DRUG USAGE PATTERN OF ANTIHYPERTENSIVES IN DIABETIC PATIENTS − A CROSS-SECTIONAL OPD-BASED STUDY IN A TERTIARY CARE SET-UP

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ABSTRACT

Objective: The objective of this study was to observe the pattern of utilization of different groups of antihypertensive drugs in patients with diabetes in a tertiary care hospital and correlate the data obtained from the study.

Methods: It was an institution-based cross-sectional study; the present study was carried out at M.G.M. Medical College and L.S.K. Hospital in Kishanganj, Bihar, in the Department of Pharmacology. This study included 520 diabetes mellitus patients with hypertensive disorders who presented to the Department of Medicine at M.G.M. Medical College and L.S.K. Hospital, Kishanganj, during the study period (June 2021–May 2022).

Results: When we appeared at the prescribing patterns of antidiabetic drugs, we found that metformin was the most common (80%), followed by sulfonylureas (65%), DDP4 inhibitors (56.7%), and alpha-glucosidase inhibitors (5%). An evaluation of the pattern of hypertensive drugs prescribed to study subjects revealed that monotherapy was the preferred option (77.1%) over combination therapy (22.9%). Telmisartan (32.4%) is the most common drug used in monotherapy among the study subjects included in the present study, followed by Amlodipine (27.4%) and Metoprolol (14.5%), Bisoprolol (14.5%), and Clinidipine (11.2%), respectively.

Conclusion: The evaluation of all medications prescribed was reasonable and in compliance with JNC-8 treatment guidelines. Further, research is needed to qualify the rationale for drug choice based on demographics, economic status, comorbidities, and complications to provide additional insight into antihypertensive drug prescribing patterns in people with diabetes so the results can be translated for broader and more real benefits can become a medical community.

Keywords: Hypertension, Diabetes, Macrovascular complications, Coronary artery disease, Peripheral vascular disease, Metformin, Calcium channel blockers, Sulfonylureas, DDP4 inhibitors, Alpha-glucosidase inhibitors.

INTRODUCTION

Diabetes and hypertension (HTN) are the most significant burdens on global health. The World Health Organization predicts that by 2025, 300 million people will have diabetes, and 1.5 billion [1] will have high blood pressure (BP) [2]. According to the International Diabetes Federation's 2006 Diabetes Atlas, India, now, has approximately 40.9 million diabetics. If no immediate preventive action is done that number will rise to 69.9 million by 2025 [3].

The incidence of HTN in patients with T2DM is approximately twice that of age-matched subjects without the disease [4]. The development of macrovascular problems in diabetics, such as neuropathy, nephropathy, retinopathy, coronary artery disease (CAD), stroke, and peripheral vascular disease (PVD), has also been linked to HTN as a substantial risk factor.

The Eighth Joint National Committee (JNC-VIII) has released evidence-based suggestions for treatment thresholds, objectives, and drugs to control diabetes-related HTN. Pharmacologic therapy should be started when the systolic BP (SBP) in people older is 150 mm Hg or higher or when diastolic pressure is 90 mm Hg or higher. Target systolic and diastolic pressures for patients should be <150 mm Hg and 90 mm Hg, respectively [5].

HTN Management Guidelines recommend an ACE-I or an angiotensin receptor blockers (ARB) if ACE-I is not tolerated. If BP goals are not met, a thiazide diuretic should be added in patients with a glomerular filtration rate of ≥30 8 or a loop diuretic in patients with an estimated glomerular filtration rate of ≤30 8. Beta-blockers and calcium channel blockers (CCB) have been shown in several trials to have positive effects on diabetic and hypertensive individuals [6]. In contrast to the above studies, some suggest that most diabetics require two or more drugs to control BP [7]. The resulting changes in drug use over time and place can be medical, social, and economic implications for both the individual patient populations. These differences must be identified, explained, and corrected if necessary. To this end, drug utilization studies are required with particular attention to sociodemographic characteristics, comorbidities, and patterns of antihypertensive drug use [8].

Therefore, in this present study, the usage pattern of antihypertensive drugs in hypertensive diabetics was examined, and the consistency of the prescribing design with existing guidelines was examined.

METHODS

It was an institution-based cross-sectional study; the present study was carried out at M.G.M. Medical College and L.S.K. Hospital in Kishanganj, Bihar, in the Department of Pharmacology. This study included 520 diabetes mellitus (DM) patients with hypertensive disorders who presented to the Department of Medicine at M.G.M. Medical College and L.S.K. Hospital, Kishanganj, during the study period (June 2021–May 2022).

Inclusion criteria
The following criteria were included in the study:
1. Patients with HTN who also had diabetes
2. Patients of either gender
3. Patients aged 18 and over
4. Patients willing for this study.

Exclusion criteria

The following criteria were excluded from the study:

1. Patients who have had a recent myocardial infarction or stroke
2. Immediately post-operative patients
3. Type 2 diabetes patients who are critically ill
4. Pregnant women were not allowed to participate in our study.

Ethical consideration

The study was approved by the Institutional Ethical Committee. Informed consent was taken information regarding clinical manifestations, vitals, and clinical progression of the disease and treatment which were collected.

Dependent variable

HTN.

Independent variables

Age, sex, residence, occupation, monthly income, educational level, cigarette smoking, treatment options for diabetes, body mass index, duration of T2DM, fasting blood glucose (FBG), and glycated hemoglobin A1c (HbA1c) were used.

Definitions

HTN: Patients with SBP and diastolic BP (DBP) of 140/90 mmHg or greater or on antihypertensive therapy were considered hypertensive.

Staging of HTN: [2]

1. BP of 120/80–139/89 is pre- HTN
2. BP of 140/90–159/99 is Stage 1 HTN
3. 160/100–179/109 is Stage 2 HTN
4. BP ≥180/110 is a hypertensive crisis.

Poor glycemic control: [3]

1. A poor glycemic control was considered when a patient's HbA1c is >7%
2. A person was considered to have T2DM when he/she is an FBG of ≥126 mg/dl and HbA1C ≥6.5% [3].

Patients were chosen from the Department of General Medicine outpatient department. After completing the inclusion and exclusion criteria, 520 individuals with diabetes and HTN problems were taken. Following study enrolment, a pre-tested interviewer-administered questionnaire was received. Patients with diabetes were identified by reviewing the physician's diagnosis on their chart/medical record. Participants were interviewed, and data on sociodemographic factors (age, gender, domicile, educational status, occupation, monthly income, and current cigarette smoking status) were obtained.

After a 15-min rest, (SBP and DBP) were measured twice at 3-min intervals in the sitting posture, and the mean was calculated. Hypertensive individuals had SBP and/or DBP of 140/90 mmHg or higher, respectively, or were on antihypertensive treatment. FBS levels were measured using blood samples (3 ml) obtained after overnight fasting of 8–12 h. The glucose GOD POD Methods was used to evaluate plasma glucose through a fully autoanalyzer. Uncontrolled hyperglycemia was characterized as HbA1c (Glycosylated) levels greater than 7%, (fasting plasma glucose) levels >129 mg/dL, or Post Prandial Glucose levels >180 mg/dL.

Statistical analysis

The observational data were classified and tabulated in terms of number and percentage. The IBM-SPSS version 21 was used for the analysis. The final data were examined using descriptive statistics.

RESULTS

In this study, 520 patients were included in the study. All the patients were presented with DM and HTN. While analyzing the age distribution of the study subjects, we found that 5.8% of patients were in the age group of 18–30 years, 6.9% were in the age group of 31–40 years, 35%

of patients were between 41 and 50 years, 37.7% patients were aged between 51 and 60 years, and 14.6% patients were above 60 years age group. Out of 520 patients studied, 47.9% of patients were male, and 592.1% were female patients (Table 1).

The duration of HTN among study subjects. The majority of the subjects, that is, 390 (75%) patients, had HTN for 5–10 years, while 115 (22.1%) patients had HTN for <5 years, and only 15 patients had HTN for more than 10 years. Duration of diabetes for more than 10 years was found in 45 (8.7%) patients, while among 138 (26.5%) cases, the time of DM was <5 years, and 337 (64.8%) patients had DM for 5 to years (Table 2).

While analyzing the prescribing pattern of antidiabetic drugs, we found that metformin was most common (80%), followed by sulfonylureas (65%), DDP4 inhibitors (56.7%), and alpha-glucosidase inhibitors (26.5%). A total of five classes of antihypertensive drugs were used. ACEIs were not prescribed in this study. The most common type of antihypertensive drug was CCB (46%), followed by ARBs (35%), β-blockers 922.3%), and diuretics (12.9%) (Table 3).

The antihypertensive drugs used in monotherapy. Telmisartan (32.4%) is the most common drug used in monotherapy among the study subjects included in the present study, followed by amlodipine (27.4%) and metoprolol (14.5%), bisoprolol (14.5%), and clinidipine (11.2%). Telmisartan, along with amlopidine, was the most common combination therapy prescribed to the study subjects, followed by Telmisartan+Hydrochlorothiazide (29.4%) and Amlodipine+Chlorothiazide (26.9%) (Table 4).

Analysis of the other drugs prescribed to the study subjects, we found the hypolipidemic drug was the most common and was prescribed in 56% of patients. Aspirin was prescribed as a single drug in 40% or in combination with clopidogrel in 12.9% of cases. Analgesics were also prescribed in 35% of cases, while rosuvastatin and atorvastatin were prescribed with near equal frequency (30% and 27.9%, respectively). The frequency of multivitamins was 11.9% (Table 5).

DISCUSSION

The term HTN is used to denote elevated BP. It is defined as the condition, in which BP is equal to SBP >140 mmHg and DBP >90 mmHg. HTN is the leading non-communicable disease risk contributing to morbidity and mortality. In India, HTN is a major non-communicable disease risk, responsible for 10% of all deaths. HTN accounts for 10% of ischemic heart disease, 21% of PVD, 24% of acute myocardial infarction, and 29% of stroke [9]. The overall prevalence of HTN in India, according to a study by Anchal *et al.* estimated at 29.8% [10].

Patients with chronic HTN have a higher risk of developing CAD, stroke, heart failure, PVD, vision loss, and chronic kidney disease [11]. The prevalence of HTN is more common in men of low socioeconomic status, and the prevalence increases with age [12]. The prevalence varies significantly within the WHO regions, with rates as low as 3.4% (males) and 6.8% (females) in rural India.

In addition, T2DM is the most common comorbid condition associated with HTN [12]. DM and HTN are two conditions that interact and significantly increase a person's risk of developing atherosclerotic cardiovascular problems [6].

Type 2 DM is a rapidly growing epidemic in India, currently affecting 7.4 million people with a prevalence of 8.3%. The prevalence of HTN in T2DM is significant and can be observed in more than 80% of patients. Not only has HTN been recognized as a significant risk factor for the development of diabetes but also for the development of micro- and macrovascular problems, such as nephropathy, retinopathy, CAD, stroke, and PVD in diabetics. Reducing either isolated systolic or systolic-diastolic HTN significantly reduces the risk of micro- and macrovascular complications and cardiovascular or diabetic deaths [13].

Table 1: Age and sex distribution

	Frequency	Percentage
Age group		
18–30 years	30	5.8
31–40 years	36	6.9
41–50 years	182	35.0
51–60 years	196	37.7
>60 years	76	14.6
Total	520	100.0
Sex		
Male	249	47.9
Female	271	52.1

Table 2: Duration of hypertension and diabetes

	Frequency	Percentage
Duration of hypertension		
<5 years	115	22.1
5–10 years	390	75.0
>10 years	15	2.9
Duration of diabetes		
<5 years	138	26.5
5–10 years	337	64.8
>10 years	45	8.7

Table 3: Prescribing pattern of oral antidiabetic and hypertensive drugs

	Frequency	Percentage
Antidiabetic drugs		
Metformin	416	80.0
Sulfonylureas	338	65.0
DDP4 Inhibitors	295	56.7
Alpha-glucosidase inhibitors	138	26.5
The pattern of hypertensive drugs		
CCB	239	46.0
β- Blockers	116	22.3
ARB	182	35.0

ARB: Angiotensin receptor blockers, CCB: Calcium channel blockers

Table 4: Antihypertensive drugs prescribed in monotherapy and combination therapy

	Frequency	Percentage
Monotherapy		
Telmisartan	130	32.4
Amlodipine	110	27.4
Metoprolol	58	14.5
Bisoprolol	58	14.5
Cilnidipine	45	11.2
Combination therapy		
Telmisartan+Amlodipine	52	43.7
Telmisartan+Hydrochlorothiazide	35	29.4
Amlodipine+Chlorthalidone	32	26.9

Table 5: Details of other drugs prescribed

Drugs	Frequency	Percentage
Hypolipidemic	291	56.0
Analgesics	182	35.0
Aspirin	208	40.0
Rosuvastatin	156	30.0
Atorvastatin	145	27.9
Aspirin+Clopidogrel	67	12.9
Multivitamins	62	11.9

However, in the treatment of HTN, lifelong management with lifestyle changes and pharmacotherapy is required, and the ultimate goal of this is to reduce morbidity and mortality by reducing the complications associated with HTN [14].

Therefore, robust control of HTN in patients with T2DM is essential. The JNC-8 guidelines provide recommendations for the management of HTN [5]. The JNC-8 recommendations are widely followed by Indian physicians [20]. A BP goal of <140/90 is recommended by most guidelines in patients with T2DM [15].

Demographics of study participants are as follows: Analyzing the age distribution of study participants, we found that 5.8% of patients were in the 18–30 year age group, 6.9% in the 31–40 year age group, 35% of patients were between 41 and 50 years age group, 37.7% of patients were between 51 and 60 years old, and 14.6% of patients were over 60 years old. The age distribution of the study participants revealed that 89.1% of the patients were over 40 years old, and this observation suggests that these people are more prone to developing cardiometabolic disorders such as HTN and T2DM. Of 520 patients studied, 47.9% of patients were male, and 592.1% were female patients in the present study, suggesting that males are more prone to HTN.

In their study, Johnson and Singh examine patterns of use of antihypertensive drugs and the control of BP in diabetics with high BP. In terms of demographics, they showed that the median age (SD) was 61.2 (11.5) years old, and almost 97% were male [16].

In this study, Dhanaraj *et al.* compare current guidelines to antihypertensive drug prescribing patterns in T2DM (type 2 diabetes) patients. In terms of demographic information, they indicated that 620 (52%) male and 566 (48%) female patients made up the mean age (SD) of patients with diabetic HTN, which was 55.6 (10.1) years [17].

Alavudeen *et al.* evaluated patterns of use of antihypertensive drugs in diabetics with high BP in their study. In their study, they reported that 149 prescriptions from 81 (54.4%) women and 68 (45.6%) men were examined. The mean age of male patients included in the study was determined to be 55.28.5 years, and the mean age of the female patients included in this study to be 58.1–12.9 years [18].

Bhore *et al.* determined in their study the current prescribing pattern of antihypertensive drugs in patients with type 2 diabetes and evaluated the rationality of the recommendations of the JNC-8 guidelines. In terms of the demographics of the study participants, they disclosed that a total of 76 patients were included in the prescription data recorded in CRF for 1 month. The mean age of the patients was 54.99.3 years, and most of them were in the age group of 51–60 years. The proportion of women was 51.3% [19].

Based on the observations of the present study, we can surmise that the most common type of antihypertensive drug was CCB, followed by ARBs, blockers, and diuretics. In these patients, monotherapy was preferred over combination therapy. In our study, telmisartan was most commonly prescribed as either monotherapy or combination therapy. In our study, diuretics were only used as a combination therapy. In terms of antidiabetics, we found metformin to be the most common, followed by sulfonylureas, DDP4 inhibitors, and alpha-glucosidase inhibitors. The concomitant use of statins suggests that preventive strategies are also used in these patients who are at risk for cardiovascular disease (CVD). On evaluation of all prescribed medications, it was determined that all prescribed medications were reasonable and in compliance with JNC-8 treatment guidelines.

CONCLUSION

1. HTN and DM are related complications that strongly predispose a person to atherosclerotic cardiovascular complications. Therefore, treating HTN in diabetics is of most importance to reduce cardiovascular and other complications

2. Against this context, the present study looked at the utilization of several antihypertensive medication classes in diabetic patients in a tertiary care hospital. Based on the observation, we conclude that the most common type of antihypertensive drug was CCB, followed by ARBs, blockers, and diuretics. In addition, monotherapy was preferred over combination therapy in these patients. In our study, telmisartan was most commonly prescribed as either monotherapy or combination therapy. In our study, diuretics were only used as a combination therapy. In terms of antidiabetics, we found metformin to be the most common, followed by sulfonylureas, DDP4 inhibitors, and alpha-glucosidase inhibitors. The concomitant use of statins suggests that preventive strategies are also used in these patients who are at risk for CVD.

3. On evaluation of all medications prescribed was reasonable and in compliance with JNC-8 treatment guidelines. Further, research is needed to qualify the rationale for drug choice based on demographics, economic status, comorbidities, and complications to provide additional insight into antihypertensive drug prescribing patterns in diabetics so the results can be translated for wider and more accurate benefits can become a medical community.

AUTHORS' CONTRIBUTIONS

Equal contribution.

CONFLICTS OF INTERESTS

Nil.

AUTHORS' FUNDING

Nil.

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