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**TAMING THE SUGAR DRAGON: AN IN-DEPTH REVIEW OF  
DIABETES MELLITUS, ITS ORIGIN, DIAGNOSIS AND CUTTING-  
EDGE THERAPIES**

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**ABSTRACT**

One of the oldest diseases, diabetes mellitus, was referenced in Egyptian literature more than three thousand years ago. The sweetness of diabetic patients' urine was noted by Indian doctors around 1500 B.C., who named it "Madhumeha." And is also called "Sugar". Diabetes mellitus (DM) is an eclectic group of chronic metabolic illnesses in which a person has excessive blood sugar levels, either as a result of insufficient insulin production by the pancreas or insufficient insulin uptake or action by the body's cells. The symptoms of polyuria, or frequent urination, polydipsia, or increased thirst, and polyphagia, or excessive appetite, are brought on by high blood sugar levels. One defining trait of diabetes mellitus is inadequate insulin secretary response, which translates to poor carbohydrate (glucose) utilisation. Nephropathy, neuropathy, cardiovascular and renal consequences, retinopathy, food-related disorders, and other issues are among the many complications of diabetes

mellitus. The two kinds of Diabetes Mellitus are type 1 diabetes mellitus (T1DM) and type 2 diabetes mellitus (T2DM). Type 1 Diabetes Mellitus (T1DM) is an autoimmune condition that affects the pancreatic cells, reducing or impairing insulin production, whereas type 2 Diabetes Mellitus (T2DM) is caused by a dysfunction of the pancreatic beta cells, which makes it difficult for the person to utilise insulin. The various types of diabetes and their associated complications—including immune system problems, retinopathy, nephropathy, somatic and autonomic neuropathy, cardiovascular disorders, and diabetic foot—are introduced in this review. Causes of Diabetes Mellitus, signs & symptoms, diagnosis, lifestyle management, treatments are also covered.

**Keywords: Diabetes Mellitus, Type 1 Diabetes Mellitus, Type 2 Diabetes Mellitus, Diabetic foot, Nephropathy, Neuropathy**

## 2. INTRODUCTION:

Diabetes mellitus (DM) is a chronic metabolic disorder of carbohydrates, fats and protein metabolism in which pervasiveness has been increasing steadily all over the world. Diabetes mellitus (DM) affects 100 million peoples worldwide [1]. Diabetes mellitus is the forebearer disease and it was mentioned in Egyptian literature before 3000 years ago. The sweetness of diabetic patients' urine was noted by Indian doctors around 1500 B.C., who named it "Madhumeha." The symptoms of diabetes mellitus include diabetes a person experience high blood sugar, either because the pancreas does not produce enough insulin or because the body cells do not adequately use or respond to the insulin that is produced. The high blood sugar produces the symptoms of polyuria i.e. frequent urination, polydipsia (increased thirst), and polyphagia (increased appetite) [2]. Inadequate insulin secretary response,

which translates into impaired carbohydrates (glucose) use, is a characteristic feature of diabetes mellitus, as is the resulting hyperglycemias. Diabetes mellitus (DM) is called also called the "sugar". Diabetes is the most common endocrine disorder and it mostly occurs when there is deficiency of insulin secretion, damage of pancreatic  $\beta$  cell, deterioration of insulin activity (insulin resistance) [3]. Diabetes results in unusual levels of glucose in the bloodstream. This can cause severe short-term and long-term consequences ranging from brain damage to amputations and heart disease. Diabetes is pervaded by hyperglycemia and disturbances in carbohydrate, fat and protein metabolism. It is associated with an absolute or relative deficiency in the secretion of insulin or with insulin resistance. The various complications associated with diabetes mellitus includes

nephropathy, neuropathy, cardiovascular and renal complications, retinopathy, food related disorders and so on. Type 1 Diabetes Mellitus (T1DM) and type 2 Diabetes Mellitus (T2DM) are the 2 types of DM. Type 1 Diabetes Mellitus is an autoimmune disorder that affects pancreatic cells which reduces or impairs

the production of insulin while type 2 Diabetes Mellitus is a result of impairment of pancreatic beta cells that hinder the individual's ability to use insulin [4].

### 3. Classification:

Diabetes mellitus can be classified into several types as follow;

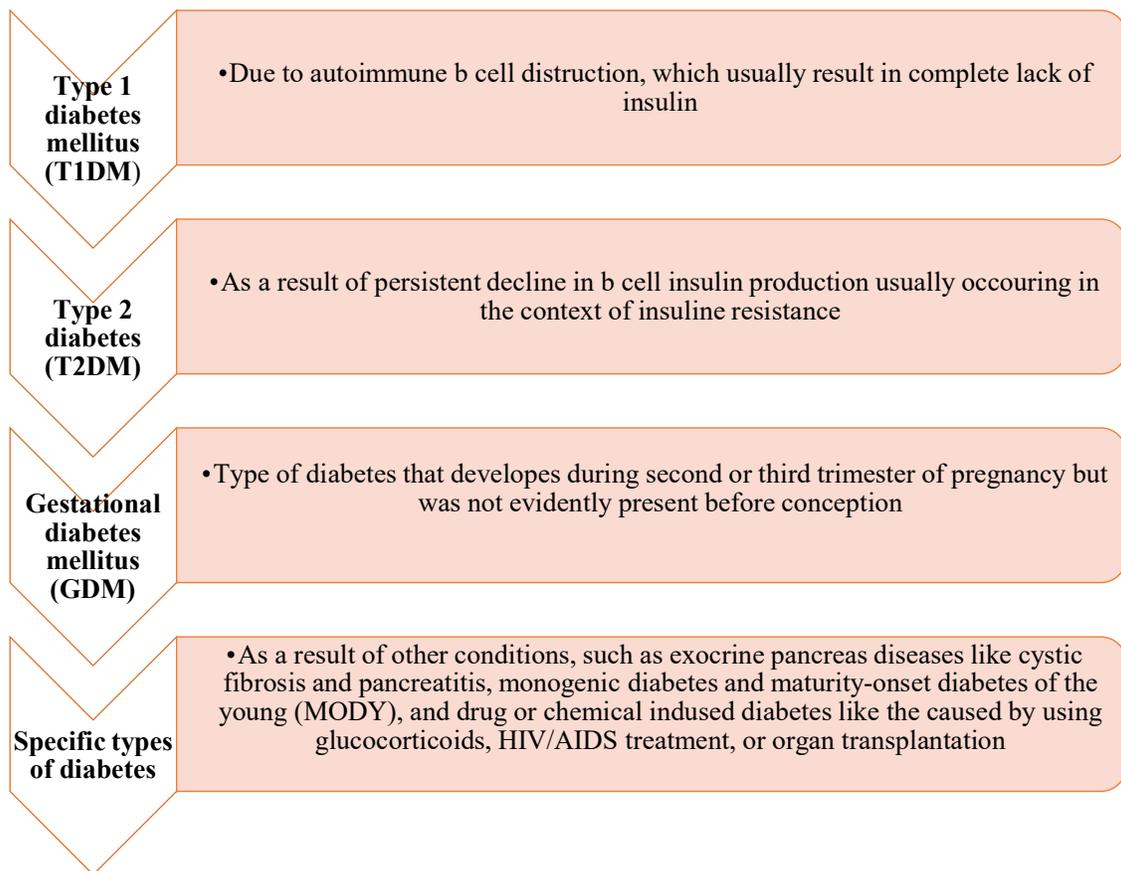


Figure 1: Types of Diabetes

**3.1.** Type 1 diabetes mellitus (T1DM) is caused by autoimmune b-cell destruction, typically leading to total insulin shortage;

**3.2.** Type 2 diabetes (T2DM) is caused by a progressive loss of b-cell insulin

secretion generally against the background of insulin resistance;

**3.3.** Gestational diabetes mellitus (GDM) is a kind of diabetes that develops during pregnancy but was not overtly present before conception.

3.4. Different types of diabetes brought on by external factors, such as exocrine pancreatic diseases (such as cystic fibrosis and pancreatitis), monogenic diabetes syndromes (such as neonatal diabetes and maturity-onset diabetes of the young [MODY]), and drug- or chemical-induced diabetes (such as with the use of glucocorticoids, in the treatment of HIV/AIDS, or following organ transplantation).

### **3.1. Type 1 Diabetes Mellitus:**

This is an autoimmune disease in which the immune system mistakenly demolishes the insulin-making beta cells of the pancreas. This causes diabetes by leaving the body without enough insulin to function normally and this is called an autoimmune reaction or autoimmune cause. It account for almost about 5-10% cases of diabetes globally. Type 1 Diabetes Mellitus typically develops more quickly than other forms of diabetes [1].

In Type 1 Diabetes Mellitus the patients require daily administration of insulin so as to normalize the glucose level in the blood. If the insulin is not taken then life is being threatened and can be fatal. The reason of type 1 Diabetes Mellitus is not identified yet being presently not preventable. Albeit, the reasons for type 1 diabetes mellitus are still unclear, changes in environmental risk factors and/or viral infections may have an impact on the appearance of Diabetes

Mellitus. Extreme urination and thirst, continuous hunger, weight loss, vision changes and fatigue are the main symptoms of this type of Diabetes Mellitus. More often than not, the number of people who diagnosed with type I diabetes mellitus is escalated [5].

### **3.2. Type 2 Diabetes Mellitus:**

This is the metabolic disorder which involving excess weight and insulin resistance. In Type 2 Diabetes Mellitus patients, the pancreas produce insulin initially, but the body has trouble using this glucose-controlling hormone. Eventually, the pancreas cannot produce enough insulin to respond to the body's need for it (i.e. the insulin is insufficient to bring about its proper effect). Type 2 diabetes is the most common form of diabetes, accounting for 85 to 95% of cases in developed nations and an even higher percentage in developing nations, as stated by the International Diabetes Federation.

The symptoms (concurrent to type I diabetes mellitus symptoms) are generally less noticeable or absent, the illness could be dismissed and be undiagnosed for numerous years, and not until complications have already ascended. For various years, type 2 Diabetes Mellitus was observed only in adults, nowadays it has started to be seen in children also. Till now the exact causes of development of Type 2 Diabetes Mellitus are unknown,

some significant risk factors being pointed out. The most significant ones include: excess body weight, physical activity and unhealthy diet. Most patients with Type 2 Diabetes Mellitus are obese, and obesity itself causes some degree of insulin resistance [6]. And in some cases patients who are not obese by traditional weight criteria may have an increased percentage of body fat distributed predominantly in the abdominal region.

### **3.3. Gestational diabetes mellitus:**

Gestational diabetes mellitus is a type of Diabetes Mellitus resolved in the second or third trimester of pregnancy that is not clearly overt diabetes. GDM is a transitional disorder that happens in pregnancy and brings enduring danger of type II diabetes. Women with slightly elevated blood glucose levels are diagnosed as having gestational diabetes, whilst women with substantially elevated blood glucose levels are classified as having diabetes mellitus in pregnancy. GDM tends to grow from the 24<sup>th</sup> week of pregnancy. Screening of GDM is done by an oral glucose tolerance test and is recommended and must be conducted early in pregnancy for high-risk women, and between the 24th and 28th week of pregnancy in all other women. About 4% of pregnant women develop gestational diabetes or 135,000 cases annually, according to the American Diabetes

Association. Gestational diabetes is fully treatable but requires careful medical supervision throughout the pregnancy period [7].

### **3.4. Other Specific Type (Monogenic Types):**

Monogenic diabetes is characterized by deficiencies in beta cell activity that are caused by certain gene mutations. It has a variety of clinical symptoms that require various treatments, some of which appear in the neonatal period and others in the early stages of adulthood. When  $\beta$ -cells fail to compensate for insulin resistance, diabetes occurs. The monogenic errors in insulin action produced by the particular gene mutations have characteristics of severe insulin resistance without obesity. 13 Secondary diabetes can result from a variety of conditions, including pancreatitis, cystic fibrosis, Down syndrome, and hemochromatosis to medical treatments including corticosteroids, other immunosuppressive, diuretics and pancreatectomy [8].

### **4. Causes of Diabetes mellitus:**

There are some of the causes of Type 1 Diabetes Mellitus are lack of sufficient amount of insulin. Most often is a genetic tendency that is sometimes it follows a viral infection such as mumps, rubella, cytomegalovirus, measles, influenza, encephalitis and polio. Common cause of Type 1 Diabetes Mellitus is injury to the

pancreas from toxins, trauma or surgical removal of all the majority of pancreas.

The causes of Type 2 Diabetes Mellitus are multi factorial and complex. But even there is no single cause. There are some well-known causes are obesity (i.e. environmental factors) and family history (i.e. hereditary factor). For various years, Type 2 Diabetes Mellitus was seen only in adults but now-a-days it is seen in children also. There is no known exact cause but most significant risk factors are excess body weight, physical inactivity and poor nutrition. Other factors which impacted are ethnicity, family history of DM, past history of gestational diabetes and advancing age. There is not known exact cause of gastestational diabetes mellitus in some women but there is often a positive family history of the diabetes mellitus [9].

## **5. Signs and Symptoms: [10-12]**

The signs and symptoms of diabetes mellitus are numerous This is a reason why diabetes is termed the silent killer. The most commonest and typical symptoms of diabetes are as follows:

### **5.1 Polyurea:**

As the name suggest; poly means many. This is the frequent or exorbitant urination by the Diabetes Mellitus patients, and this is the most common symptom of Diabetes Mellitus. Due to the more amount of sugar present in the urine, it acquires sugary taste. Usually, the body reabsorbs glucose

as it passes through the kidney during urine formation. But when diabetes boost the blood sugar level, the kidneys may not be able to bring it all back in. This can cause the body to make more urine, and then takes fluid.

### **5.2 Polydipsia:**

Because of the polyurea more amount of urine so as the water is discharged from the body so the body feels the dryness of mouth and extreme thirst. The body craving for water and yet is not satisfiable.

### **5.3 Polyphagia:**

This refers to the excessive hunger. This is another sign of diabetes mellitus. In this the diabetes mellitus patient experience more hunger than the usual. This excessive hunger rises due to body reaction to lack of glucose which has been lost as a result of polyuria, thus starving the body cells. The patient is enticing to eat more quantity of food than usual, and this increase the level of blood glucose, and more increase in body weight. besides, the body converts the food we eat into glucose which the cells use for energy with the help of insulin. If the body does not make enough insulin, or if the cells resist the insulin made by the body, then the glucose cannot get into them and therefore no energy. This makes person more tired and hungry as usual.

### **5.4 Blurred vision:**

Changed fluid levels in the body could make the eye lenses to swell up. They

change shape and lose their ability to focus. And vision will not be clear.

### **5.5 Unplanned weight loss:**

If your body should not get enough energy from food then it will start starving cells and burning muscles to produce enough energy. This results in weight loss even though you have not changed the way of eating.

### **5.6 Nausea and vomiting:**

The body produces ketones when it begins to burn fat. These substances can accumulate in the blood to dangerous levels; possibly, this is a condition known as diabetic ketoacidosis, which is potentially fatal. Your stomach may feel queasy after consuming ketones.

## **6. Diagnosis: [13-15]**

Never base a diagnosis of diabetes mellitus in a client who is asymptomatic on a single abnormal blood glucose reading. If diabetes mellitus is identified, the doctor must be certain that the diagnosis is accurate because there are serious and lasting ramifications for the patient.

The diagnosis of diabetes mellitus includes;

### **6.1 Casual Plasma (Blood) Glucose Test**

The diagnosis of diabetes with this test is done by the presence of diabetes symptoms and blood glucose level of 11.1 mmol/L (200 mg/dl) or higher.

### **6.2 Fasting Plasma Glucose (FPG) Test**

A diagnosis with Fasting Plasma Glucose (FPG) test is made when the fasting blood glucose level is 7.0 mmol/L (126 mg/dL) or higher on at least two tests. Values of 100–125 mg/dl indicate pre-diabetes. A normal fasting blood glucose level is less than 100 mg/dl.

### **6.3 Oral Glucose Tolerance Test**

The criterion for a diagnosis of diabetes with Oral Glucose Tolerance test is two-hour blood glucose level of 200 mg/dl or higher. Pre-diabetes is diagnosed if the two-hour blood glucose level is 140–199 mg/dl.

### **6.4 Postprandial Blood Glucose Test**

In this test the blood glucose levels measured 2 hours after eating a meal. Postprandial blood glucose testing is typically performed on individuals who have hyperglycemia symptoms or whose fasting glucose test results raise the possibility of diabetes but are not definitive. Diabetes is indicated by readings above 200 mg/dl.

## **7. Treatment:**

The treatment is to control the causes and to give high doses of regular insulin. The patients are required to control the blood glucose level with the medicine and and/or by cling to exercise program and dietary plan. The major components of treatment of diabetes mellitus are [16].

### **7.1. Drug treatment**

### **7.2. Non-drug treatment**

## 7.1 Drug treatment: [17-19]

Antidiabetic drugs are the type of drugs which are used to treat the diabetes mellitus by lowering glucose level in blood. The only exceptions are insulin, exenatide, and pramlintide. Because they are all taken orally, these medications are sometimes known as oral hypoglycemic agents or oral anti hyperglycemic medicines. Different kinds of anti-diabetic medications exist, and the choice of one depends on the patient's age, condition, and type of diabetes, among other things. Diabetes mellitus of type 1 (T1DM) is a condition brought on by a shortage of insulin. Insulin needs to be administered or inhaled if you have type 2 diabetes. Insulin resistance in the cells is the illness known as type 2 diabetes mellitus. In order to treat diabetes mellitus, the pancreas secretes more insulin, target organs become more responsive to insulin, and the rate at which glucose is absorbed from the gastrointestinal tract is slowed down.

### 7.1.1 Insulin:

Typically, insulin is injected or given subcutaneously via an insulin pump. There is continuing research into alternative administration methods. Insulin may also be administered intravenously in acute care. The rate at which they are broken down by the body distinguishes between the various forms of insulin. Treatment for type 1 diabetes requires insulin. As an

article of religion, it was long believed that bringing plasma glucose back to normal would stop diabetes challenges.

### 7.1.2 Insulin sensitizers:

Oral hypoglycemic agents along with insulin are useful in the treatment of Type 2 Diabetes Mellitus and those agents include Sulphonylureas, Alpha glucosidase inhibitors, Biguanides and Thiazolidenediones. The main aim of this treatment is to correct metabolic disorder like resistance to insulin and insufficient insulin secretion.

### 7.1.3 Sulfonylureas:

These were two of the first commonly used oral hypoglycemic drugs. They are insulin secretagogues, directly opening the KATP channel in pancreatic beta cells to release insulin.

Examples are: Glimepiride, Glibenclamide, Chlorpropamide, Glipizide, Glyburide etc.

### 7.1.4 Meglitinides:

Meglitinides, also known as "short-acting secretagogues," aid in the pancreas' production of insulin. Meglitinides have a unique mechanism of action that involves channels. The mechanism is that the pancreatic beta cells' potassium channels are closed, which allows them to open their calcium channels and increase insulin release.

Examples are: Repaglinide, Nateglinide, Nateglinide.

### **7.1.5 Biguanides:**

Biguanides decrease hepatic glucose production while increasing peripheral glucose absorption, particularly that of skeletal muscle. They are insulin secretagogues, directly causing the KATP channel in pancreatic beta cells to open, triggering the release of insulin.

Examples are: Metformin, Phenformin, Buformin.

### **7.1.6 Thiazolidinediones:**

Thiazolidinediones (TZD) or glitazones are associated with medication of Type 2 Diabetes Mellitus. If we see their chemical structure, it contains thiazolidine group which produce the main action of these active ingredients. Mechanism of action involves the activation of peroxisome proliferator-activated receptor (PPAR gamma), a nuclear receptor. Several genes involved in lipid and glucose metabolism as well as energy balance had their transcription altered by this action (Hauner, 2002). The main derivatives of Thiazolidinediones (TZDs) are Pioglitazone, Rosiglitazone and Lobeglitazone.

### **7.1.7 Glucosidase inhibitor:**

The route of administration of these medications to the patients is through oral route to decrease the blood glucose. The alpha glucosidase inhibitors are also known as "diabetes pills" but due to the

fact hypoglycemic drugs do not directly affect insulin secretion or sensitivity.

## **7.2 Non-Drug Treatment: [20]**

### **7.2.1 Life style change:**

Life style change is explained as the way of living which has been altered by variety manner. There are seven principles of life style which is for good diabetes care as follows: learning much about diabetes mellitus, regular care for diabetes, learn on how to control your diabetes, prevent long term diabetes problems, frequently check for long term problems and treat them well etc.

### **7.2.2 Exercise:**

Exercise plays the main role to keep all diseases far away. Exercise is very important in helping to prevent diabetes and it having vital role of our treatment. Physical exercise is essential because, it helps in losing weight, decrease blood glucose levels and keeps it low for several hours after words, can reduce cholesterol and blood pressure, helps reduce stress.

### **7.2.3 Dieting:**

The diet endorses placing an attention on foods that are higher in fiber and low in fat. In a diet, high fiber and low fat can make body more sensitive to insulin. Diet also involves weight loss which is other way to increase diabetic patient's body sensitivity to the effects of insulin.

## **8. Complications:**

As the blood glucose increases the complications increases in diabetes mellitus patients as increase the oxidative stress, cardiovascular and many other renal diseases. The complications of diabetes mellitus are highly increasing in poor urban slum dwellers, middle class family and even in rural areas also. This increases day by day due to increased stress among the society, physical inactivity, and change in lifestyle and dietary changes. Unfortunately, delayed treatment of diabetes mellitus may increase the many complications. The research study says, the most physically inactive peoples are susceptible to the metabolic syndrome and hypertension. The major cause of morbidity and mortality are both macrovascular and microvascular complications. The macrovascular complications are more severe coronary diseases, stroke and peripheral neuropathy. The microvascular complications are sneakier and long term which is diabetic retinopathy, diabetic nephropathy and diabetic foot [21-23].

#### 9. CONCLUSION:

Diabetes mellitus is a metabolic disease that can be prevented through lifestyle modification, diet control, control of overweight and obesity. The general public education is still crucial for containing this new disease. Despite new research into the pathophysiology of the disease, novel

medications are still being produced and there is no solution in sight. Adaptive management is necessary to enhance the quality of life for the people with diabetes mellitus.

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#### 11. Conflict of interest:

The authors declare no conflict of interest.

#### REFERENCES:

- [1] Unai Galicia-Garcia, Asier Benito-Vicente, Shifa Jebari, Asier Larrea-Sebal, Haziq Siddiqi, Kepa B. Uribe, Helena Ostolaza, and César Martín, Pathophysiology of Type 2 Diabetes Mellitus, *Int J Mol Sci.* 2020 Sep; 21(17): 6275.
- [2] Ritu Lakhtakia, The History of Diabetes Mellitus, *Sultan Qaboos University Med J, August 2013*, Vol. 13, Iss. 3, pp. 368-370, Epub. 25th Jun 13
- [3] Sazid Alam, Khalid Eqbal, Iqbal Patel, Imamuddin Mulla, The history of

- diabetes: From olden days to discovering insulin, *International Journal of Unani and Integrative Medicine* 2017; 1(1): 25-28
- [4] Christian Rask-Madsen and George L. King, Vascular complications of diabetes: mechanisms of injury and protective factors, *Cell Metab.* 2013 Jan 8; 17(1): 20–33.
- [5] Adam L. Burrack, Tijana Martinov, and Brian T. Fife, T Cell-Mediated Beta Cell Destruction: Autoimmunity and Alloimmunity in the Context of Type 1 Diabetes, *Front Endocrinol (Lausanne)*. 2017; 8: 343.
- [6] Xiyue Jing, Jiageng Chen, Yanan Dong, Duolan Han, Haozuo Zhao, Xuying Wang, Fei Gao, Changping Li, Zhuang Cui, Yuanyuan Liu & Jun Ma, Related factors of quality of life of type 2 diabetes patients: a systematic review and meta-analysis, *Health and Quality of Life Outcomes* (2018:) 16:189
- [7] Abbas Alam Choudhury, V Devi Rajeswari, Gestational diabetes mellitus - A metabolic and reproductive disorder, *Biomedicine & Pharmacotherapy* (2021): 143: 112183.
- [8] Schwitzgebel, Valerie M. “Many faces of monogenic diabetes.” *Journal of diabetes investigation* vol. 5,2 (2014): 121-33.
- [9] Ceriello A, Prattichizzo F. Variability of risk factors and diabetes complications. *Cardiovasc Diabetol.* 2021 May 7;20(1):101.
- [10] La Sala L, Pontiroli AE. Prevention of Diabetes and Cardiovascular Disease in Obesity. *Int J Mol Sci.* 2020 Oct 31;21(21):8178.
- [11] Thipsawat S. Early detection of diabetic nephropathy in patient with type 2 diabetes mellitus: A review of the literature. *Diab Vasc Dis Res.* 2021 Nov-Dec;18(6):14791641211058856.
- [12] Yousri NA, Suhre K, Yassin E, Al-Shakaki A, Robay A, Elshafei M, Chidiac O, Hunt SC, Crystal RG, Fakhro KA. Metabolic and Metabo-Clinical Signatures of Type 2 Diabetes, Obesity, Retinopathy, and Dyslipidemia. *Diabetes.* 2022 Feb 1;71(2):184-205.
- [13] Christ-Crain M. Diabetes Insipidus: New Concepts for Diagnosis. *Neuroendocrinology.* 2020;110(9-10):859-867.
- [14] Ziegler D, Tesfaye S, Spallone V, Gurieva I, Al Kaabi J, Mankovsky B, Martinka E, Radulian G, Nguyen KT, Stirban AO, Tankova T, Varkonyi T, Freeman R, Kempler P, Boulton AJ. Screening, diagnosis and management of diabetic sensorimotor polyneuropathy in clinical practice: *International expert consensus recommendations.* *Diabetes Res Clin Pract.* 2022 Apr;186:109063.

- [15] Fenske W, Refardt J, Chifu I, Schnyder I, Winzeler B, Drummond J, Ribeiro-Oliveira A Jr, Drescher T, Bilz S, Vogt DR, Malzahn U, Kroiss M, Christ E, Henzen C, Fischli S, Tönjes A, Mueller B, Schopohl J, Flitsch J, Brabant G, Fassnacht M, Christ-Crain M. A Copeptin-Based Approach in the Diagnosis of Diabetes Insipidus. *N Engl J Med*. 2018 Aug 2;379(5):428-439.
- [16] Yu J, Lee SH, Kim MK. Recent Updates to Clinical Practice Guidelines for Diabetes Mellitus. *Endocrinol Metab (Seoul)*. 2022 Feb;37(1):26-37.
- [17] Fralick M, Jenkins AJ, Khunti K, Mbanya JC, Mohan V, Schmidt MI. Global accessibility of therapeutics for diabetes mellitus. *Nat Rev Endocrinol*. 2022 Apr;18(4):199-204.
- [18] Artasensi A, Pedretti A, Vistoli G, Fumagalli L. Type 2 Diabetes Mellitus: A Review of Multi-Target Drugs Molecules. 2020 Apr 23;25(8):1987.
- [19] Piñeiro F, Gil V, Donis M, Torres MT, Orozco D, Merino J. Factores implicados en el incumplimiento del tratamiento farmacológico en la diabetes no insulino dependiente [Factors involved in noncompliance with drug treatment in non-insulin dependent diabetes mellitus]. *Aten Primaria*. 1997 Nov 15;20(8):415-20. Spanish. PMID: 9462935.
- [20] Chellappan DK, Yap WS, Bt Ahmad Suhaimi NA, Gupta G, Dua K. Current therapies and targets for type 2 diabetes mellitus. *Panminerva Med*. 2018 Sep;60(3):117-131
- [21] Rosboth S, Lechleitner M, Oberaigner W. Risk factors for diabetic foot complications in type 2 diabetes-A systematic review. *Endocrinol Diabetes Metab*. 2020 Aug 17;4(1):e00175.
- [22] Brzecka A, Madetko N, Nikolenko VN, Ashraf GM, Ejma M, Leszek J, Daroszewski C, Sarul K, Mikhaleva LM, Somasundaram SG, Kirkland CE, Bachurin SO, Aliev G. Sleep Disturbances and Cognitive Impairment in the Course of Type 2 Diabetes-A Possible Link. *Curr Neuropharmacol*. 2021;19(1):78-91.
- [23] Mattsson K, Nilsson-Condori E, Elmerstig E, Vassard D, Schmidt L, Ziebe S, Jöud A. Fertility outcomes in women with pre-existing type 2 diabetes-a prospective cohort study. *Fertil Steril*. 2021 Aug;116(2):505-513.