A Comparative Study on Diabetes Mellitus, Management and Its Complications in Opposite Genders

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ABSTRACT

Objective: The main objective is to study Gender and Age difference among diabetic patients and prescription pattern of antidiabetic drugs at Andhra Prime Hospital, Guntur. To improve rationality of antidiabetic drugs and to improve quality of life and socio- economic status of the patient. **Materials and methods:** It is a prospective observational study done at Andhra Prime Hospital, Guntur. The records of all patients who had Diabetes Mellitus was extracted by using patient data collection forms. **Results:** A total of 849 patients consisting of 461 Males (54%) and 388 Females (46%) were enrolled. Among these 115 patients were diagnosed as Type 1 DM (Males - 62 and Females - 53) where 734 patients were diagnosed as Type 2 DM (Males – 399 and Females - 335). The age group between 21-40 (12.13%) were affected more with Type 1 DM. The age group between 41-60 (48.64%) were affected with Type 2 DM. Patients diagnosed with type 1 DM was prescribed with insulin (11.3%) and type 2 DM was prescribed with oral hypoglycemic agents (88.7%). Out of 849 patients, 430 patients were identified with various complications. **Conclusion:** Of the 849 patients analyzed in Endocrinology department, it was observed that males were affected more than females in Type 1 and 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.

INTRODUCTION:

Diabetes mellitus (DM) is a chronic disease that is recognized as a major public health problem. In recent years its incidence has been growing gradually everywhere in the world.[1] In 2020, according to the International Diabetes Federation (IDF), 463 million people have diabetes mellitus in the world, of this 77 million people belongs to India, second most affected in the world after China. One in six people (17%) in the world with diabetes mellitus is from India. India's diabetic population as calculated in October 2018 was about 17.5% of the global total. In India type 1 diabetes mellitus (T1DM) is rarer than in western countries. It is a serious and complex metabolic disorder characterized by high levels of blood glucose resulting with absolute (T1DM) and relative (T2DM) deficiency of the glucose regulating hormone: Insulin. There are mainly 2 types of diabetes, Type1 diabetes mellitus (T1DM) more common in children and type 2 diabetes mellitus (T2DM) most commonly observed in adults. DM is suspected mainly based on its symptoms. The high blood glucose produces the signs of frequent urination (polyuria), increased thirst (polydipsia) and increased hunger (polyphagia).[2]

Not only biological factors but also psychosocial factors are responsible for diabetes risk. Evidence indicates that diabetes and its complications are strongly related to psychological and psychiatrically problems. Various types of psychosocial factors include depression, poor eating habits, poor exercise and fear of hypoglycemia. Patient with diabetes from high level of diabetes-specific emotional stress associated with poor adherence to exercise, diet, medications, inadequate glycemic control, obesity, hereditary, life style includes alcohol consumption, smoking.[3]

Gender Differences in Diabetes Mellitus:[4]

Gender differentiation arise from sociocultural processes, such as different behaviors of women and men, various forms of diet, lifestyle or stress or attitudes.

High parenteral age, neonatal infections, and pre-eclampsia were the main risk factors in early childhood for T1DM incidence in boys, whereas pre-term delivery predominantly associated with T1DM in girls. In adults, several gender specific risk factors were identified as predictors of the development of T2DM. Uric acid levels and physical inactivity were independently related to the incidence of T2DM in women and systolic blood pressure levels, smoking, alcohol intake in men. There are also distinct subgroups at particular risk for T2DM

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27

in both genders. Women with a history of gestational DM are at risk of DM after delivery and women with polycystic ovarian syndrome (PCOS) are also at increased risk. In men, erectile dysfunction and low testosterone levels may precede the development of DM. The prevalence of type 2 diabetes is more in men than in women because of visceral fat mass in men.

Influence of Age factor in Diabetes Mellitus:[5]

Age is a crucial risk factor for Diabetes mellitus. In T2DM Ageing induces a decrease in insulin sensitivity and alteration or insufficient compensation of the functional mass of beta cells in the face of increasing insulin resistance. In relation to the function of beta cells, ageing is correlated with a decrease in the proliferation capacity of beta cells and enhance sensitivity to apoptosis. Recently it has been suggested that age related decline mitochondrial function contributes to insulin resistance in elderly people with T2DM. The majority of new T1DM are diagnosed in adulthood. T1DM can be triggered by a virus, such as common flu or cold and also due to injury or removal of pancreas.

Complications of Diabetes Mellitus:[6]

Untreated, diabetes will lead to several complications. The gap between the onset of the disease and clinical diagnosis of diabetes results in the development of complications. Diabetes is a multifactorial disorder, which is affecting a greater number of populations. Acute complications of diabetes are diabetic keto acidosis (DKA) and non-ketotic hyperosmolar coma. Serious long-time complications are heart disease, diabetic neuropathy, diabetic nephropathy, diabetic foot ulcers and diabetic retinopathy.

Management:

Insulin:[7] It is a potent anabolic hormone.

Indications for insulin: T1DM, pregnancy, severe infections, severe catabolic states, OAD failure, acute stressful situations like acute coronary syndrome, stroke, acute renal or hepatic failure, Secondary diabetes, post-transplant diabetes, congestive heart failure.

Insulin can add to existing OADs for short or long durations.

Site of injection: Anterior abdominal wall as first preferred site, other sites include thighs, buttocks and lastly arm.

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28

Examples includes aspart (Novolog), glulisine (Apidra), lispro (Humalog), Human mixtard, Human actrapid.

Oral hypoglycemic agents:[8] These are commonly used in treatment of diabetes mellitus which helps to lowers the blood glucose levels. There are six distinct classes of hypoglycemic agents: biguanides, sulfonylureas, α-glucosidase inhibitors, thiazolidinediones, DPP- 4 inhibitors and SGLT2 inhibitors.

MATERIALS AND METHODS:

Study Design: It includes the patients, usage of Antidiabetic drugs in Andhra Prime Hospital, Guntur. To study the comparative progression of disease in opposite genders and prescription pattern of antidiabetic drugs.

Study Period: 6 Months (October 2020 – March 2021)

Source of Data: Andhra Prime Hospital, Guntur (Private Hospital)

Methods of collection of data:

By reviewing prescriptions

By reviewing case sheets

Study population: All outpatients and inpatients of Endocrinology Department of Andhra Prime Hospitals in Guntur.

Sample size: 849 patients were analyzed and studied.

Sampling Criteria:

Inclusion criteria:

 All patients diagnosed with diabetes mellitus

 Prescription containing one or more Antidiabetic drugs.

Exclusion criteria:

 Pediatrics

Citation: Gada Yerukala Srawan Kumar et al. Ijppr.Human, 2021; Vol. 21 (2): 26-38.

29

Prescription with Improper details or Incomplete details.

RESULTS AND DISCUSSION:

In this study males (54%) effected more than females (46%) 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.[4] 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 to women.[1] Syed waif gillani et al, in his study states that women significantly reported high distress level and low social functioning than men.[9] Another study by Shaista Malik et al, states that men has high risk of fatal and nonfatal cardiovascular events as well as 40% greater risk for all-cause mortality.[10]

Table No. 1: Gender categorization

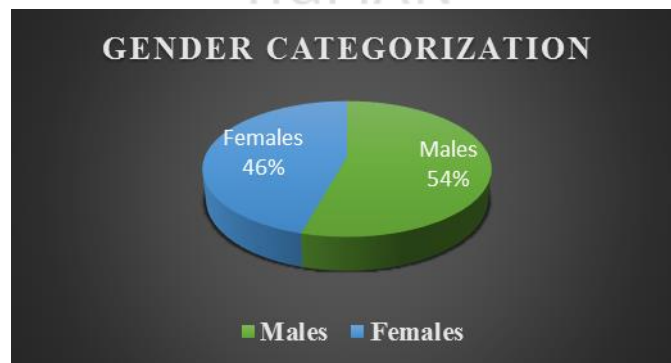| Parameters	Males	Females
No of patients	461	388

Figure No. 1: Gender categorization of males and females

The age of onset is typically different, with T1DM (hereditary) being diagnosed most often in younger people, while type 2 diabetes is diagnosed more commonly in adults. However, this is not always the case. The increasing incidence of obesity among children and adolescents has caused a rise in the development of T2DM in young people. Further, some adults with diabetes may be diagnosed with a form of late-onset T1DM. In T2DM, the pancreas produces insulin, but the body cannot use it effectively, where as in T1DM no longer production of

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30

insulin because of pancreatic beta cell damage by immune system. A fasting blood sugar (<100 mg/dl) and random (non-fasting) blood glucose (<200 mg/dl) measurement can be used to diagnose any type of diabetes. This study reveals that patients are affecting more with type 2 DM than type 1 DM. 115 patients are diagnosed as type 1 DM, accounting with 14%. 734 patients has been diagnosed as type 2 DM, accounting with 86% as shown in **figure 2**.

Table No. 2: Comparison of Type 1 DM and Type 2 DM

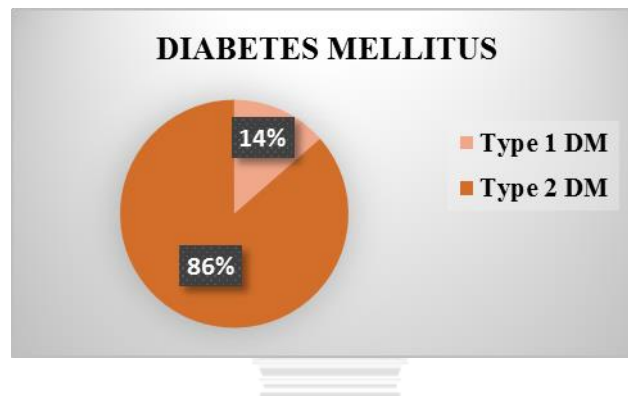| Parameters	Type 1 DM	Type 2 DM
No of patients	115	734

Figure No. 2: Comparison between Type 1 DM and Type 2 DM

The male diabetic patients are observed to be living more affectively with diabetes, lesser depression and anxiety but more energy and better positive well-being than women. Christa Meisinger et al, observed sex related differences in his study among 3052 cases of male and 3114 cases of female.[11] Systolic blood pressure, regular smoking and high daily alcohol intake predicted the development of DM in men, whereas uric acid and physical inactivity during leisure time were associated with diabetes development in women. In both T1DM and T2DM males were affected more than females as shown in **figure 3**.

Table No. 3: Gender differentiation of Type 1 DM and Type 2 DM

Parameters	Type 1 DM		Type 2 DM	
	Males	Females	Males	Females
No of patients	62	53	399	335

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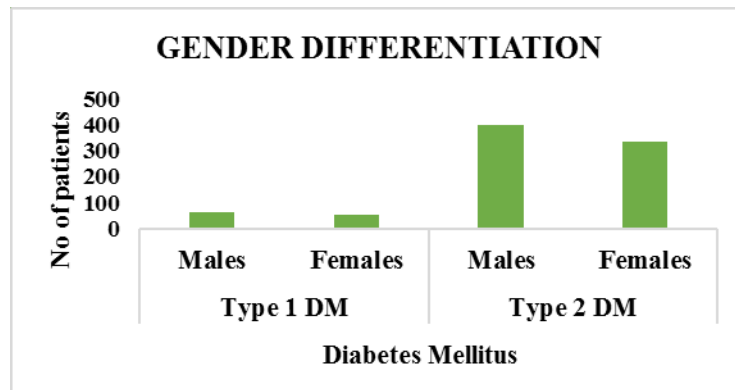
31

Figure No. 3: Gender distribution of males and females in Diabetes Mellitus

The prevalence of diabetes was increased with advancing age. Decline beta cell proliferation and increased 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.[12] In this study 41-60 age group are diagnosed more with T2DM where as in T1DM young age group affected majorly which is pictorially represented in **figure 4.**

Table No. 4: Diabetes Mellitus based on age factor

Age (Years)	TYPE 1 DM (n=115)				TYPE 2 DM (n=734)			
	Male	Male%	Female	Female%	Male	Male%	Female	Female%
< 20	1	0.12	3	0.35	0	0	0	0
21-30	35	4.12	28	3.30	7	0.82	8	0.94
31-40	21	2.47	19	2.24	69	8.13	72	8.48
41-50	3	0.35	2	0.24	124	14.61	103	12.13
51-60	0	0	1	0.12	101	11.90	85	10.01
61-70	2	0.24	0	0	74	8.72	52	6.12
71-80	0	0	0	0	21	2.47	11	1.30
81-90	0	0	0	0	3	0.35	4	0.47

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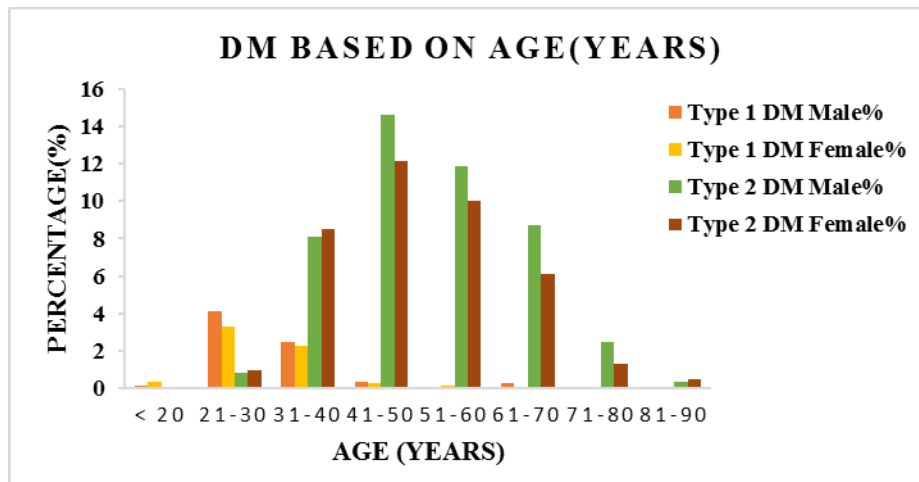
32

Figure No. 4: Age group and gender distribution of patients

Out of 849 prescriptions, 690 (81%) are prescribed with monotherapy and the remaining 159 (19%) are with combination therapy as depicted in **figure 5** was compared with a study conducted by Joshi H et al, containing 92 prescriptions reveals that, monotherapy was found to be predominant over combination therapy.[13]

Table No. 5: Total number of prescriptions

Parameters	No of prescriptions(n=849)
Single drug prescribed	690
Two drugs prescribed	159
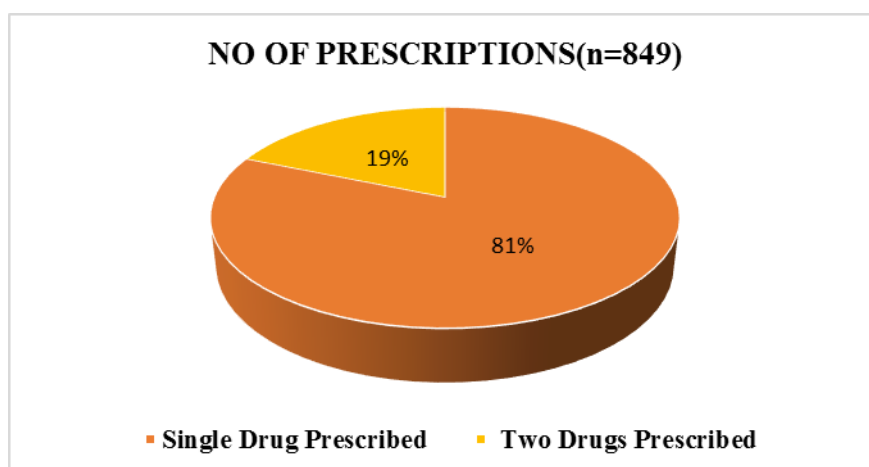
Figure No. 5: Total number of prescriptions collected from a private hospital

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33

Early insulin administration is needed for glycemic control and delay in the onset of complications. Human insulin is prescribing most commonly for the patients with T1DM. Human Mixtard was used most commonly in both males and females as shown in **figure 6**. Insulin therapy in DM helps to maintain HbA1c levels <7% during the first decade of diagnosis. M. Hanefeld et al, in his study suggest that the people newly diagnosed with DM and HbA1c >9% should be given early transient intensive insulin therapy.[14]

Table No. 6: Different class of insulins prescribed for Type 1 DM

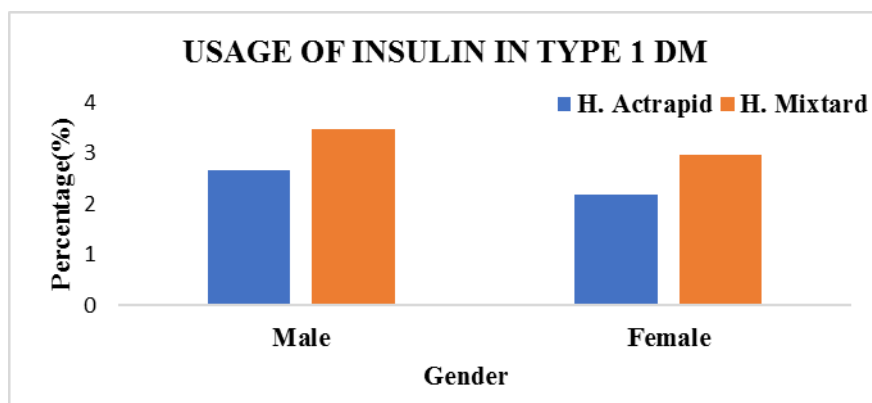| Insulin	Male	Male%	Female	Female%
Human Actrapid	27	2.68	23	2.28
Human Mixtard	35	3.47	30	2.98

Figure No. 6: Usage of different brands of insulin in Type 1 Diabetes Mellitus

Majority of type 2 DM patients in this study were prescribed with oral drugs either alone (20.44%) are in combination (79.56%). 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 reduce drug related problems. Kannan et al, in his prospective study which was conducted over a period of 9 months (from May 2010 to Jan 2011) in the outpatient department of a tertiary care hospital at Kottakkal, Kerala, India it was found that combination therapy of Sulfonylurea and Biguanide were more used than monotherapy. In these Glimepiride and metformin combination drugs were used commonly followed by Glibenclamide and metformin.[15] In present research study Combination of sulphonyl urea + biguanide are prescribed more followed by Sulfonyl ureas + biguanide + alpha glucosidase inhibitor data were depicted in

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34

figure 7. Metformin with combination of sulphonyl ureas 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 (3.37%) along with oral hypoglycaemic agents.

Table No. 7: Different categories of drugs used in Type 2 DM

| Drugs	Male	Male%	Female	Female%
Biguanide	89	8.83	79	7.84
Sulfonyl urea + Biguanide	278	27.58	230	22.82
Sulfonyl urea+ Biguanide+ Alpha glucosidase inhibitors	93	9.23	66	6.55
Sulfonyl urea + Biguanide + DPP 4 inhibitor	2	0.20	1	0.09
DPP 4 inhibitor + Biguanide	7	0.69	9	0.89
Sulfonyl urea + Biguanide + DPP 4 inhibitor + Thiazolidinediones	1	0.10	0	0
Insulin	24	2.38	10	0.99
Sulfonyl urea	3	0.30	0	0
SGLT2 Inhibitors	1	0.10	0	0
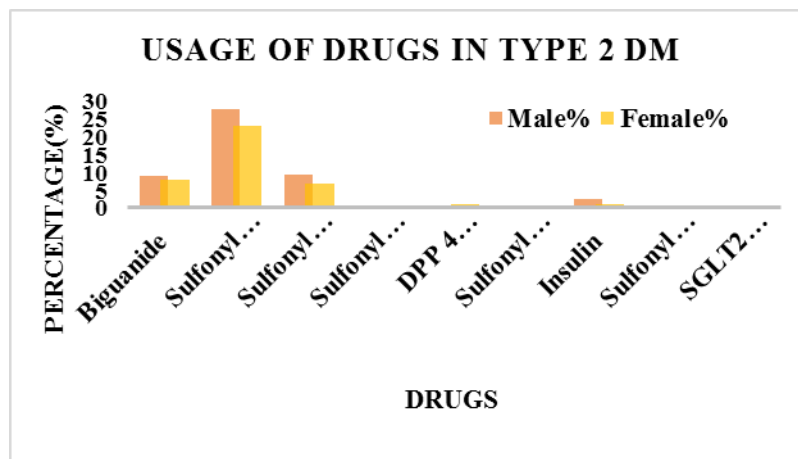
Figure No. 7: Usage of different classes of drugs in Type 2 Diabetes Mellitus

Diabetes lead to increased risk of various complications like Diabetic ketoacidosis, Diabetic foot ulcer, Hypertension, Thyroid, Diabetic nephropathy, coronary artery disease etc,. Early diagnosis and treatment of complications can avoid morbidity & mortality. Among

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35

population males 226 (52.55%) are having more complications than females 204 (47.45%). Various changes in the cardiovascular system related with aging includes in vascular function and cardiac function. The study in remote area of cenengan island by suastika et al, found that coronary artery disease prevalence in Diabetic patients is relatively high and older age had higher risk for CAD than younger age group.[5] The total of 5.58% people effected with CAD in present study. The results obtained from this study were compared with studies carried out in different races. The increase in HbA1C and poor adherence to the medication leading to DKA. Acute and serious complication of diabetes mellitus. 0.93% people affected with DKA. Insulin resistance is associated with thyroid dysfunction. According to Nobre et al, around 12.5% of diabetic patients had thyroid disorders.[16] In this study the level of TSH was high in diabetic patients 19.06%. Hypothyroidism is due to reduced glucose absorption, increase glucose accumulation in GI tract and decreased disposal of glucose. Diabetes two times likely to develop hypertension. This study was compared with other study which has a total of 92 patients with comorbid conditions along with diabetes mellitus, commonly seen comorbid condition was hypertension 81(67.5%).[13] Improper diet intake and poor exercise leads to develop insulin resistance, which further decreased vasodilation and causes hypertension. It was observed that 58.61% of patient have complication of Hypertension in this study. It was found to be that people living in village more likely to develop diabetic foot ulcer than in urban areas. The patients who had not practiced the foot self-care were more likely to develop diabetic foot ulcer. The study conducted by Tesfamichael G. Mariam et al, reveals that Prevalence of diabetic foot ulcer among diabetic patients who attend diabetic clinic was 13.6%.[17] In present study 13.95% cases were reported. This study has shown significant association between the development of Diabetic nephropathy and risk factors such as family history of kidney diseases and BMI especially with overweight, gender, systemic hypertension, serum creatinine, GFR, and retinopathy. Males with T2DM has highest percentage of diabetic nephropathy. The result was presented in **figure 8.**

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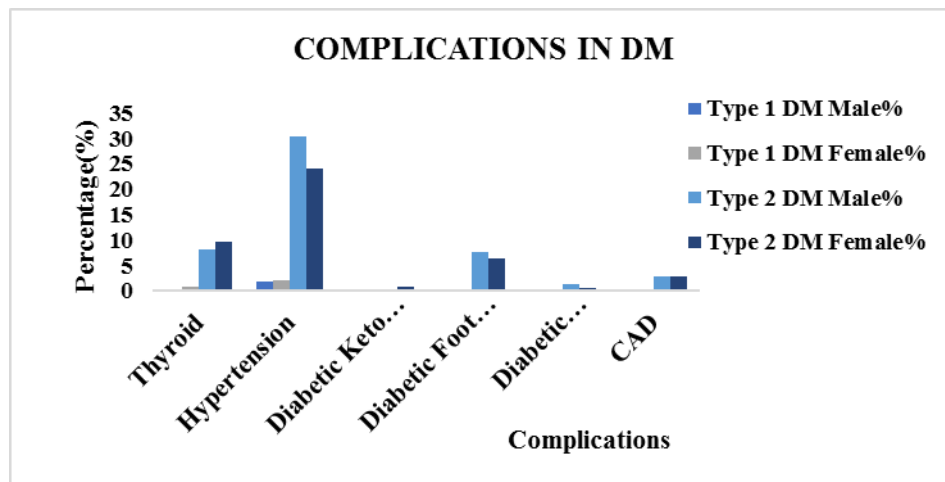
36

Complications observed in DM

Figure No. 8: Various complications observed in Diabetes Mellitus

CONCLUSION:

It was concluded that, males are more effected than females. Type 1 diabetic patients are mostly young adults, middle and old age people are diagnosed as T2DM. Diabetic 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 morbid condition for type 2 Diabetic patients. Combination of biguanide and sulfonyl urea are most commonly prescribing.

ACKNOWLEDGEMENT:

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37

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38