"Cross Sectional Observational Study on Oral Hypoglycaemic Agents Used in Addition to Insulin for Type-II Diabetes Mellitus Management"

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ABSTRACT
Background:
Diabetes-this is the most common word which is heard all over the world, and became the part and parcel in everyone's life. This only due to the lack of awareness of disease education among the people. Thus, there are increasing in number of co-morbidities along with the diabetes. There comes the usage of many classes of drugs. Thus, the evaluation of the drug use pattern was done along with providing patient education.

Methodology:
A cross sectional observational study was conducted over a period of 6 months in both inpatients and outpatients. The patient's information was collected from the patient records, case sheets or drug charts. The patients were providing with the questionnaire forms through which the evaluation was done.

Results: A total of 493 patients were enrolled in the study. Among them 40% were females and 60% were males of different age groups ranging from below 20-90 years. Out of 493 prescriptions, 334 (67.74%) are prescribed with monotherapy and the remaining 159 (32.25%) are with combination therapy. Some of them were identified with various complications.

Conclusion: out of 493 patients analysed in Endocrinology department, it was observed that males were affected more than females in Type 2 diabetes mellitus and most of the patients were prescribed with combination of Sulfonylurea and Biguanide under different brand names. Hypertension is identified as major complication in diabetic patients.

Keywords: Diabetes mellitus, etiology, epidemiology, insulin, oral hypoglycemic agents.

I.   INTRODUCTION:
The term "diabetes" was first discovered by Araetus of Cappodocia (81 – 133AD). Later the "mellitus" was coined by Thomas Willis (Britain) in 1675. Diabetes mellitus (DM) is a chronic disorder characterized by altered metabolism of carbohydrates, proteins and fats. Discovery of role of pancreas in diabetes by Joseph Von Mering and Oskar Minkowiski in 1889. In 1910, "Sir Edward Albert Sharpey-Schofer of Edinburgh" in Scotland suggested that diabetes lacked a single chemical which produced by pancreas. The name "Insulin" was later proposed by Himsworth, in 1936. The term "Diabetes" and "Mellitus" are derived from Greek language. "Diabetes" denotes "a passer through, a "siphon" whereas the "Mellitus" means a "sweet". It is believed that Greeks entitled it such a way, due to exaggerated urine proportions produced by diabetic patients which attracted flies and bees. DM is a serious, chronic and complex illness characterized by hyperglycaemia that resulted from the pancreatic β-cells generate deficient insulin (a hormone that adjusts blood glucose) when the body cannot efficiently custom the insulin or both of them [ ].

Diabetes mellitus (DM) is generally called as diabetes. It is a group of diseases characterized by increased levels of glucose in blood resulting from defects in insulin production, insulin action, or both. It is a chronic disease that mainly effects the body condition. It is a disorder that effects the body's ability to make or use insulin. Impaired fasting glycaemia and impaired glucose tolerance are the important risk factors for the future development of diabetes and cardiovascular diseases. In both developed and developing countries diabetes is one of the leading causes of renal failure. It is a metabolic disorder of various with disturbances of carbohydrate, fat and protein metabolism. Diabetic ketoacidosis, hyperosmolar

hyperglycaemic state or death comes under acute complications.

World health organization has categorized DM as the 7th leading cause in USA while it was estimated that 422 million adults present diabetes in 2014, 4 times higher than the recorded cases in 1980 . Clinicians also believe that DM may be occurred by the carbohydrates and fat existence in daily diet given that starch digestion in mammals is accomplished by a-amylase and a-glucosidase. Inhibition of starch digestive enzymes or glucose transporters can reduce glucose release and absorption in the small intestine. This decrement could help to manage DM.

Insulin is a naturally occurring peptide hormone produced by the beta cells of the pancreatic islet; it is considered as the main anabolic hormone of the body. It regulates the metabolism of carbohydrates, fats and protein by elevating the absorption of glucose from the blood stream into liver, fat and skeletal muscle.

According to the 2019 data of international diabetes federation, 463 million adults are diagnosed with diabetes mellitus. The prevalence was rapidly increasing. In 2017 it is estimated that 425 million people are diagnosed with diabetes mellitus. The prevalence is doubled by 2030 and expected to rise to 629 million by 2045. This rate is largely reflected by risk factors of obese and gene factors. Diabetes mellitus is common throughout the world and more common in developed countries due to urbanization, lifestyle modification and physical inactivity. Diabetes mellitus is the eighth leading cause of death. 2.2 million deaths were recorded in worldwide due to high blood glucose levels and its associated complications. The prevalence is associated with macrovascular and microvascular endpoints. 34 million of Americans were living with diabetes mellitus. Approximately 90-95 % of them were diagnosed with type 2 diabetes mellitus. In 2011, 4.6 million of people were expired due to diabetes mellitus.

Statistics in percentages and millions:
In 2010 – 285 million of people were suffering.
In 2019 – 9.3% - 463 million of people were suffering.
By 2030- it is estimated to be 10.2% - 578 million of people.
By 2045- it is estimated to be 10.9%- 700 millions of people.
This above estimation may come true, if there is no better control or cure over diabetes mellitus.

Methods and methodology:

Study site:
The study was conducted in LALITHA SUPER SPECIALITY HOSPITAL, GUNTUR.
Design of the study:
It includes the patients, usage of Antidiabetic drugs in Lalitha super speciality hospital, Guntur. This study was based on the cross-sectional study design. The subjects who took part in the study were selected on the basis of drug use pattern in diabetic patients (both OP &IP).
Study Period: the study was conducted for a period of 6 months.
Source of data: Lalitha super speciality hospital, Guntur (private hospital).

Methods of collection of data:
By reviewing prescriptions.
By reviewing case sheets.
Study population: All outpatients and inpatients of General Department of Lalitha Super Speciality Hospital in Guntur.
Sample size: patients were analysed and studied.

Sample criteria:
Inclusive criteria:
➢ All patients diagnosed with diabetes mellitus.
➢ Prescription containing one or more Antidiabetic drugs.
➢ The patients who visited diabetic clinic department of hospital.
➢ The patients admitted to medicine ward with diabetes diseases in hospital.
➢ The patients with other co-morbid conditions like hypertension, hyperglycaemia, neuropathy, nephropathy, diabetic foot.
➢ The patients willing to participate in the study.
Exclusive criteria:
➢ Paediatrics.
➢ Prescription with improper details or incomplete details.
➢ Pregnancy women.

II. RESULTS:
A total of 493 patients were enrolled into the study. The data was taken from the patient who was during the 6 months duration. In this study males (60%) effected more than females (40%) data were depicted in figure 1. Recent studies show the prevalence of diabetes mellitus is more in males compared to females, but the reason is unclear. Risk factors for DM are age, lifestyle modifications, lack of exercise, high blood pressure, depression, genetic, overweight. A study conducted by Patricio Fernando Lemes Dos Santos

et al, among 175 adults ages 18-64 years in inner town of central- western Brazil reveal that men have lower knowledge regarding the DM compared in women. Syed waif Gillani et al, in his study states that women significantly reported high distress level and low social functioning than men. Another study by Shaista Malik et al, states that men have high risk of fatal and nonfatal cardiovascular events as well as 40% greater risk for all-cause mortality.

1. GENDER DISTRIBUTION

Table No. 1: Gender categorization

sex	No. of patients	percentage
Male	298	60%
Female	195	40%

Figure:1 GENDER WISE DISTRIBUTION
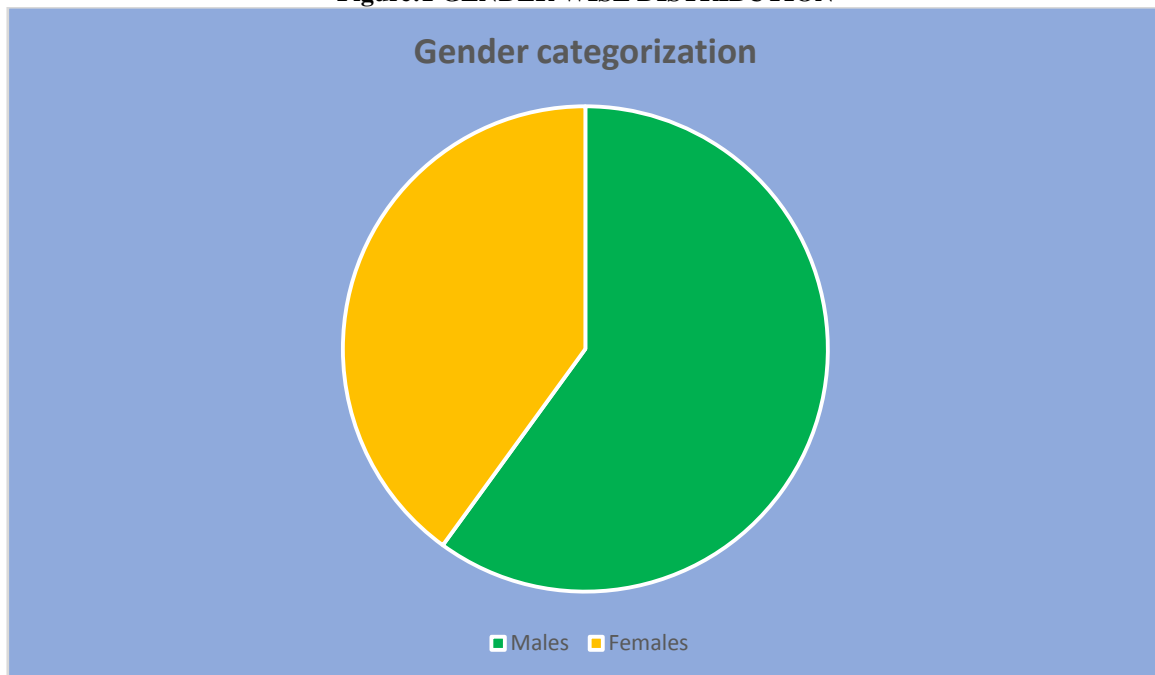
The overall patient's demographics of sex distribution in the study are, 40% of them were females and the remaining 60% were males.

2. AGE DISTRIBUTION OF PATIENTS

The prevalence of diabetes was increased with advancing age. Decline in beta cell proliferation and sensitivity to apoptosis are the age-related problems. Szoke E et al, in his study indicates the first and second phase of insulin secretion normally decreases at the rate of approximately 0.7% per year with ageing, this decrease in beta cell function is accelerated about two times in people with impaired glucose tolerance. In this study 51-60 age group are diagnosed more with T2DM which is pictorially represented in **figure 2.**

Table No. 2: Age distribution of the diabetic patients

Age (years)	Males	Males%	Females	Females%
<20	0	0	02	1.02
21-30	08	2.68	04	2.05
31-40	20	6.71	19	9.74
41-50	57	19.12	37	18.97
51-60	97	32.55	52	26.66
61-70	73	24.49	47	24.10
71-80	39	13.08	29	14.87
81-90	04	1.34	05	2.56
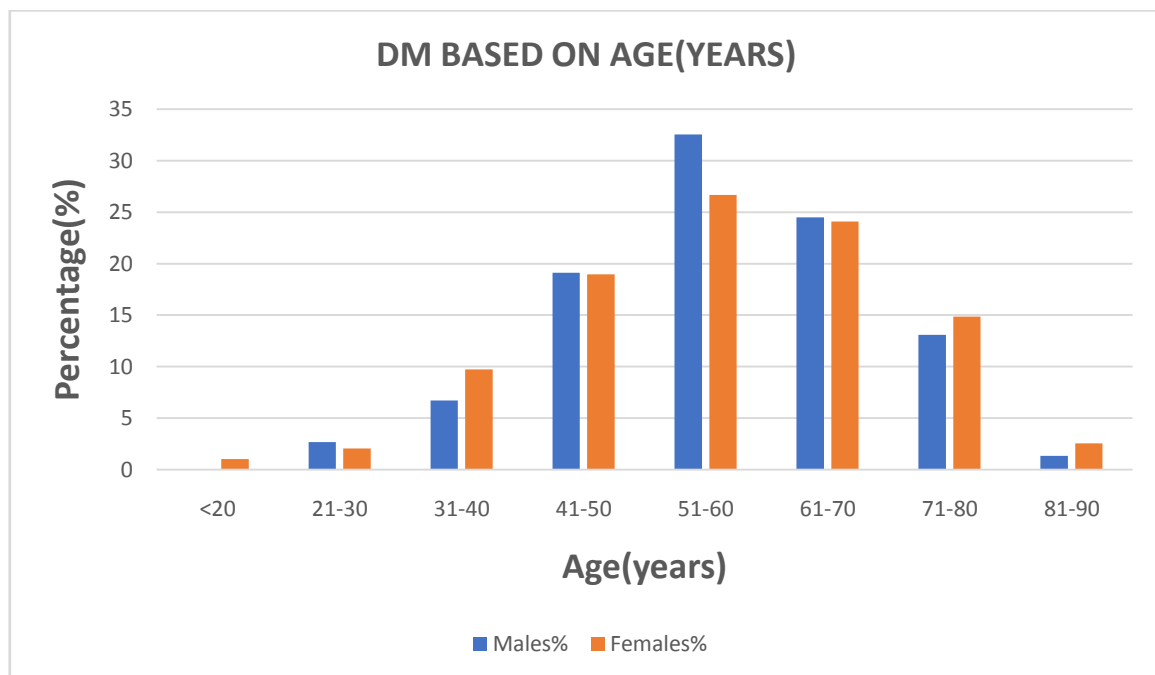


Figure No. 4: AGE DISTRIBUTION OF PATIENTS

Patients of age group from below 21 years up to 90 years were included in the study.

3. **MAJOR CO-MORBIDITIES**

Table No. 2: Major Co-morbidities along with Diabetes

Co-Morbidities	No. of Patients	Percentage
Hypertension	298	60.44
Hypothyroidism	48	9.73
Liver disease	45	9.12
Diabetic foot	35	7.09
Diabetic Neuropathy	30	6.08
COPD	28	5.67
others	9	1.82

Figure:3 Major Co-morbidities
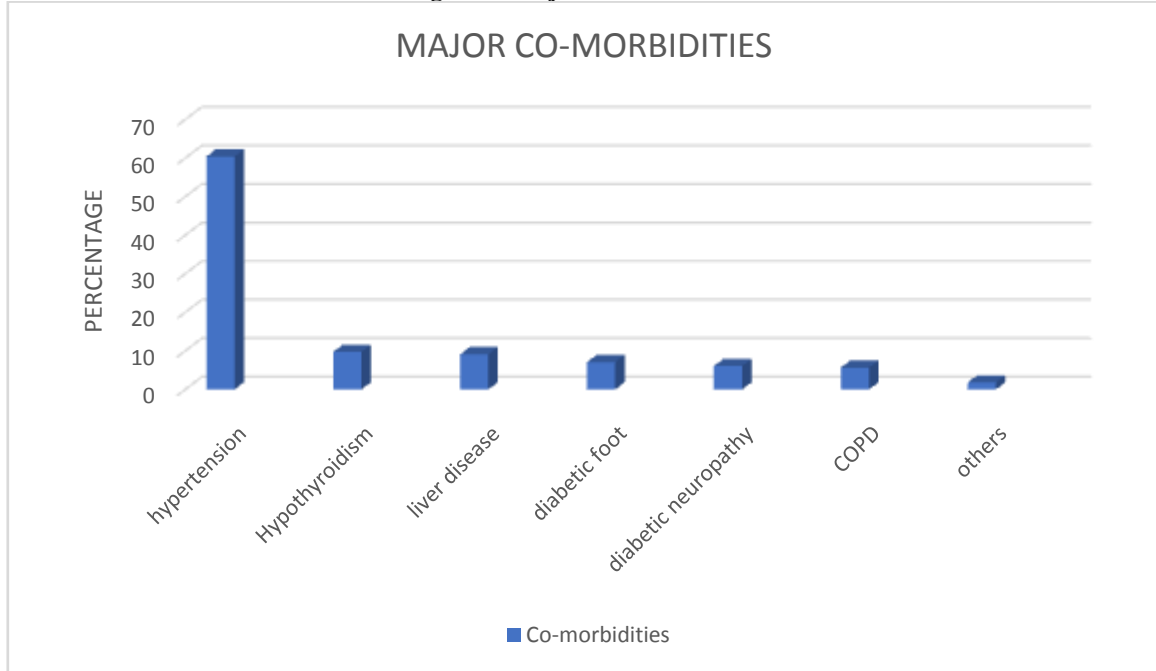
The above graph depicts the occurrence of co-morbidities along with diabetes. It is shown that among 493 patients (100%) the prevalence of comorbidities along with diabetes was found to be Hypertension 298 patients (60.44%), Hypothyroidism 48 patients (9.73%), liver diseases 45 patients (9.12%), Diabetic foot 35 patients (7.09%), Diabetic neuropathy 30 patients (6.08%), COPD 28 patients (5.67%), Others 9 patients (1.82%).

4. CATEGORIES OF DRUGS USED BY THE PATIENTS

Out of 493 prescriptions, 334 (67.74%) are prescribed with monotherapy and the remaining 159 (32.25%) are with combination therapy as depicted in **figure 5** was compared with a study conducted to be predominant over combination therapy.

Table No.5: Total number of prescriptions

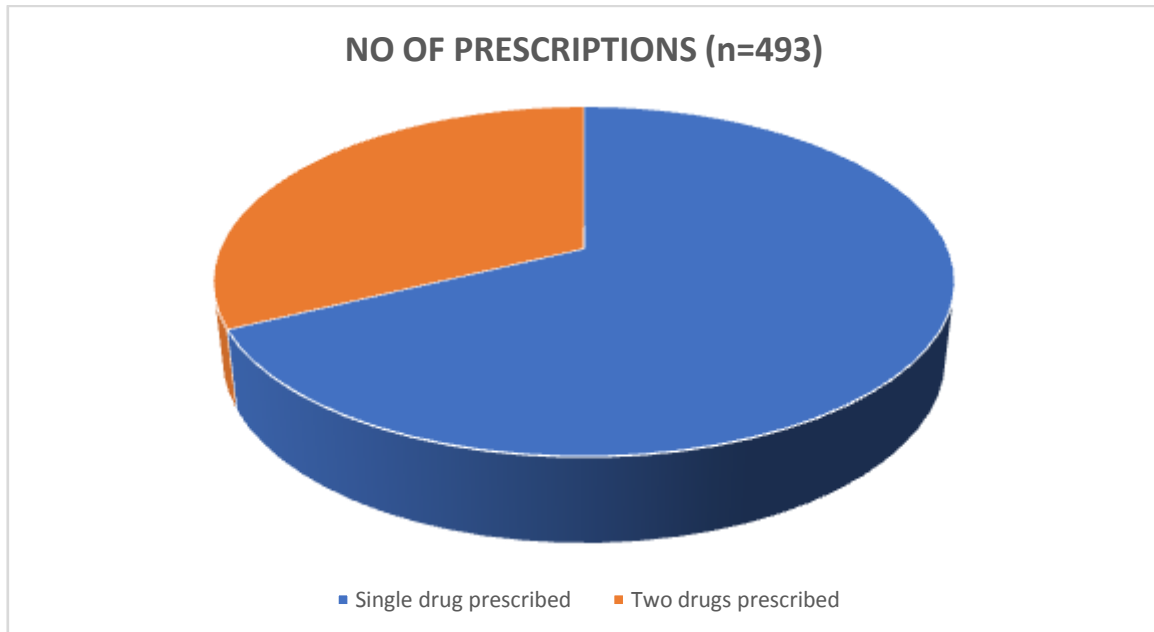| Parameters	No of prescriptions (n=493)
Single drug prescribed	334
Two drugs prescribed	159

Figure No.5: Total number of prescriptions collected from private hospital

Early insulin administration is needed for glycaemic control and delay in the onset of complications. Majority of type 2 DM patients in this study were prescribed with oral drugs either alone or in combination. Metformin (Biguanide) is the widely consider as ideal first line agent for treatment of DM. Combination drugs is unavoidable but proper combination selection of clinical judgement will be beneficial and reduced drug related problems. In present research study combination of sulphonyl urea + biguanide are prescribed more followed by sulfonyl urea + biguanide + alpha glucosidase inhibitor data were depicted in **figure 6.** Metformin with combination of sulphonyl urea showing good therapeutic response. Sulphonyl urea like Glimepiride is most prescribed. In present study the patients with greater HbA1c i.e. > 8 was prescribed with insulin along with oral hypoglycaemic agents.

Table No.6: Different categories of drugs used in Type 2 DM

Drugs	Male	Male%	Female	Female%
Biguanide	56	16.76	46	28.93
Sulfonyl urea + biguanide	157	47.00	79	49.68
Sulfonyl urea + Biguanide + Alpha glucosidase inhibitors	63	18.86	9	5.66
Sulfonyl urea + Biguanide + DPP 4 inhibitor	2	0.59	6	3.77
DPP 4 inhibitor + biguanide	7	2.09	0	0
Sulfonyl urea + biguanide + DPP 4 inhibitor + thiazolidinediones	1	0.29	9	5.66
Insulin	24	7.18	10	6.28
Sulfonyl urea	19	5.6	0	0
SGLT2 Inhibitors	5	1.49	0	0

USAGE OF DRUGS IN TYPE 2 DM
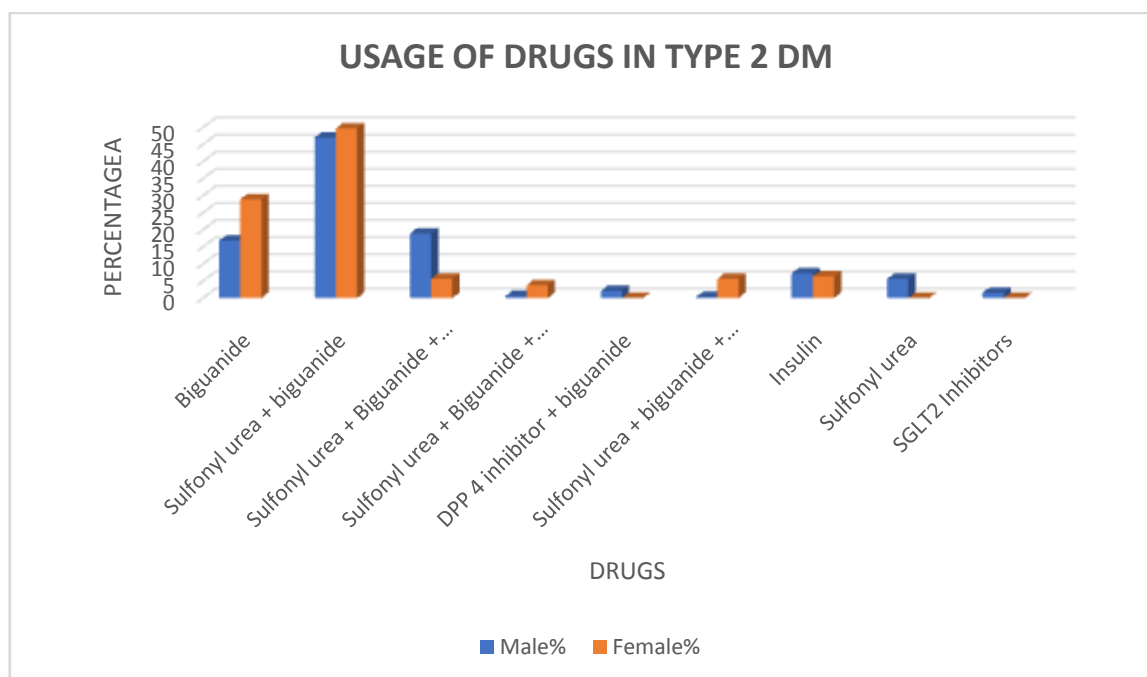
III. CONCLUSION:

It was concluded that, males are more effected than females. Diabetes patients with irregular usage of medication, improper diet intake, lack of exercises, depression leading to various microvascular and macrovascular complications. Hypertension is the most common co-morbidity condition for type 2 diabetes patients. Combination of biguanide and sulfonyl urea are most commonly prescribing.

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