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RESEARCH ARTICLE

PRESCRIBING PATTERN OF ANTIDIABETIC DRUGS IN URBAN POPULATION OF HYDERABAD

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Background: Diabetes mellitus (DM) is a major public health problem in developing countries. Drug utilization study of antidiabetic drugs is of paramount importance to promote rational drug use in patients with DM and to make available valuable information for the health-care team.
Aims & Objective: To determine the prescription pattern of drugs used in the treatment of patients with type 2 DM in outpatient general clinics of Hyderabad.
Materials and Methods: A retrospective study was carried out by evaluating 600 prescriptions of antidiabetic drugs over a period of 2 month obtained from pharmacy database of five general family clinics. The study assessed prescribing pattern for six classes of antidiabetic drugs: insulin, biguanides, sulfonylureas, glitazones, α-glucosidase inhibitors, and dipeptidyl peptidase-4 (DPP-4) inhibitors.
Results: Of 600 prescriptions evaluated, 349 were of male patients and 251 were of female patients. Frequency of use of antidiabetic drugs as monotherapy was 74.5% and as combination therapy was 24.5%. As monotherapy, sulfonylureas (33%) were the highly prescribed class of antidiabetic drugs followed by biguanides (20%), insulins (11.3%), α-glucosidase inhibitors (4.8%), DPP-4 inhibitors (4%), and glitazones (1.1%). Among individual drugs, metformin (20%) and glimepiride (16.6%) were the maximum prescribed drugs. As combination therapy, metformin + glimepiride (9.3%) and metformin + voglibose (3.8%) are the most commonly prescribed two-drug combinations, and metformin + voglibose + insulin (1.1%) is the most popular three-drug combination.
Conclusion: Sulfonylureas was the most commonly prescribed drug class for patients with type 2 DM followed by biguanides. Major limitations of this work include its retrospective nature and the inability to determine the actual patient adherence to therapy.

INTRODUCTION

Diabetes mellitus (DM) is the most common metabolic disorder affecting people all over the world. Globally, in 2010, approximately 285 million people worldwide had DM, and it is estimated that more than 438 million people will have DM by 2030. In India, the incidence of DM is rising rapidly. India had the largest number of people with DM (around 50.8 million) in 2010, and the number is likely to rise to 87 million by 2030. In the developing countries, such as India, the majority of patients with DM are in the age group of 45–64 years, whereas in the developed countries these are in the age group of >65 years.[2]

DM can cause both morbidity and mortality and requires appropriate treatment to improve the quality of life. Treatment of type 2 DM includes a wide range of oral antidiabetic drugs. Sulfonylureas and biguanides have been used for the past 5o years for the treatment of DM. The past decade has seen the introduction of a number of new oral antidiabetic drugs such as α-glucosidase inhibitors, thiazolidinediones, meglitinides, and the most recently introduced glucagon-like peptide analogs and dipeptidyl peptidase inhibitors.[3]

Several antidiabetic drug utilization studies published in health-care settings from various parts of the world can facilitate rational drug use in patients with DM. These studies provide useful insights into the current prescribing practices and also identify irrational prescribing. Concurrent illness such as hypertension in patients with DM makes it more difficult to avoid multiple drug use, hence patients with DM are more prone to polypharmacy and sometimes to irrational

prescriptions.[4] In addition to the dietary habits and sedentary lifestyle, the increase in prevalence is most marked in urban population. Therefore, we analyzed the prescription pattern of antidiabetic drugs from urban population.

MATERIALS AND METHODS

This retrospective study analyzed the prescriptions of the patients with DM obtained from a computerized pharmacy database of five private clinics of a locality of Hyderabad.

Sample Size: During a period of 2 months (June 2013 to July 2013), a total of 600 prescriptions containing antidiabetic drugs were collected from five private clinics. The information in each prescription included name, sex, age, generic and brand name of the prescribed drugs, dosage, usage, frequency, and the physician's name. Sample size was calculated using the formula, $n = 4Pq/l^2$.The global and national prevalence is 8%. According to this prevalence, sample size will be in 650–700 range. Thus, in this study we have analyzed 600 prescriptions.

Patients on antidiabetic medication with only one active ingredient were defined as receiving monotherapy, whereas those on medication with more than one active ingredient were defined as receiving combination therapy.

RESULTS

This retrospective study involved 600 prescriptions of patients with diabetes treated in five private clinics of a locality of Hyderabad.

The patients were divided into six groups on the basis of ages: 20–29, 30–39, 40–49, 50–59, 60–69, and 70–79 years. The demographic characteristics of the patients were studied: gender, age, and comorbidities. Of the 600 prescriptions analyzed, 349 were of male patients and 251 of female patients.

Antidiabetic drugs prescribed: In the overall utilization pattern, sulfonylureas (33%) were the most commonly prescribed drugs followed by biguanides (20%), insulins (11.3%), α-glucosidase inhibitors (4.8%), dipeptidyl peptidase-4 (DPP-4) inhibitors (4%), and glitazones (1.1%). The leading drugs in each group being glimepiride, metformin, human mixtard insulin, voglibose, sitagliptin, and pioglitazone, respectively. Among individual drugs, metformin (20%) and glimepiride (16.6%) were the most prescribed drugs.

Table 1: Demographic data of the patients

Age (years)	Men	Women	Total
20–29	18	40	58
30–39	38	40	78
40–49	53	39	92
50–59	91	38	129
60–69	81	49	130
70–79	68	45	113
Total	**349**	**251**	**600**

Table 2: Monotherapy and combination therapy

	No. of Patients	Percentage
Monotherapy	447	74.5%
Combination therapy	153	24.5%

Table 3: Prescription pattern of antidiabetic drugs as monotherapy based on class of drugs

Drugs	N	%
Insulin	75	12.5
Metformin	120	20
Glimepiride	100	16.6
Glibenclamide	44	7.3
Gliclazide	27	4.5
Glipizide	27	4.5
Voglibose	29	4.8
Sitagliptin	20	3.3
Saxagliptin	5	0.8

Table 4: Prescription pattern of antidiabetic drugs based on combination therapy

Drugs	N	%
Two-drug combination therapy		
Metformin + insulin	10	1.6
Metformin + glimepiride	56	9.3
Metformin + glipizide	16	2.6
Metformin + voglibose	23	3.8
Metformin + pioglitazone	21	3.5
Metformin + glibenclamide	5	0.8
Three-drug combination therapy		
Metformin + voglibose + insulin	7	1.1
Metformin + pioglitazone + insulin	5	0.8
Metformin + glimepiride + sitagliptin	4	0.6
Metformin + glipizide + insulin	3	0.5

The most commonly prescribed two-drug combination was of metformin and glimepiride (9.3%) followed by metformin + voglibose (3.8%), metformin + pioglitazone (3.5%), metformin + glipizide (2.6%), metformin + insulin (1.6%), and metformin + glibenclamide (0.8%). In three-drug combinations, the combination of metformin, voglibose, and insulin (1.1%) was highly prescribed followed by metformin + pioglitazone + insulin (0.8%), metformin + glimepiride + sitagliptin (0.6%), metformin + glipizide + insulin (0.5%), and metformin + pioglitazone + voglibose (0.5%). The prescribing patterns of antidiabetic medications in comorbid conditions were also analyzed. Among these comorbidities, antidiabetic drugs were

prescribed to 53% of patients with hypertension, 25% of those with angina pectoris, and 22% of those with hypercholesterolemia. With respect to antidiabetic drug combination therapy, the study shows that about 24.5% of patients were on combination therapy.

Table 5: Use of antidiabetic drugs in patients with diabetes having comorbidities

Comorbidity	Antidiabetic drugs			Antihypertensive drugs	
	Drugs	N	%	Drugs	%
Hypertension	Metformin	33	16.6	Metoprolol	22
	Insulin	9	4.5	Telmisartan	20
	Glimepiride	16	8.0	Olmesartan	17
	Gliclazide	6	3.0	Atenolol	13
	Glipizide	8	4.0	Amlodipine	13
	Glibenclamide	7	3.5	Enalapril	8
	Voglibose	9	4.5	Bisoprolol	7
	Sitagliptin	5	2.5		
	Metformin + glimepiride	5	2.5		
	Metformin + insulin	3	1.5		
	Metformin + voglibose	3	1.5		
	Glimepiride + insulin	2	1.0		
Angina pectoris	Metformin	21	10.6	Diltiazem	39
	Glimepiride	10	5.0	Isosorbide dinitrate	37
	Metformin + voglibose	10	5.0	Bisoprolol	18
	Metformin + glimepiride	8	4.0	Ecosprin	16
Hypercho-lesterolemia	Metformin	15	7.5	Atorvastatin	47
	Glimepiride	11	5.5	Simvastatin	28
	Metformin + insulin	9	4.5	Rosuvastatin	13
	Glimepiride + insulin	8	4.0	Fenofibrate	12

DISCUSSION

DM is a disease of metabolic dysregulation, most notably abnormal glucose metabolism accompanied by characteristic long-term complications. The complications can be microvascular and macrovascular.

Patients with all forms of DM [including insulin-dependent diabetes mellitus (IDDM) and noninsulin-dependent diabetes mellitus (NIDDM)] for considerable duration are vulnerable to the complications that cause serious morbidity.[5] The number of people with DM is increasing due to population growth, aging, urbanization, and increasing prevalence of obesity and physical inactivity.[6]

In this study, the prescribing pattern suggests that in general private clinics antidiabetic drugs are prescribed more to men (58.5%) than to women (41.5%). The prevalence of DM was maximum in the age group of 50–59 years for men and in the age group of 60–69 years for women. In this study, the most commonly prescribed drug class was that of sulfonylureas, and among the individual drugs, it is metformin. The high prevalence indicates the importance of the proper management and rational selection of antidiabetic drug therapy to improve the overall health of urban population of Hyderabad.

There are many approaches to manage DM, such as lifestyle modifications and pharmacotherapy. Some of the risk factors such as dietary choices, smoking, alcohol consumption, overweight, and sedentary lifestyle are modifiable.[7] Dieticians should be consulted for diet plan. Appropriate control on the calorie intake forms the core of dietary modifications. Regular physical activity improves body response to insulin. Lifestyle modifications are usually the first intervention that is sought in the treatment and prevention of DM. In this study, we reported that more than half of patients (74.5%) were treated with a single drug, but studies suggest combination therapy with two

Therapeutic agents target both insulin resistance and defects in insulin secretion. In our study, we have seen that metformin as monotherapy was prescribed in 205 of patients. It may be the first therapeutic option in patients with type 2 DM associated with overweight or obesity, as it prevents both microvascular and macrovascular complications and mortality. It produces beneficial changes in glycemia control.[8] But several studies suggest a potential benefit of initial combination therapy on glycemic control in patients with DM compared to metformin monotherapy across a wide range of baseline A1C levels.[9]

Our study showed that 16.6% of patients with diabetes were treated with glimepiride monotherapy. Again there are studies indicating that metformin was not significantly better than glimepiride in glycemic control of type 2 DM, and glimepiride would be a good choice second to metformin in monotherapy for patients with type 2 DM.[10]

The Diabetes Control and Complications Trial and the UK Prospective Diabetes Study showed the relationship between improved blood glucose

control and the prevention of DM complications. However, type 2 DM is not only a metabolic disorder associated with hyperglycemia but also a syndrome of cardiovascular risk factors such as dyslipidemia, hypertension, and obesity. More than 50% of deaths in people with DM are due to cardiovascular disease. Thus, the treatment of type 2 DM requires agents that not only lower blood glucose levels but also improve lipoprotein levels and reduce body weight. Therefore, insulin therapy is associated with several metabolic effects, including hepatic glucose output, decreased postprandial blood glucose levels, and improved lipid profile. However, large doses of insulin are required to achieve near-normal blood glucose levels and are associated with weight gain and the risk of hypoglycemia.[11]

Pioglitazone is a thiazolidinedione that increases insulin sensitivity in target tissues. In combination with other hypoglycemic drugs, pioglitazone is an effective protocol in glycemic control. Voglibose, an α-glucosidase inhibitor, lowers the daily glycemic conversions and inhibits overwork of the pancreatic beta cells but has little effect on insulin sensitivity in patients with NIDDM. Several new drugs with glucose-lowering efficacy that may offer certain advantages have recently become available. These include injectable glucagon-like peptide-1 agonists and DPP-4 inhibitors. These agents offer a low risk of hypoglycemia combined with sustained weight loss. Oral therapy for type 2 DM when used appropriately can safely assist patients to achieve glycemic targets in the short to medium term. However, the progressive nature of type 2 DM usually requires a combination of two or more oral agents in the longer term, often as a prelude to insulin therapy.[12] Issues related to safety and tolerability notably weight gain often limit the optimal applications of antidiabetic drugs such as sulfonylureas and thiazolidinediones. Moreover, the impact of different drugs, even within a single class, on the risk of long-term vascular complications has come under scrutiny.[13] Type 2 DM has been classically thought of as a condition that can be managed initially with diet and exercise. Later, with the progressive failure of insulin secretory capacity, oral agents are generally used to promote insulin secretion (sulfonylureas and repaglinide), to improve insulin action in the liver (metformin), or to delay the absorption of carbohydrate from the meal (acarbose and miglitol). In recent years, combinations of oral agents have been used to attack the pathophysiology of DM at multiple points in cases where insulin secretion is still moderate.[14]

CONCLUSION

This study showed that type 2 DM was more prevalent in men than in women. The geriatric patients were found to have high risk of developing type 2 DM. A total of 198 patients had comorbid conditions along with DM, and the most common comorbid condition in the study was hypertension (42%).

The study has shown metformin as the predominantly prescribed oral antidiabetic drug both in monotherapy and in combination therapy. No significant increase was found in the prescriptions of newer oral antidiabetic agents such as α-glucosidase and DPP-4 inhibitors. In this study, it was observed that the physicians preferred monotherapy more often than the combination therapies, and the most commonly prescribed individual agent was metformin. Overall, monotherapy was found to be predominant over combination therapy. It may be concluded that the incidence of polypharmacy is low, the essential drug prescription is high, and the drug use is quite rational.

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