

Thiazides can likewise be utilized as first line drugs, however are better utilized alongside ACEI/ARBs. On the off chance that the objective BP isn't gotten with the underlying dosages of first-line drugs, expansions in portions are recommended[7].

Numerous patients require various specialists to arrive at the objective BP then, at that point, expansion of a second-line drug should be thought of. Beta-blockers [especially assuming that the patient has coronary conduit disease] and calcium channel blockers are utilized as second line add-on drugs. CCBs are the most fitting extra specialists for BP control in patients with diabetes. The blend of a Pro inhibitor with a CCB is more successful in decreasing CV occasions than an expert inhibitor in addition to a thiazide diuretic. A thiazide diuretic is prescribed as an extra to bring down BP and give extra CV danger decrease.

β-Blockers, like CCBs, are helpful extra specialists for BP control in patients with diabetes. They ought to likewise be utilized to treat another convincing sign (e.g., post-MI). Nonetheless, they might cover manifestations of hypoglycemia (quake, tachycardia, and palpitations yet not perspiring) in firmly controlled patients, postpone recuperation from hypoglycemia, and produce heights in BP because of vasoconstriction brought about by unopposed β-receptor feeling during the hypoglycemic recuperation stage. Notwithstanding these likely issues, β-blockers can be utilized securely in patients with diabetes.[8]

MEDICATION ADHERENCE

Adherence, as utilized in ongoing problems, was characterized by the World Wellbeing Association as the degree to which an individual's conduct concerning taking medicine, following an eating regimen, and additionally executing way of life changes relates with suggestions from a medical services supplier.

JOINT NATIONAL COMMITTEE 8 (JNC 8) GUIDELINES FOR MANAGEMENT OF HYPERTENSION

Hypertension is quite possibly the most well-known condition found in essential consideration and ideal administration of hypertension is a significant mediation in anticipation of stroke, myocardial localized necrosis, renal disappointment and passing. The eighth Joint National Committee rules (JNC 8) distributed in 2014 gives proof based suggestions to the board of hypertension and is a significant reference for clinicians. The past rules (JNC 7) were in 2003 and this zeroed in on controlling raised systolic circulatory strain in all grown-ups with hypertension and suggested a pulse objective for all age gatherings. The most recent 2014 rule varies from its ancestor in that it centers around diastolic (rather than systolic) circulatory strain for grown-ups younger than 60 years and puts forth more moderate pulse objectives for grown-ups 60 years old or more established (150/90 mm Hg) and for patients with diabetes or persistent kidney sickness (140/90 mm Hg).

METHODS

A Prospective and Hospital based study was conducted in the inpatient wards of Medicine Department of Karnataka Institute of Medical Sciences, (KIMS) Hospital, Hubli. Data regarding patient's demographic details, diagnosis, complete prescription, and any other information will be collected in a predesigned pro forma. The collected data were assessed and thoroughly analysed.

Ethical Issues

The ethical clearance for the study was obtained from institutional ethical committee of SET's College of Pharmacy, Dharwad.

Study Procedure

The study was carried out by regular visits to in-patient medicine department and case sheets of 150 patients were collected. The relevant data collection from case sheets were properly documented in a separate data collection form. The obtained data were then identified, evaluated and analysed based on gender, age group, etiology, social history and drug interactions.

RESULTS

A total of 150 case sheets where reviewed , analyzed and categorized based on age, gender, past medical history, length of hospital stay, number of drugs prescribed, drug interaction, drug rationality and medication adherence.

Table 1: Gender wise distribution.

Gender	No. of Patients (N=150)	Percentage (%)
Male	87	58
Female	63	42

Among the study population of 150 patients, 87 were Male patients and 63 Female patients. It indicates male patients were found to be more (58%). [Table 1]

Table 2: Distribution based on age.

Age	No. of Patients	Percentage (%)
18-25	0(M-0,F-0)	0
26-40	11(M-5,F-6)	7.33
41-60	69(M-41,F-28)	46
>60	70(M-41,F-29)	46.67

Out of 150 patients, 70(46.67%) were greater than 60 years, 69(46%) patients between 41-60, whereas the patients belonging to age group of 26-40 (7.33%) years were less.[Table 2]

Table 3: Past Medical History.

Past Medical	No. of Patients(N=150)	Percentage(%)
Hypertension	135	90
Type 2 diabetes mellitus	132	88
Chronic kidney disease	6	4
Ischemic heart disease	4	2.66
Tuberculosis	3	2
Cardiovascular accident	2	1.33
Upper limb deep vein thrombosis	1	0.66
Hypothyroidism	1	0.66
Chronic obstructive pulmonary disease	1	0.66
Seizure	1	0.66
Trauma	1	0.66
Parietal hematoma	1	0.66

In our study 90% had history of Hypertension and 88% Type 2 Diabetes Mellitus. The past medical history of patients subjected to study are given below. Among the patients, 15 were newly diagnosed with hypertension and 18 with type 2 diabetes mellitus.[Table 3]

Table 4: Distribution based on number of anti-hypertensive drugs given per patient.

No. of Drugs	No. of Patients (N=150)	Percentage (%)
0-1	75	50
2-3	65	43
>3	10	6.66

Out of 150 patients, 0-1 drugs were prescribed for 50%, 2-3 drugs for 43% whereas >3(6.66%) drugs were prescribed less.[Table 4].

Table 5 :Pattern of anti-hypertensive drugs prescribed.

Name of Drugs	No. of Drugs (N=245)	Percentage (%)
Amlodipine	107	43.67
Lasix	68	27.75
Enalapril	13	5.30
Mannitol	11	4.48
Metoprolol	10	4.08
Telmisartan	8	3.26
Clonidine	8	3.26
Carvedilol	5	2.04
Labetalol	4	1.63
Atenolol	3	1.22
Digoxin	2	0.81
Isosorbide dinitrate	1	0.40
Losartan	1	0.40
Bisoprolol	1	0.40
Spironolactone	1	0.40
Verapamil	1	0.40

In our study the most commonly prescribed Anti-Hypertensive was Amlodipine for 43.67%, followed by Lasix for 27.75% patients. The other prescribed drugs are as follows.[Table 5]

Table 6 : Prescription based on class of drugs.

Length of Hospital Stay	No. of Patients(N=150)	Percentage(%)
<2 days	19	12.67
3-5 days	59	39.33
>5 days	72	48

In our study, Calcium channel blockers were prescribed more (44.48%), Diuretics (32.65%), whereas Vasodilators (0.40%) were less among them.[Table 6]

Table 7: Distribution based on hospital stay.

Drug Class	Number Of Drugs (N=245)	Percentage(%)
Calcium Channel Blockers	109	44.48
Diuretics	80	32.65
Beta Blockers	23	9.38
Angiotensin Converting Enzyme Inhibitors	13	5.30
Angiotensin Receptor Blockers	9	3.67
Alpha 2 Adrenergic Agonists	8	3.26
Cardiac Glycosides	2	0.81
Vasodilators	1	0.40

In the study population, 72(48%) patients were hospitalised for a period of more than 5 days, 59(39.33%) for 3-5 days, and 19(12.67%) for less than 2 days.[Table 7]

Table 8:Rationality of drug.

Drug Related Problems	Number (N=125)	Percentage (%)
Drug Duplication	41	32.8
Drug Without Indication	13	10.4
Indication Without Drug	71	56.8

A total of 125 drug related problems were found, in which 71 were indication without drug,41 were drug duplication and 13 were drug without indication. [Table 8].

Table 9: Drug Duplication.

Drug Class	Number(N=51)	Percentage(%)
Blood Modifiers	12	29.26
Beta-Lactam	9	21.9
Anti-Hypertensives	7	17.07
GI Drugs	5	12.19
Anti-Infectives	4	9.75
Cardiovascular	3	7.31
Iron Preparation	1	2.43

41 drug duplication were found in our study, out of them the number of blood coagulants were more (29.26%) followed by Beta-Lactam (21.9%) and Anti-hypertensives (17.07%). The number of iron preparation were the least (2.43%).[Table 9]

Table 10: Indication without drug.

Indication	Number(n=71)	Percentage
Breathlessness	35	49.29
Cough	12	16.9
Fever	7	9.85
Vomiting	4	5.63
Loose stools	4	5.63
Low appetite	3	4.22
Abdominal pain	3	4.22
Headache	2	2.81
Psoriasis	1	1.40

Among indication without drug, breathlessness was the most common indication (49.29%) followed by cough (16.9%), Fever (9.85%), vomiting (5.63%) and least was psoriasis (1.40%).[Table 10]

Table 11 :Drug without indication.

Drug	Number (N=13)	Percentage
Ivermectin	7	53.84
Paracetamol	2	15.38
Lactulose	1	7.69
Udiliv	1	7.69
Metronidazole	1	7.69
Fluconazole	1	7.69

Among drug without indication, Ivermectin (53.84%) is the most common, followed by paracetamol (15.38%). Lactulose, Udiliv, Metronidazole and Fluconazole are least among them (7.69%).[Table 11]

Table 12: Drug Interactions.

Interactions	No. of Interactions (N=339)	Percentage (%)
Major	53	4.61
Moderate	906	78.85
Minor	190	16.53

Based on our study Moderate (78.85%) interactions were more than Minor (16.53%) and Major (4.61%).
[Table 12]

Table 13 :Morisky Medication Adherence Scale.

ADHERENCE SCALE	SCORE 0-1 (Low)	SCORE 2-3-(High)
Knowledge	23	127
Motivation	46	104

Based on Morisky Medication Adherence scale, Majority of patients (127) scored 2-3, only 23 patients scored 0-1 in knowledge. In motivation 104 patients scored 2-3 and 46 scored 0-1.[Table 13]

DISCUSSION

A prospective observational study on prescribing pattern of anti-hypertensive drugs, medication adherence and drug related problems in type 2 diabetic patients was conducted in medicine department of KIMS hospital- Hubli, over a period of 6 months. A total of 150 patients were included in the study.

The study shows that the percentage of male patients 87(58%) diagnosed with hypertension and type 2 diabetes mellitus were more compared to percentage of female patients 63(42%). The difference is statistically significant showing men at higher risk than women. This is in contrast to a study conducted by Sirajudeen Shaik Alavudeen et.al. in which percentage of female patients were (54.4%) more compared to male patients(45.6%)[6].

Among the 150 patients studied, majority of patients were under the age group of above 60(46.67%) followed by 41-60(46%) and least were of age group 26-40(7.33%), which is similar to a study by Verma V in which maximum number of patients were in the age group of above 60 years(70%)[7]. None of the patients were admitted under the age group of 18-25 years. This suggests that prevalence of hypertension and diabetes increases as age advances and mainly geriatric population are at higher risk of getting hypertension and type 2 diabetes mellitus. A possible reason for this could be insulin resistance, changes in the vascular system such as thickening of arterial walls, loss of elasticity that occurs as a person age.

In the present study, most of the patients have a past medical condition with majority being hypertension 135(90%) and type 2 diabetes 132(88%) followed by chronic kidney disease(4%), ischemic heart disease(2.66%), tuberculosis(2%), cardiovascular diseases(1.33%) and least being upper limb deep vein thrombosis, hypothyroidism, chronic pulmonary disease , seizure, trauma and parietal hematoma with each having a percentage of 0.66%. Further studies are needed in these parameters.

Among the anti-hypertensive drugs prescribed, 75(50%) patients were given single anti-hypertensive drug while in 65 cases 2-3 drugs were given. In 10 patients more than 3 anti-hypertensive drugs were given.

The most prescribed anti-hypertensive drug was amlodipine 107(43.67%) followed by furosemide 68(27.75%) and enalapril 13(5.30%).The least prescribed was isosorbide dinitrate 1 (0.40%).

The most commonly prescribed anti-hypertensive class of drugs were calcium channel blockers(44.48%), similar to a study conducted by M.B. Rekha in which most prescribed drug class were calcium channel blocker(amlodipine)[1], followed by diuretics(32.65%),beta blockers(9.38%), angiotensin converting enzyme inhibitors(5.30%), angiotensin receptor blockers(3.67%), alpha agonists(3.26%), cardiac glycosides(0.81%) with least being vasodilators(0.40%). Among calcium channel blockers, amlodipine 107(43.67%) was the most commonly prescribed and among diuretics, furosemide 68(27.75%) followed by beta blockers, with metoprolol 10 (4.08%), angiotensin converting enzyme inhibitors with enalapril 13(5.30%), angiotensin receptor blockers with telmisartan 8(3.26%). Clonidine 8(3.26%) was the alpha agonist given followed by digoxin 2(0.81%) constituting the cardiac glycoside and isosorbide dinitrate 1(0.40%), the vasodilator.

Calcium channel blockers have very less metabolic effect which is beneficial for hypertensive diabetic patients. Diuretics helps to reduce the total body sodium load and extracellular fluid expansion that occurs in hypertensive diabetes patients and patients with chronic kidney disease . Diuretics and calcium channel blockers are also cheaper and highly available than other anti-hypertensive drugs. These could be the reason for them to be the most commonly prescribed drug classes. According to JNC-8 guidelines first- line drugs are: thiazide type diuretics, calcium channel blockers, angiotensin converting enzyme inhibitors and angiotensin receptor blockers whereas loop diuretics and beta blockers are second line agents. In the present study we identified that JNC 8 guidelines has not been taken into consideration in most of the prescription which was included in the study. Since the study was conducted in only one centre, further multicentric studies should be conducted to identify the rationale behind the particular prescriptive pattern and the efficacy of the same.

The duration of hospitalization was found more than 5 days in most of the patients (48%) followed by 3-5 days (39.33%) and < 2 days(12.67%), in contrast to the study of Zaman Huri et. al. in which maximum stay was seen in less than 7 days(71.5%).

A total of 125 drug related problems were found(drug duplication- 41-32.8%,indication without drug-71-56.8%, drug without indication-13-10.4%), which is similar to a study conducted by Zaman Huri et. al. in which indication without drug(3.9%) were more followed by drug duplication(1%) and drug without indication(0.3%)[8].

Drug duplication was most seen with blood coagulants 12(29.26%) followed by beta lactam 9 (21.9%),anti-hypertensives 7(17.07%), drugs 5(12.19),anti-infectives 4(9.75%), cardiovascular 3(7.31%) and least seen in iron preparations 1(2.43%).

Among indication without drug, breathlessness was the most common indication 35(49.29%) followed by cough 12(16.9%), fever 7(9.85%), vomiting 4(5.63%), loose stools 4(5.63%), low appetite 3(4.22%), abdominal pain 3(4.22%), headache 2(2.81%) and the least was psoriasis 1 (1.40).

Among drug without indication , ivermectin 7(53.84%) is the most common followed by paracetamol 2(15.38%). Lactulose, udiliv, metronidazole and fluconazole are the least seen with each 1(7.69%) case.

A total of 1149 drug interactions are seen in the present study. Out of the 1149 drug interactions, major interactions found were 53(4.61%), moderate interactions found were 906(78.85%) , minor interactions found were 190(16.53%), which is similar to a study conducted by Subramanian et. al. in which moderate interactions (85.4%) were more than major and minor interactions[9].

Based on Morisky Medication Adherence Scale, majority of patients(127) have high score based on motivation and knowledge . The study implies that most of the patients are adherent to the treatment .This is similar to a study conducted by Nandini Natarajan et.al. , in which majority of patients reported high adherence[10].

LIMITATION OF THE STUDY

Our study included a random selection of patients. As a result, the findings cannot be generalized to all the patients admitted in the hospital, as many cases might have been missed during night shifts and public holidays.

CONCLUSION

The present study provides an understanding of prescription pattern of anti-hypertensive drugs in hypertensive diabetic patients. According to JNC-8, first line drugs are ACEI, ARB, CCB or thiazide diuretics and later line drugs are beta blockers, loop diuretics, alpha agonists. Our findings shows that Amlodipine(CCB) is the most commonly given anti-hypertensive drug followed by furosemide(Diuretic). This suggests that the prescribing pattern of antihypertensive drugs showed less adherence to current guideline. However further studies should be conducted to identify the rationale behind the particular prescriptive pattern.

Analysis of medication adherence suggests that most of the patients had adequate knowledge about their disease and were generally consistent with the prescription. Study of drug related problems shows that a lot of improvement is needed for drug utilization and patient care. Drug interaction analysis indicates that moderate drug interactions are seen more than major and minor interactions.

The study reveals that there is a lot of scope for pharmaceutical care services to enhance the therapeutic outcome and also shows the need of a clinical pharmacist to prevent drug related problems and improve patient quality of life. The study opens a path for further researches regarding the prescribing pattern in management of hypertension in type 2 diabetes patients.

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CONFLICT OF INTEREST

The authors have no conflict of interests to declare pertaining to this article.

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