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Research Article.....!!!

## **DRUG USE EVALUATION OF ORAL HYPOGLYCEMICS IN DIABETIC PATIENTS IN A TERTIARY CARE HOSPITAL**

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### **ABSTRACT**

Since 1995, a dozen of orally administered diabetes medications or combination of medications for the management of diabetes mellitus have been approved by FDA. They play a primary defense function against hyperglycemic events in comparison to insulin therapy. Traditionally in oral hypoglycemic agent therapy, sulphonyl ureases have always been the agents of first choice, while bisguanides and alpha-glucosidase inhibitors were unpopular. Metformin is approved for use in pediatrics. Objectives: To evaluate drug use of oral hypoglycemic in hospitalized diabetic patients in a tertiary care hospital. To assess the prescribing pattern of oral hypoglycemic drugs by using ADA guideline. To correlate association of diabetes with demographic details of patients. Methodology: A retrospective study of 6 months duration was undertaken during 2017-2018. A total number of 110 patients case sheets were utilized for study from diabetics patients, department of Saphthagiri Institute of Medical Sciences & Research Centre (SIMSRC). Patients were included in study with any age with diagnosis of diabetes mellitus. Randomization was done by selecting alternative case sheets. Drugs data on the utilization of oral hypoglycemics and patient's data were computed using MS Excel and statistical analysis was done by using SPSS (Statistical package for the social sciences). Result: Out of 110 patients enrolled in the study from inpatient department, Majority of patients 34.5% belonged to age group of 51-60 years. the number of Female patients were high by 10.9%. 55.4% patients were females and 44.5% patients were males. Number of appropriate prescriptions were 95.4% and Number of inappropriate prescriptions were 4.5%. Conclusion: This study gives an overview of the Evaluation Of Oral Hypoglycemics in the study area. The study showed that patients between the ages of 51 and 60 years were admitted more frequently than other age groups.

### **KEYWORDS:**

Oral hypoglycemics,  
Diabetes mellitus,  
Metformin, Biguanides  
and Glimpiride.

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**INTRODUCTION:**

Diabetes mellitus (DM) is one of the oldest diseases known to man, which was the first reported in Egyptian literature about 3000 years ago. It is a chronic disease that requires long-term medical attention both to limit the development of its devastating complications and to manage them if they do occur. The World Health Organization (WHO) defines diabetes mellitus as “A metabolic disorder of multiple etiology characterized by chronic hyperglycemia with disturbances of carbohydrate, fat and protein metabolism resulting from defects in the insulin secretion, insulin action, or both.”

India has the largest population of diabetes in the world. The International Diabetes Federation (IDF) estimates the number of people with diabetes in India will reach 80 million by the year 2025. The World Health Organization (WHO) has projected that the global prevalence of type-2 diabetes mellitus will more than double from 5 million in 1995 to 300 million by 2025. Between 1995 and 2025, there will be a 35% increase in worldwide prevalence of diabetes mellitus, from 4 to 5.4%. There is no specific cause for DM, but both etiologic factors and risk factors are associated with it. The risk factors are heredity, obesity, increasing age, emotional stress, autoimmune  $\beta$ -cell damage, endocrine diseases (e.g., Cushing disease). Insulin and glucagon are two hormones that help in the regulation of body glucose level. Insulin that usually converts glucose into glycogen is secreted by beta cells of pancreas while glucagon is the enzyme that helps to produce glucose from stored glycogen precursor is secreted by alpha cells of pancreas.

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) afflicts 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.

Type 2 DM is due primarily to lifestyle factors and genetics. A number of lifestyle factors are known to be important to the development of type 2 DM. These are physical inactivity, sedentary lifestyle, cigarette smoking and generous consumption of alcohol. Obesity has been found to contribute to approximately 55% of cases of type 2 DM. Gestational diabetes is hyperglycaemia with blood glucose values above normal but below those diagnostics of diabetes, occurring during pregnancy. Women with gestational diabetes are at an increased risk of complications during pregnancy and at delivery. They and their children are also at increased risk of type 2 diabetes in the future. Gestational diabetes is diagnosed through prenatal screening, rather than through reported symptoms.

The benefits of lowering or normalizing blood glucose levels in the management of diabetic patients was conclusively demonstrated in the U.K. Prospective Diabetes Study (UKPDS). Whereas randomized controlled clinical trials traditionally provide useful information on drug safety and efficacy, drug utilization patterns and clinical effectiveness in a “real-world” setting may differ substantially from the data provided from such trials. In particular, agent tolerability, drug-drug interactions, and the use of complicated drug regimens may lead to poor compliance or discontinuation with prescribed medications, resulting in reduced clinical effectiveness. Data from the Third National Health and Nutrition Examination Survey found that many U.S. adults with type 2 diabetes have unacceptable levels of glycemic control. Furthermore, only 37.7% of the patients treated with oral hypoglycemic agents (OHAs) were found to have HbA1c values  $\leq 7\%$ , a level the ADA considers the goal for patients with diabetes.<sup>10</sup> Inadequate management of diabetic patients will increase the risk of developing diabetes complications which will have negative impact on the health system.

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. Patients with diabetes have an increased incidence of atherosclerotic cardiovascular, peripheral arterial, and cerebrovascular disease. Hypertension and abnormalities of lipoprotein metabolism are often found in people with diabetes.

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. 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. 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. There are several classes of oral drugs used to control blood glucose levels, including: 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. glipizide 2.5 to 10mg PO before breakfast and evening meal, start with low dose. glimepiride 1 to 2 mg orally once a day.

## **Materials and Methods**

### **Duration of Study:**

The study was conducted for a period of six months.

### **Site of Study**

The study was conducted at Saphagiri Institute of Medical Sciences & Research Centre (SIMSRC).

### **Study Design**

A hospital based retrospective and prospective observational study.

### **Sources of Data And Materials**

Patient case sheet. Laboratory data reports. Medication / treatment chart.

Suitable design documentation form.

### **Study Criteria Inclusion Criteria**

Prescriptions from all diabetic patients of either gender are included.

### **Exclusion Criteria**

Prescriptions from Gestational diabetes (diabetes during pregnancy) and cases with insufficient data are excluded. Prescriptions from Patients in psychiatric department also excluded.

### **Method of Data Collection**

Data collection form:

Data was collected by using a self-designed data collection form, which contained details like patient demographics, laboratory data, drug therapy and other relevant information.

Patient Medical Record:

Data was collected from Patient Medical Record which comprised of patient demographics, history of patient, general physical examination, laboratory data, and drug therapy

### **Study Procedure**

This is a retrospective and prospective observational study. The patients who satisfied the inclusion criteria was enrolled into the study with the help of patient consent form. The clinical pharmacist reviewed the patient case notes, medication chart, laboratory data and other relevant data.

A structured data collection form was used to record all the necessary data including patient demographic details, patient medication history, co morbid conditions and reason for admission, medication details and lab investigation. The pattern of drug dosing was also recorded.

### **Results**

This study was conducted for a period of 6 months, the study included 110 patients from IP

department of Sapthagiri Institute of Medical Science, a tertiary care hospital in Bangalore.

### AGE DISTRIBUTION OF PATIENTS OBSERVED IN THIS STUDY

Patients were categorized according to their age groups. Out of 110 patients majority 38 (34.5%) of them were found in the age group between 51-60 years, followed by 25 (22.7%) in the age group between 61-70 years, 17 (15.4%) in the age group between 71-80 years, then 13 (11.8%) were found between 41-50, then 11 (10%) were found between 30-40 years and 6 (5.4%) were >80 years. (Fig. 1 and Table. 1)

Table 1: Age Distribution of Patients Observed (n=110)

Age Distribution (In Years)	Total No. of Patients	In Percentage
30-40	11	10%
41-50	13	11.8%
51-60	38	34.5%
61-70	25	22.7%
71-80	17	15.4%
>80	6	5.4%

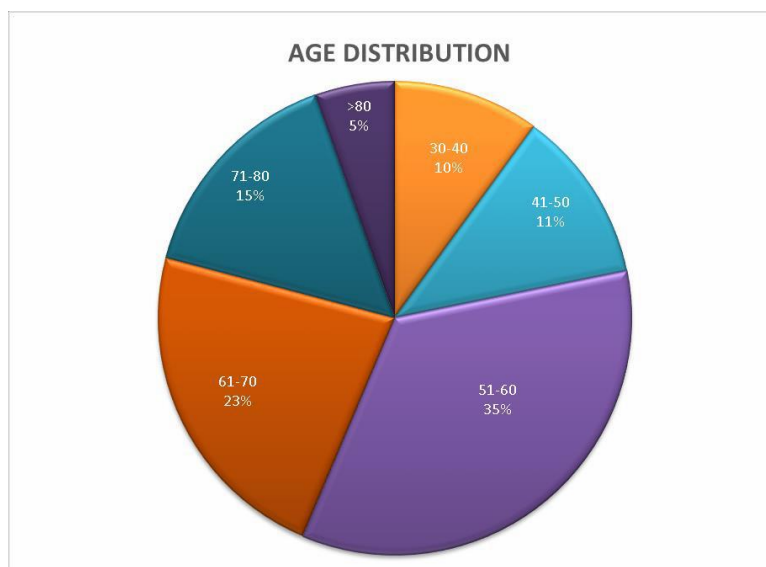


Figure1: Age Distribution of Patients Observed In this Study

### > DISTRIBUTION OF GENDER IN PATIENTS OBSERVED IN THIS STUDY

Out of 110 patients, 49 (44.5%) patients were males and 61 (55.4%) patients were females. the number of female patients were high by 10.9%. (Fig. 2 and Table. 2)

Table 2: Gender Distribution Of Patients Observed (n=110)

Gender	No of patients	In Percentage
Male	49	44.5%
Female	61	55.4%
Total	110	100%

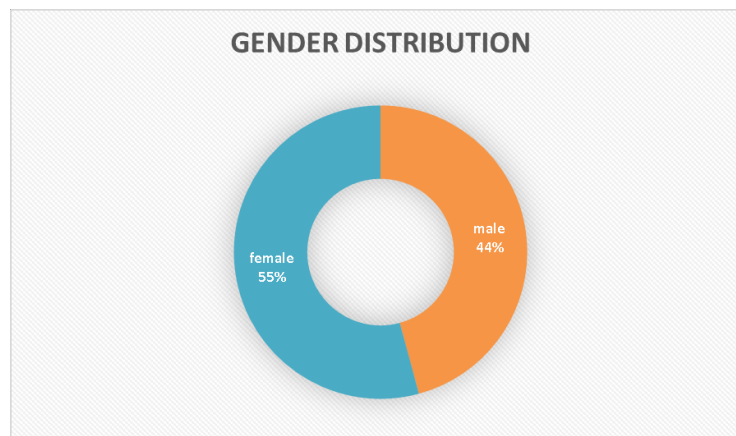


Figure 2: Gender Distribution of Patients observed

#### > 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, Chronic Kidney Disease, Anemia, Myocardial Infarction, Liver Dysfunction, Congestive Cardiac Failure, COPD, ESRD and hyperlipidemia, Infection. Among these 15 co-morbid conditions Hypertension and Ischemic Heart Disease are comparatively high. (Fig. 3-4 and Table. 3)

Table 3: Co-Morbid Conditions Of Patients (n=175)

Co-morbid conditions	No. of Patients	In Percentage
Hypertension	83	47.4%
IHD	20	11.4%
CAD	14	8%
Unstable angina	12	6.8%
Asthma	7	4%
CKD	7	4%
Anemia	6	3.4%
MI	6	3.4%
Liver dysfunction	4	2.2%
CCF	3	1.7%
Acute kidney injury	3	1.7%
COPD	3	1.7%
Infection	3	1.7%
ESRD	2	1.1%
Hyperlipidemia	2	1.1%

Figure 3: Co-Morbid Conditions of Patients

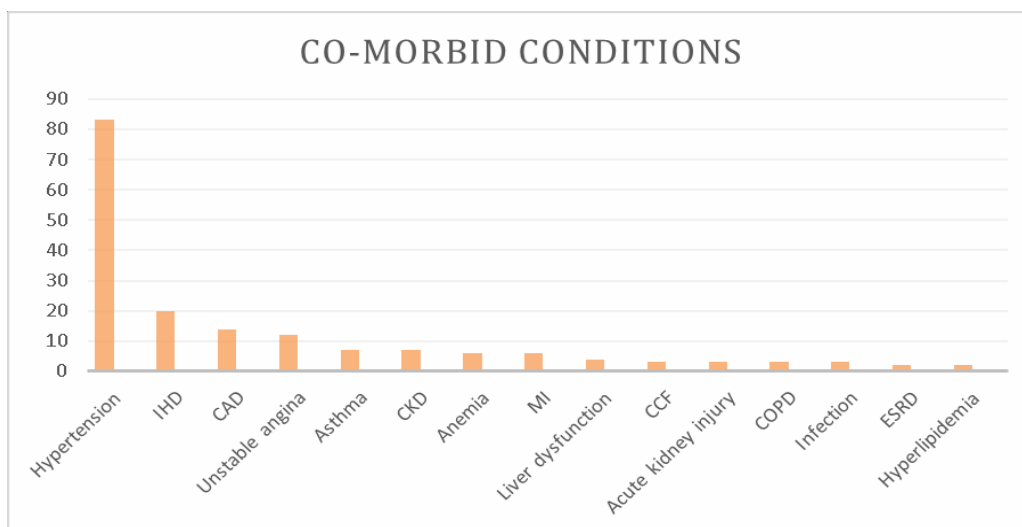
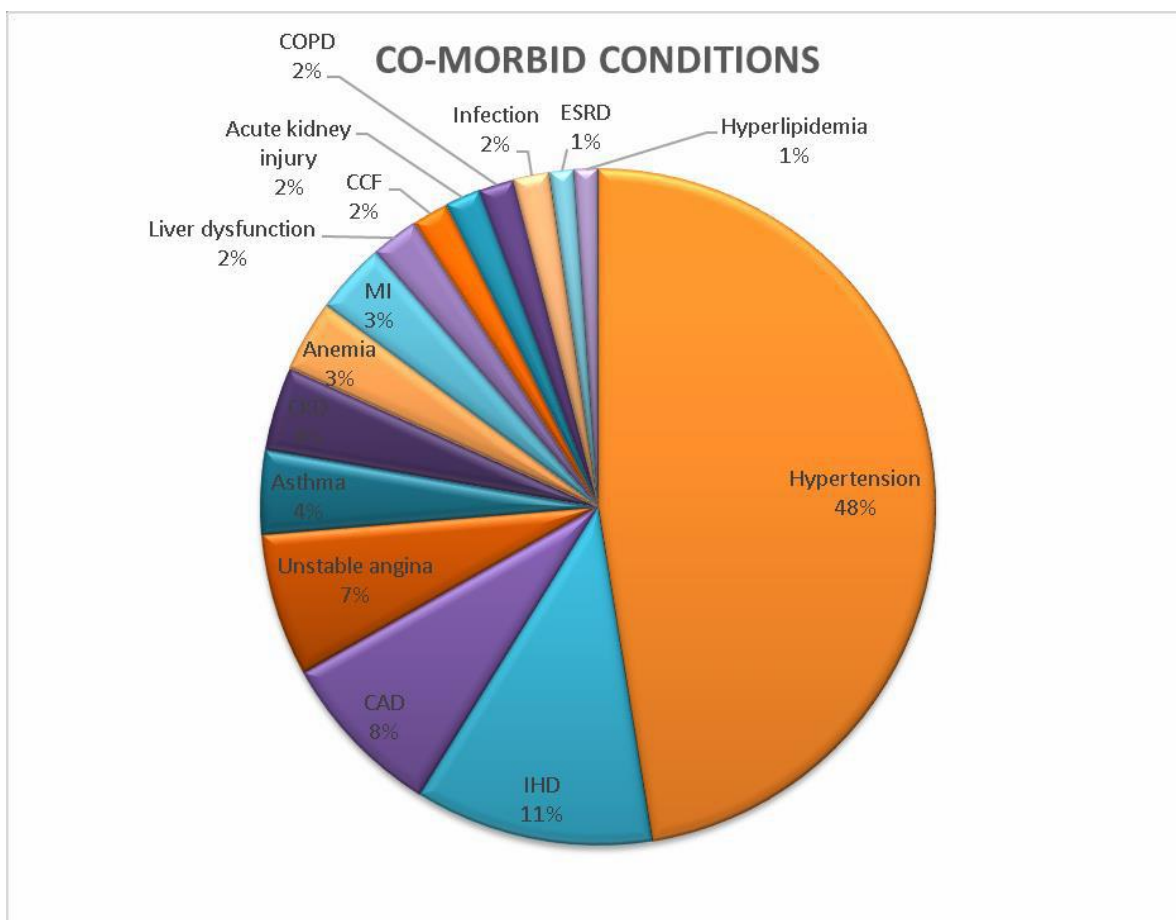


Figure 4: Pie Chart Representation of Patients Co-Morbid Conditions



### NUMBER OF MEDICATIONS PRESCRIBED IN STUDY POPULATION

Out of 110 prescriptions, the total number of drugs prescribed were 816. Average number of drugs per prescription were 7.41. Number of appropriate prescriptions were 105 (95.4%) and Number of inappropriate prescriptions were 5 (4.5%). (Fig. 5 and Table. 4)

Table 4: Number of Medications Prescribed in Study Population

<b>Total no of prescriptions</b>	110
<b>Total no of drugs prescribed</b>	816
<b>Average no of drugs per prescription</b>	7.41
<b>No. of appropriate prescriptions</b>	105 (95.4%)
<b>No. of inappropriate prescriptions</b>	5 (4.5%)

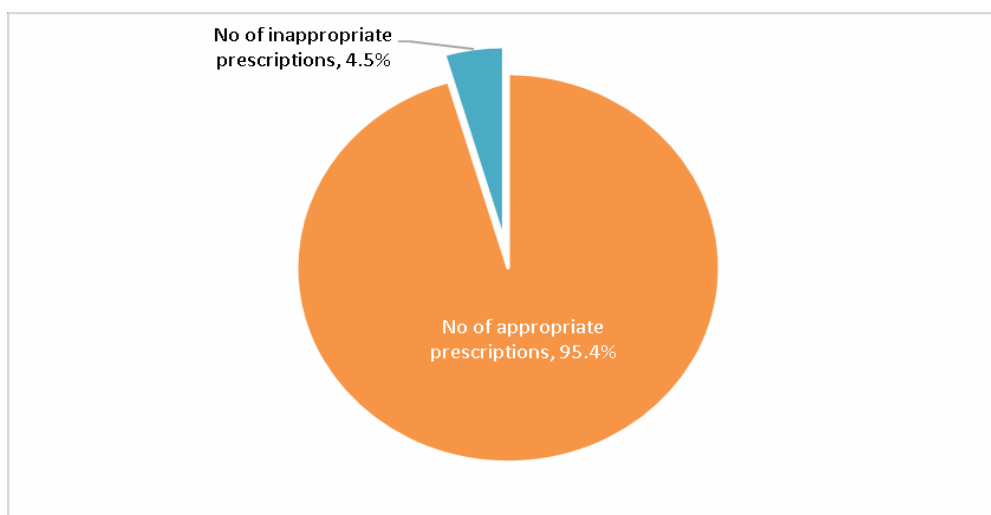


Figure 5: Pie Chart Representation of Number of Medications Prescribed Appropriate/ Inappropriate.

### DISTRIBUTION OF DIFFERENT TYPES DRUGS PRESCRIBED

A total of 816 drugs were prescribed in the study population of 110 patients. Anti-diabetics were the commonest class of drugs prescribed accounting for 169 (20.7%) of the total drugs followed by Anti-platelet drugs 69 (9.3%), Antibiotics 53 (6.4%), Analgesic 45 (5.2%), Diuretics 37 (4.5%), Hypolipidemic 35 (4.2%), Anti- angina 31 (3.7%), Respiratory agent 14 (1.7%), Calcium channel blocker 12 (1.4%), Benzodiazepines 8 (0.9%), Antihistamine 8 (0.9%), Antihypertensive drugs 8 (0.9%), and others 328 (40.1%). (Fig. 6 and Table 5)



Table 5: Distribution of Different Types Drugs Prescribed (n=816)

Drugs prescribed	Total No. of drugs	In Percentage
Anti-diabetic	169	20.7%
Anti-platelet	69	9.3%
Antibiotics	53	6.4%
Analgesic	45	5.2%
Diuretics	37	4.5%
Hypolipidemic	35	4.2%
Anti-angina	31	3.7%
Respiratory agent	14	1.7%
Calcium channel	12	1.4%
Benzodiazepines	8	0.9%
Antihistamine	8	0.9%
Antihypertensive	7	0.8%
Others*	328	40.1%

\* PPIs, IV fluids, Corticosteroids, Antacid, Anti-emetic, Antifungal, Vitamins

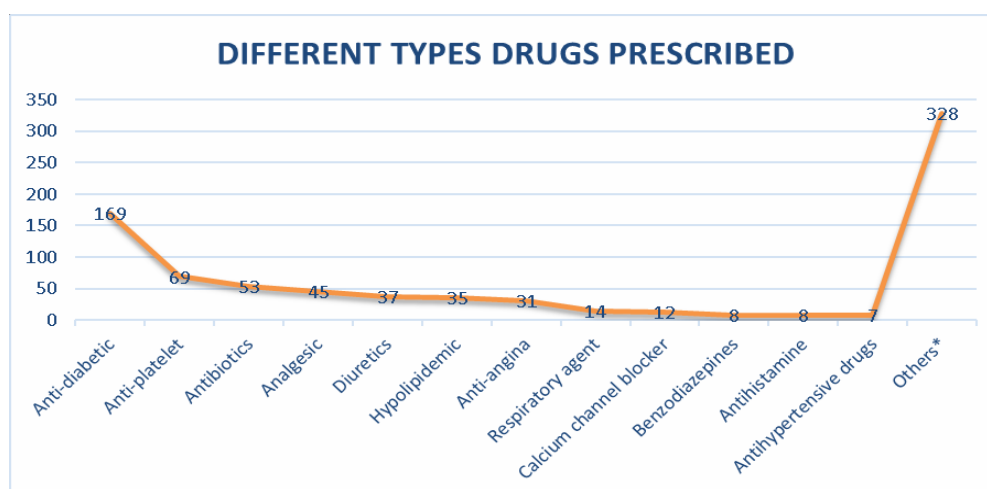


Figure 6: Distribution of Different Types Drugs Prescribed

### > EVALUATION OF ORAL HYPOGLYCEMIC THERAPY

In the study of 110 diabetic patients I observed that Biguanides (Metformin) utilization was high as monotherapy (49.2%). Glimpiride + metformin was used most widely (54.2%) as a combination therapy. (Fig. 7-8 and Table. 6-7)

Table 6: Evaluation Of Single Prescribed Oral Hypoglycemics (n=138)

Monotherapy	Number of Prescription	In Percentage
Metformin	68	49.2%
Glimpiride	35	25.36%
Sitagliptin	21	15.21%
Glyburide	14	10.1%
Total	138	

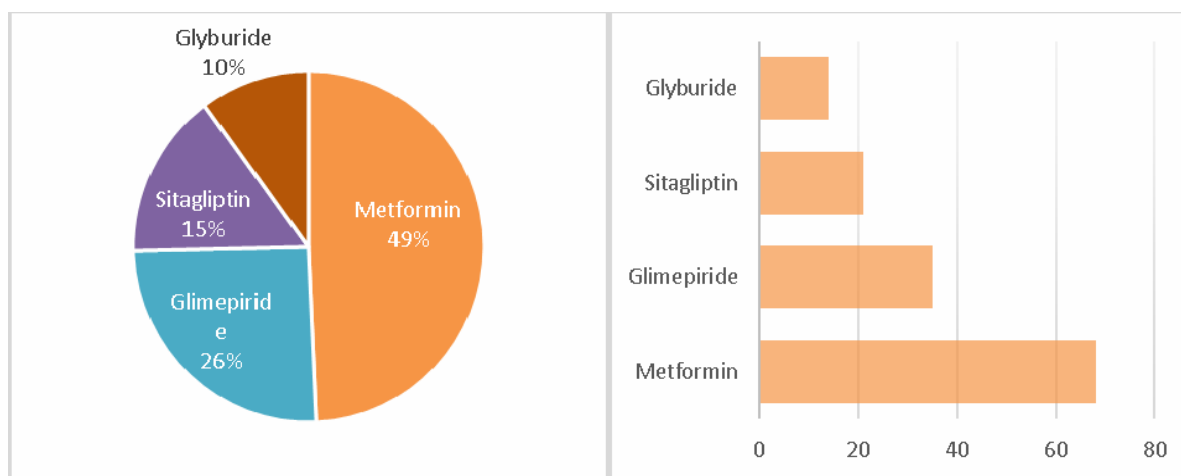


Figure 7: Evaluation Of Single Prescribed Oral Hypoglycemics

Table 7: Evaluation of Combination Therapy of Oral Hypoglycemics (n=35)

Combination therapy	Number of Prescription	In Percentage
Glimepiride/metformin	19	54.2%
Glimepiride/metformin/voglibo	9	25.7%
Sitagliptin/metformin	7	20%
Total	35	

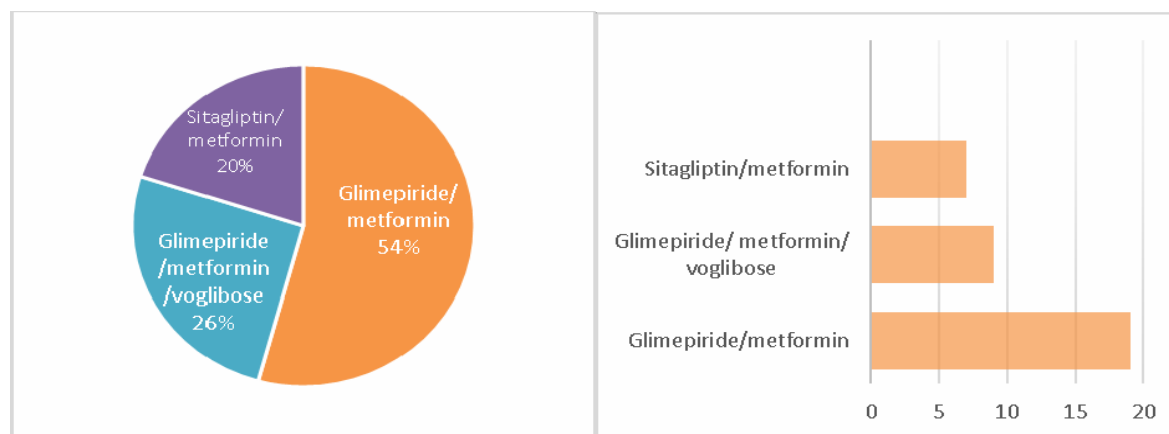


Figure 8: Evaluation of Combination Therapy of Oral Hypoglycemics

> **DISTRIBUTION OF FREQUENCY OF TREATMENT OBSERVED**

Out of 173 Oral Hypoglycemic prescribed 121 (69.9%) were given as Twice a day, followed by 38 (21.9%) were given as Three times a day and Once daily in 9 (5.2%). (Fig. 9 and Table. 8)

Table 8: Distribution of frequency of treatment observed (n=173)

Frequency Of Treatment	Number Of Patients Prescribed With Antibiotics	In Percentage
Once Daily	9	5.2%
Twice A Day	121	69.9%
Three Times A Day	38	21.9%
Four Times A Day	5	2.8%

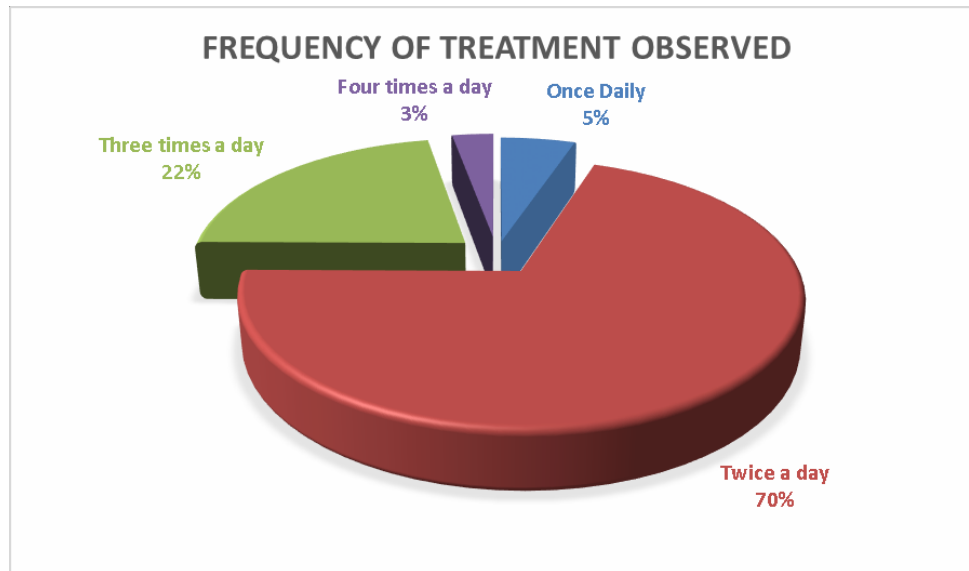


Figure 9: Distribution of frequency of treatment observed

### Discussion

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

The patient was divided in six age group such as 30-40, 41-50, 51-60, 61-70, 71-80 and >80. The majority of patients, 34 % 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.

One hundred and ten patients participated in the study. Demographic details show that female patients were 61 (55.4%) and male patients were 49 (44.5%) The study shows that female patients are more than male patients, however in earlier study female predominance were seen which is in agreement with our result supported by Syed Muhammad Ashar et.al. The reason for having diabetes more in males than in females could be because of lifestyle.

Anti-diabetic drugs commonly prescribed as monotherapy were metformin (49.2%), Glimperide (25.36%), Sitagliptin (15.21%), Glyburide (10.1%) and as combination therapy Glimperide/metformin (54.2%), Glimperide/metformin/voglibose (25.7%), Sitagliptin/metformin (20%). Biguanides (metformin) (49.2%) 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 G etal In combination therapy Glimperide/metformin combination was most widely used (54.2%)

Out of 110 prescriptions, the total number of drugs prescribed were 816. Average number of drugs per prescription were 7.41. 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 169 (20.7%) of total drugs.

In the present study 47.4% patient reported hypertension along with diabetes mellitus, these results were supported by Dashputra AV et al . this study indicates that hypertension is the commonest co-morbidity seen with diabetes mellitus.

Anti-platelet were the second commonest drug prescribed which accounts for 69 (9.3%) antibiotics 53 (6.4%), Analgesic 45 (5.2%), Diuretics 37 (4.5%), Hypolipidemic 35 (4.2%), Anti-angina 31 (3.7%), Respiratory agent 14 (1.7%), Calcium channel blocker 12 (1.4%), Benzodiazepines 8 (0.9%), Antihistamine 8 (0.9%), Antihypertensive drugs 8 (0.9%), and others ( PPIs, IV fluids, Corticosteroids, Antacid, Anti-emetic, Antifungal, Vitamins) 328 (40.1%) were prescribed.

Out of 173 Oral Hypoglycemic prescribed 69.9% were given as Twice a day, followed by 21.9% were given as Three times a day and Once daily in 5.2%. This is based on the choice and course of drugs for the therapy.

### **Conclusion**

This observational study of evaluation of oral Hypoglycemics shows metformin was the most commonly prescribed anti-diabetic drug in Monotherapy followed by Glimepiride. Among Fixed drug combination therapy Glimepiride/metformin was the most commonly prescribed antidiabetic drug.

The study showed that Majority of patients belonged to age group of 51-60 years.

Hypertension was most common associated co-morbidity in diabetic patients. Incidence of diabetes has been found higher in female as compared to male and majority of the patients develop diabetes in the most productive years of their life. In this study, males were found to be more affected by type 2 diabetes mellitus than females. Most of the patients were prescribed two oral hypoglycemic.

Average number of drugs per prescription was found to be 7.1. The most commonly drugs prescribed apart from antidiabetic were Anti-platelet drugs followed by Analgesics.

It was observed that most prescribed Oral Hypoglycemic was Metformin, Glimepiride and Sitagliptin.

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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