

Research Article



Assessment of Prescription Pattern of Antidiabetic Drugs in the Inpatient Department of A Tertiary Care Hospital

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ABSTRACT

The term diabetes mellitus describes a metabolic disorder of multiple aetiology characterized by chronic hyperglycaemia with disturbances of carbohydrate, fat and protein metabolism resulting from defects in insulin secretion, insulin action, or both. Blood/plasma glucose test is essential for diagnosis of the diabetes moreover if this test fails periodic surveillance with periodic re-testing is required. The objective of the study is to assess the prescribing pattern of antidiabetic drugs used in hospitalized patients of tertiary care hospital. To assess the prescribing pattern of antidiabetic drugs by using ADA guideline. To correlate association of diabetes with demographic details of patients. The retrospective and prospective observational study conducted over six months period included 110 diabetics' patients. Patient data were collected by using a self-design of data collection form which consist of details like patient demographic details, past medication history, co-morbid conditions, lab investigation and therapeutic data including name, dose, duration and frequency of drugs and the data were analysed statistically using Microsoft excel. Out of 110 patient 62 were male and 48 were female. The majority of patient, 41.81% were on the age group 51-60 years. 6 patients (5.45%) were type 1 diabetic and 104 patients (94.54%) were type 2 diabetic. Numbers of appropriate prescriptions were 93.63% and Number of inappropriate prescriptions were 6.36%. The most common co-morbid conditions were hypertension 45.93%. Most common prescribed dosage form to the diabetic female was tablet 52.94%. The most commonly prescribed anti-diabetic drugs were biagunides (metformin) (27.93%) in monotherapy and Glimepiride + metformin (9.49%) was used most widely as a combination therapy. Educational intervention is necessary to improve knowledge, attitude and practices of diabetes patient for health benefits.

Keywords: Anti-Diabetic drugs, diabetes mellitus, biagunides, insulin, sulphonylurea.

INTRODUCTION

The term diabetes mellitus describes a metabolic disorder of multiple etiology characterized by chronic hyperglycaemia with disturbances of carbohydrate, fat and protein metabolism resulting from defects in insulin secretion, insulin action, or both. The effects of diabetes mellitus include long-term damage, dysfunction and failure of various organs.¹ Diabetes mellitus is one of the common, non-communicable diseases in the world. Insulin and glucagon are two hormones that help in the regulation of body glucose level. Insulin that usually convert glucose into glycogen is secreted by beta cells of pancreas while glucagon is the enzyme that help to produce glucose from stored glycogen precursor is secreted by alpha cells of pancreas.²

Several pathogenic processes are involved in the development of diabetes. These range from autoimmune destruction of the β -cells of the pancreas with consequent insulin deficiency to abnormalities that result in resistance to insulin action. The basis of the abnormalities in carbohydrate, fat, and protein metabolism in diabetes is deficient action of insulin on target tissues. Deficient insulin action results from inadequate insulin secretion and/or diminished tissue responses to insulin at one or more points in the complex pathways of hormone action. Impairment of insulin

secretion and defects in insulin action frequently coexist in the same patient, and it is often unclear which abnormality, if either alone, is the primary cause of the hyperglycemia.⁴

Classification

Basically, there are four types of DM namely; Type 1 Diabetes, Type 2 Diabetes, Gestational Diabetes and other Forms of Diabetes. Type 1 DM, which is also known as insulin dependent diabetes mellitus (IDDM) affect the individual in puberty or in the early adulthood. The disease is characterized by an absolute deficiency of insulin caused by massive beta cell necrosis.² Type 2 diabetes, which used to be called adult-onset diabetes, can affect people at any age, even children.⁷ Gestational diabetes is hyperglycaemia with blood glucose values above normal but below those diagnostics of diabetes, occurring during pregnancy.⁸ Diabetes due to other causes e.g. genetic defect or medication induced.² – Monogenic diabetes syndromes, –Diseases of the exocrine pancreas, e.g., cystic fibrosis, –Drug- or chemical-induced diabetes.⁹

Diabetes mellitus may present with characteristic symptoms such as increased thirst, Frequent urination, Extreme hunger, Unexplained weight loss, Presence of ketones in the urine, Fatigue, Irritability, Blurred vision,



Slow-healing sores, Frequent infections, such as gums or skin infections and vaginal infections.³

Long-term complications of diabetes include retinopathy with potential loss of vision; nephropathy leading to renal failure; peripheral neuropathy with risk of foot ulcers, amputations, and Charcot joints; and autonomic neuropathy causing gastrointestinal, genitourinary, and cardiovascular symptoms and sexual dysfunction.⁵

Diagnosis

Symptoms of type 1 diabetes often appear suddenly and are often the reason for checking blood sugar levels. Because symptoms of other types of diabetes and prediabetes come on more gradually or may not be evident, the American Diabetes Association (ADA) has recommended screening guidelines. The ADA recommends that the people be screened for diabetes who has Anyone with a body mass index higher than 25, regardless of age, Anyone older than age 45.

Tests for type 1 and type 2 diabetes and prediabetes

Glycated hemoglobin (A1C) test

This blood test indicates your average blood sugar level for the past two to three months. It measures the percentage of blood sugar attached to hemoglobin, the oxygen-carrying protein in red blood cells. The higher your blood sugar levels, the more hemoglobin you'll have with sugar attached. An A1C level of 6.5 percent or higher on two separate tests indicates that you have diabetes.

Random blood sugar test

A blood sample will be taken at a random time. Regardless of when you last ate, a random blood sugar level of 200 milligrams per deciliter (mg/dL).

Fasting blood sugar test

A blood sample will be taken after an overnight fast.

Oral glucose tolerance test

For this test, you fast overnight, and the fasting blood sugar level is measured. Then you drink a sugary liquid, and blood sugar levels are tested periodically for the next two hours.⁶

Diabetes prevalence is continuously growing all over the world. Type 2 diabetes constitute about 85% to 95% of the diabetic population in the developed countries and even higher in the developing countries. In 2003, 194 million people having age between 20 to 79 years are diabetic and a quarter of them belong to developing countries. There is a rapid increase in the prevalence of diabetes in Asian countries.²

The treatment strategy for DM is dependent on the degree of its severity and types. In type I only insulin is administered because it is essential for DM type I cases. On the other hand, for the management of DM type II both the pharmacological and non-pharmacological approaches are applied. Pharmacological approach

involves medication therapy while in non-pharmacological weight reduction, exercise; reduce alcohol intake and reductions of smoking as beneficial.² Various classes of anti-diabetic drugs including insulin and oral hypoglycemic agents (OHA) are currently used in the treatment of diabetes, which acts by different mechanisms to reduce the blood glucose levels to maintain optimal glycemic control.¹¹

There are several classes of oral drugs used to control blood glucose levels, including:¹⁰

Sulfonylureas, such as glipizide and glimepiride, are considered hypoglycemic agents because they stimulate the release of insulin from beta cells in the pancreas, thus reducing blood glucose levels.¹⁰ Biguanides, Metformin plays a pivotal role in the treatment of patients with type 2 diabetes. Metformin decreases basal glucose output by suppressing gluconeogenesis and glycogenolysis in liver and increasing glucose disposal in muscle tissue.¹² Meglitinides such as repaglinide. They also increase insulin secretion.¹² Thiazolidinediones, such as rosiglitazone and pioglitazone, act by reducing insulin resistance of muscle and adipose cells and by increasing glucose transport into these tissues.¹⁰ DPP4-inhibitors such as sitagliptin act by inhibiting the enzyme that deactivates the GLP-1, therefore affecting glucose regulation. GLP-1 receptor agonists such as liraglutide They act as incretines by stimulating glucose-dependent insulin release in the pancreatic islets. SGLT-2 inhibitors such as empagliflozin act in the kidneys` proximal tubule, blocking the reabsorption of glucose and stimulating glycosuria.

MATERIALS AND METHODS

Study Site

This observational study was carried out in In-patient Department of Sapthagiri Institute of Medical science And Research Center, Bangalore.

Study Design

This is a retrospective and prospective observational study conducted over six months period.

Study Duration

Planning - 1 month, Data collection - 3 months, Interpretation and thesis writing -2 months.

Study Population

Patients who were admitted in Sapthagiri Institute of Medical science And Research Center and satisfying the inclusion/exclusion were enrolled in the study.

Sample Size

110 patients admitted in Sapthagiri Institute of Medical science And Research Center.



Study Criteria

Inclusion Criteria

Prescriptions from all diabetic patients of either gender are included.

Exclusion Criteria

Pregnant women, including those with gestational diabetes

Patients with diabetes secondary to other factors (e.g. malnutrition, infection, surgery)

Source of Data

Patient data collection form. Patient case sheet, Laboratory data, Patient medication chart.

Study Materials

Patient Data Collection Form

Data will be collected by using a self-design of data collection form which consist of details like patient demographic details, past medication history, co-morbid conditions, lab investigation and therapeutic data including name, dose, duration and frequency of drugs.

Study Procedure

This was a retrospective and prospective observational study, the patients who satisfied the inclusion criteria were enrolled into the study with the help of patient consent form. The clinical pharmacist review of the patient case notes, medication chart, laboratory data and other prevalent data. The data was collected in a form which included the demographic details, past medication history, co-morbid conditions, lab investigation and therapeutic data including name, dose, duration and frequency of drugs. The entire data collected was entered in Microsoft excel sheet for analysis of results. By using certain guidelines, the prescriptions were assessed for inappropriate dosing of drugs. The entire data was analysed using appropriate statistical methods (MS Excel).

Evaluation Criteria

Drug dosing in patients with diabetes mellitus in a teaching hospital was assessed.

Statistical Analysis

Statistical analysis was performed using MS excel and the result was statistically analysed using appropriate statistical method (MS excel).

RESULTS

This study was conducted for a period of 6 months, the study included 110 patients from IP department of Sathagiri Institute of Medical Science, a tertiary care hospital in Bangalore.

Patient Distributions Based on Demographic Data

Out of 110 patients 48 (43.63%) were females and 62 (56.36%) were males which is represented in table-1 and figure-1.

Table 1: Patient Distribution Based on Gender

Gender	No of patients	Percentage
Male	62	56.36%
Female	48	43.63%
Total	110	100%

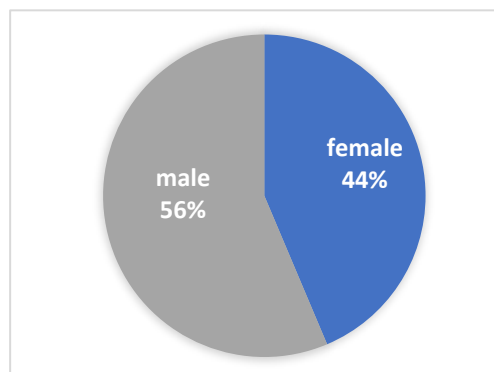


Figure 1: Pie chart of Patient Distribution Based on Gender

Age Distribution of Patients

Patients were categorized according to their age groups. Out of 110 patients majority 46 (41.81%) of them were found in the age group between 51-60 years, followed by 23 (20.90%) in the age group between 61-70 years, 16 (14.54%) in the age group between 41-50 years, then 12 (10.90%) were found between 71-80, then 8 (7.27%) were found between 30-40 years and 5 (4.54%) were >80 years which is represented in table-2 and figure-2.

Distribution of Patients Based on Diabetes Type

Out of 110 patients included in the study, 6 patients (5.45%) were type 1 diabetic and 104 patients (94.54%) were type 2 diabetic. Also 3 out of 6 patients with type 1 diabetes were male and 3 out of 6 patients with type 1 diabetes were female among 104 type 2 diabetic patients, 95 (95.16%) were male and 45 (93.75%) were female which is represented in table-3 and figure-3.

Co-Morbid Conditions of Patients

In Diabetes mellitus patients the most common co-morbid conditions are hypertension, ischemic heart disease, Coronary artery disease, Unstable angina, Asthma, Liver dysfunction, chronic kidney disease, Anemia, congestive cardiac failure, COPD, ESRD and hyperlipidemia, Infection. Among these 15 co-morbid conditions Hypertension and ischemic heart disease are comparatively high which is represented in table-4.

Table 2: Patient Distribution with Respect to their Age Groups

Age Distribution in Years	No. of Male Patients (%)	No. of Female Patients (%)	Total No. of Patients (%)
30-40	3 (37.5)	5 (62.5)	8 (7.27)
41-50	7 (43.75)	9 (56.25)	16 (14.54)
51-60	27 (58.69)	19 (41.30)	46 (41.81)
61-70	12 (52.17)	11 (47.82)	23 (20.90)
71-80	9 (75)	3 (25)	12 (10.90)
>80	4 (80)	1 (20)	5 (4.54)

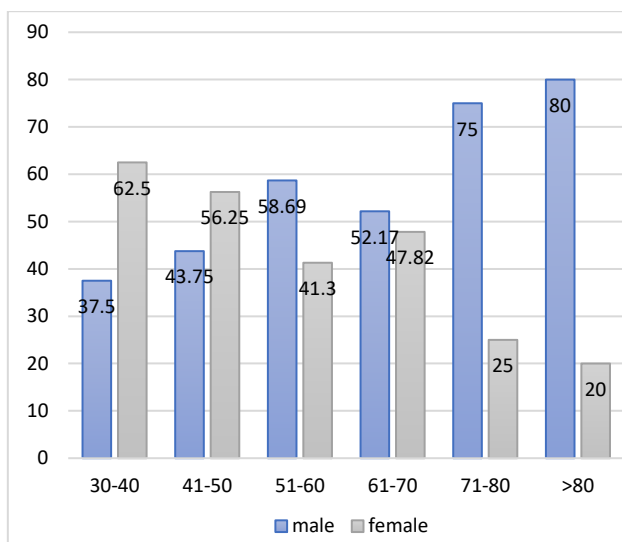


Figure 2: Graphical Representation of Patient Distribution with Respect to their Age Groups

Table 3: Patient Distribution based on diabetes type

patients based on diabetes type	Type 1 (%)	Type 2 (%)
Male	3 (4.83%)	59 (95.16%)
Female	3 (6.25%)	45 (93.75%)
Total	6 (5.45%)	104 (94.54%)

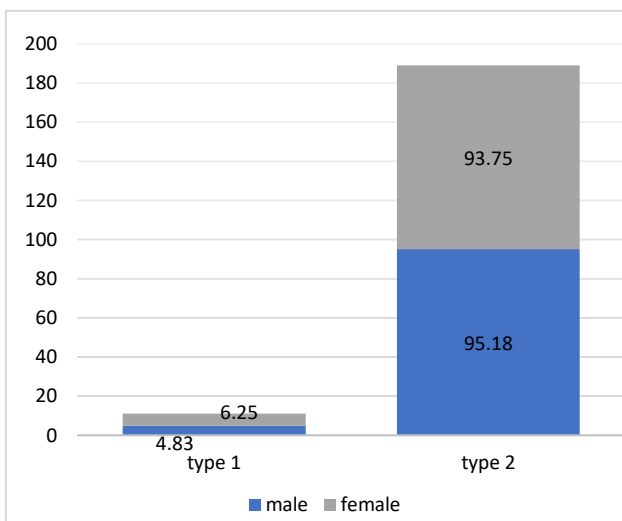


Figure 3: Graphical Representation of Patient Distribution based on diabetes type & gender

Table 4: Co-morbid Conditions of Patients

Co-morbid conditions	No. of Patients	Percentage
Hypertension	79	45.93
IHD	21	12.20
MI	4	2.32
Unstable angina	12	6.97
Asthma	6	3.48
Hyperlipidemia	1	0.58
CCF	2	1.16
Liver dysfunction	4	2.32
Acute kidney injury	2	1.16
CAD	18	10.46
CKD	5	2.90
COPD	3	1.74
ESRD	2	1.16
Infection	2	1.16
Anemia	5	2.90

Number of Medications Prescribed in Study Population

Out of 110 prescriptions, the total numbers of drugs prescribed were 744. Average numbers of drugs per prescription were 6.76. Number of appropriate prescriptions were 103 (93.63) and Number of inappropriate prescriptions were 7 (6.36) which is represented in table-5.

Table 5: Number of Medications Prescribed in Study Population

Total no of prescriptions	110
Total no of drugs prescribed	744
Average no of drugs per prescription	6.76
No of appropriate prescriptions	103 (93.63%)
No of inappropriate prescriptions	7 (6.36%)

Different Types of Drugs Prescribed

A total of 755 drugs were prescribed in the study population of 110 patients. Anti-diabetics were the commonest class of drugs prescribed accounting for 179 (23.70%) of the total drugs followed by Anti-platelet drugs 77 (10.19%), Hypolipidemic 38 (5.03%), antibiotics 34 (4.50%), Diuretics 32 (4.23%), Analgesic 32 (4.23%), Anti-angina 16 (2.11%), Respiratory agent 13 (1.72%),



Calcium channel blocker 13 (1.72%), Benzodiazepines 9 (1.19%), Antihistamine 8 (1.05%), Antihypertensive drugs 6 (0.79%), and others (PPIs, IV fluids, Corticosteroids, Antacid, Anti-emetic, Antifungal, Vitamins) 298 (39.47%) as shown in table no 6 and figure no. 4.

Table 6: Different Drugs Prescribed in Diabetic Patient

Drugs prescribed	Total No. of drugs	Percentage (%)
Anti-diabetic	179	23.70
Hypolipidemic	38	5.03
Antibiotics	34	4.50
Anti-platelet	77	10.19
Diuretics	32	4.23
Analgesic	32	4.23
Anti-angina	16	2.11
Respiratory agent	13	1.72
Calcium channel blocker	13	1.72
Benzodiazepines	9	1.19
Antihypertensive drugs	6	0.79
Antihistamine	8	1.05
Others	298	39.47

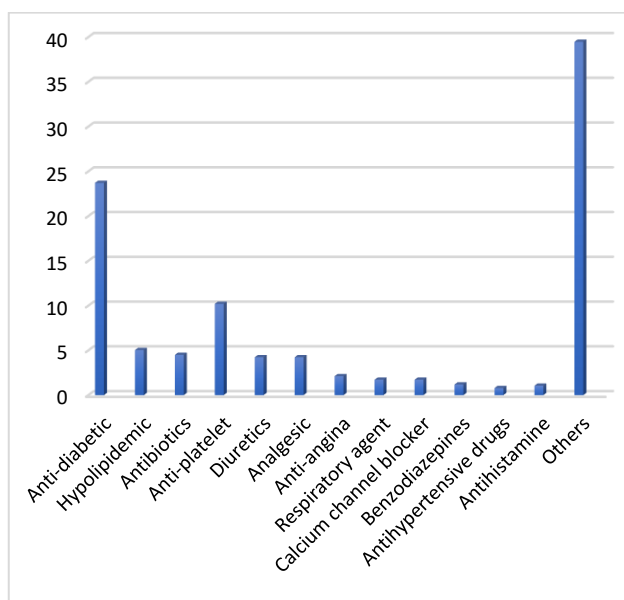


Figure 4: Graphical Representation of Different Drugs Prescribed in Diabetic Patient

Evaluation of anti- diabetic therapy

In the study of 110 diabetic patients we observed that biguanides (metformin) utilization was high as monotherapy (27.93%). Glimepiride + metformin was used most widely (9.49%) as a combination therapy as shown in the table No. 7 and figure No. 5.

Table 7: Evaluation of Anti-Diabetic Therapy

Treatment	Name of the drug	NO. of time prescribed	Percentage (%)
Monotherapy	Metformin	50	27.93
	Human insulin	45	25.13
	Glimepiride	18	10.05
	Regular insulin	33	18.43
Combination Therapy	Glimepiride/metformin/voglibose	7	3.91
	Glimepiride/metformin	17	9.49
	Sitagliptin/metformin	5	2.79
	Regular insulin/insulin isophane	4	2.23

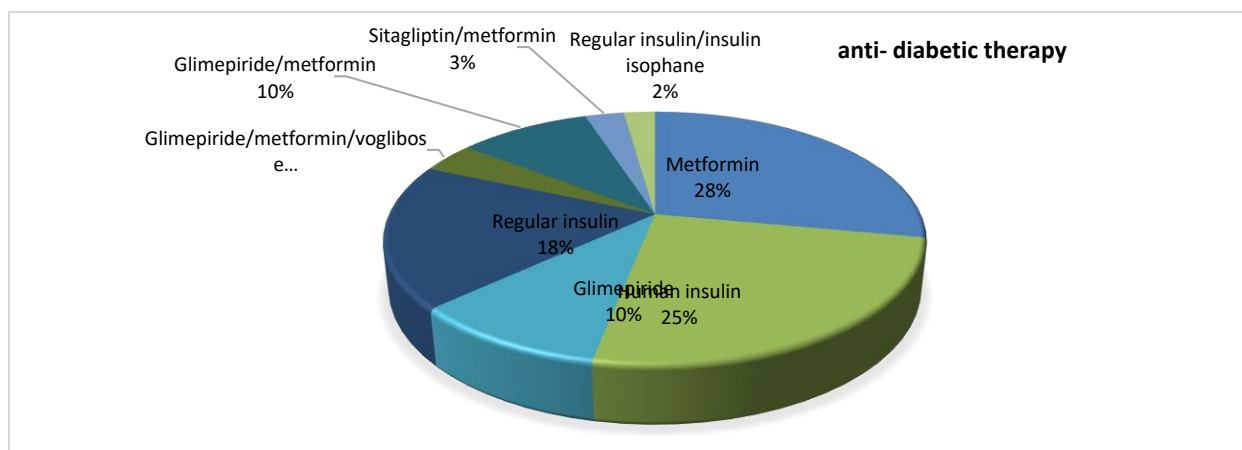


Figure 5: Pie Chart Representing Evaluation of Anti-Diabetic Therapy

Dosage Form of Anti- Diabetic Therapy

In the study of 110 diabetic patients we observed that Most common prescribed dosage form to the diabetic female was tablet (52.94%). While in male the highly prescribed dosage form was injection (53.19%) as shown in the table No. 8 and figure No. 6.

Table 8: Dosage Form of Anti-Diabetic Therapy

Dosage form of anti- diabetic therapy	Male	Female
Tablet	44 (46.80%)	45 (52.94%)
Injection	50 (53.19%)	40 (47.05%)

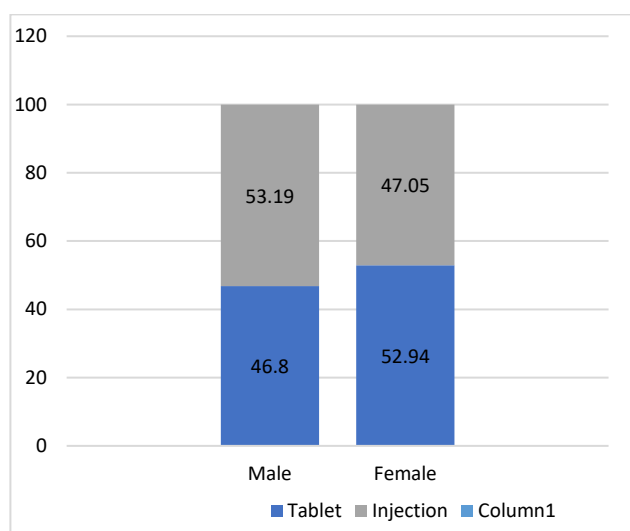


Figure 6: Graphical Representation of Dosage form of Anti-Diabetic Therapy

DISCUSSION

This study was carried out with an aim to assess the prescribing pattern of antidiabetic drugs used in hospitalized patients of tertiary care hospital in Saphthagiri Institute of Medical Science and Research Centre, Bangalore. The duration of study was six months.

One hundred and ten patients participated in the study. Demographic details show that female patients were 48 (43.63%) and male patients were 62 (56.36%) The study shows that male patients are more than female patients, however in earlier study male predominance were seen which is in agreement with our result supported by Syed Muhammad Ashar et.al.² The reason for having diabetes more in males than in females could be because of lifestyle. The patients were divided in six age group such as 30-40, 41-50, 51-60, 61-70, 71-80and >80. The majority of patients, 30 % were on age group 51-60 years, this may be due to fact that age is a risk factor for developing diabetes mellitus supported by Mandana Moradi et.al.¹⁶ Out of 110 prescriptions, the total number of drugs prescribed were 744. Average numbers of drugs per prescription were 6.76. The risk of drug interaction may increase with increase in number of drugs per prescription which ultimately lead to prescribing errors

and in hazardous to the health of patient. Anti-diabetic drugs were the most common drugs prescribed which accounts for 179 (23.70%) of total drugs.

Anti-diabetic drugs commonly prescribed as monotherapy were metformin (27.93%), Human insulin (25.13%), Regular insulin (18.43%), glimepiride (10.05%) and as combination therapy Glimepiride/metformin (9.49%), Glimepiride/metformin/voglibose (3.91%), Sitagliptin/metformin (2.79%). Biguanides (metformin) (27.93%) utilization was high as monotherapy in prescription, this may be due to its high advantages of no weight gain these results were supported by Ramachandran Gat el¹⁵. In combination therapy Glimepiride/metformin combination was most widely used (9.49%).

Anti-platelet were the second commonest drug prescribed which accounts for 77 (10.19%) antibiotics 34 (4.50%), Diuretics 32 (4.23%), Analgesic 32 (4.23%), Anti-angina 16 (2.11%), Respiratory agent 13 (1.72%), Calcium channel blocker 13 (1.72%), Benzodiazepines 9 (1.19%), Antihistamine 8 (1.05%), Antihypertensive drugs 6 (0.79%), and others (PPIs, IV fluids, Corticosteroids, Antacid, Anti-emetic, Antifungal, Vitamins) 298 (39.47%) were prescribed.

In the present study 48% patient reported hypertension along with diabetes mellitus, these results were supported by Dashputra AV at el¹⁴ this study indicates that hypertension is the commonest co-morbidity seen with diabetes mellitus. In the present study the prevalence of type 2 DM is more when compared to type1 DM (94% vs 6%), most common prescribed dosage form to the diabetic female was tablet (52.94%). While in male the highly prescribed dosage form was injection (53.19%).

CONCLUSION

This observational study of prescribing pattern of antidiabetic drugs shows metformin was the most commonly prescribed anti-diabetic drug in Monotherapy followed by Human insulin. Among Fixed drug combination therapy Glimepiride/metformin was the most commonly prescribed antidiabetic drug. Hypertension was most common associated co-morbidity in diabetic patients. Incidence of diabetes has been found higher in male as compared to female and majority of the patients develop diabetes in the most productive years of their life. In our study, males were found to be more affected by type 2 diabetes mellitus than females.

Average number of drugs per prescription was found to be 6.76. The most commonly drugs prescribed apart from antidiabetic were Anti-platelet drugs followed by Hypolipidemic. Drug-related problems can result in an increase in morbidity and mortality, as well as an increase in the cost of healthcare. Inappropriate use of medications can increase adverse drug effects that may be reflected by excessive length of hospital stay, and excessive healthcare utilization and cost. Large numbers of adverse drug reactions are predictable and often

preventable. Preventable adverse drug events are often a result of medication errors. Prescribing errors often occur because the prescribers do not have immediate access to all the needed information related to the drugs or the patient. Clinical pharmacists who have developed confidence and skill in using pharmacokinetics as a clinical tool, will be able to participate in this interdisciplinary approach to individualized patient care.

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