

A Review Article on Diabetes Mellitus

1 .S.A.Saniya, 2. Shaik Rizwana

(B PHARMACY 3RD YEAR),

(B PHARMACY 3RD YEAR).

Submitted: 01-06-2023

Accepted: 10-06-2023

ABSTRACT

Diabetes is a chronic, metabolic disease characterized by elevated level of blood glucose, which leads over time to serious damage to the heart, blood vessels, eyes, kidney and nerves .It is of two typeTypes1and Type2.

When the body loses the ability to make insulin (or) can only make a very small amount of insulin. The signs of Type1 diabetes are Increase hunger, Dry mouth, upset of stomach andvomiting, frequent urination, unexplained weight loss, even though eating and feel hungry, fatigue.

Type2 diabetes is caused by dual defects of resistance to the action of insulin combined with an inability to make enough insulin to overcome the resistance. The signs of type2 diabetes areaugmented thirst, frequent urination, increase hungry, unintended weight loss, fatigue, Blurred vision ,slow healing sores, frequent infections .other type of diabetes are gestational diabetes, Epidemiology is diabetes etiology of diabetes mellitus , Treatment of diabetes mellitus are stemcell therapy, Antioxidants therapy, Anti inflammatory treatments, Dietary management, Newerinsulindelivry devices, Oralhypoglycemia or Antidiabetics agents ,complications i.e., acuteand chronic complications are eye problems, foot problems , heart attackand stroke ,kidneyproblems,Nervedamage, serial problems.[1]

KEYWORDS

Diabetes,Gestationaldiabetes,Stemcelltherapy,Anti oxidants.

I. INTRODUCTION

Diabetesmellitisisachronicdisorderofcarbohydrat es,fatsandproteinsmetabolism. Defective or

deficient insulin secretory responses, which translate into impairedcarbohydrates (glucose) use, is a characteristic features of diabetes mellitus, as it is theresulting hyperglycemias. Diabetes mellitus (DM) is commonly referred to as a “sugar” andit is the most common endocrine disorder and usually occurs when there is deficiency

orabsenceofinsulinorrarely,impairmentofinsulina ctivity(insulinresistance).TheInternational Diabetes Federation (IDF) estimates the total number of diabetic subjects to bearound40.9millioninIndiaandthisisfurtherstetor iseto69.9million bytheyear2025.

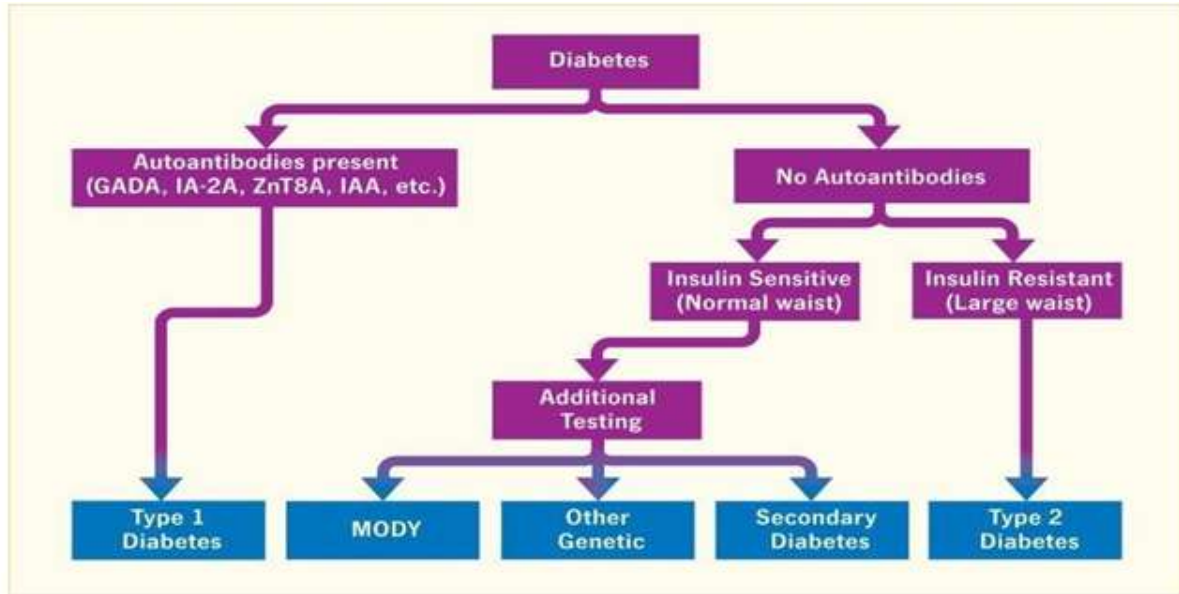
Insulin glucagon hormones both are secreted by the pancreas. Insulin is secreted bythe beta cell and glucagon is secreted by the alpha cells both are located in the islets ofLangerhan’s. Insulin decreases the blood glucose level by the glycogenesis and transportglucose into the muscles liver and adipose tissue. Neural tissue and erythrocytes do notrequiredinsulinfor glucoseutilizationwhereasal phacellsplaysanimportantroleincontrolling blood glucose by producing the glucagon and it increase the blood glucose levelbyacceleratingthe glycogenenesis.

In addition to increased risk of obesity, metabolic and cardiovascular disorders, andmalignancyin futurelifeoffetusafterdelivery[2]

DIABETES;

Diabetes is a chronic, metabolic disease characterized by elevated level of bloodglucose, which leads over time to serious damage to the heart, blood vessels, eyes,kidneyandnerves.

TYPES OF DIABETES



Type 1 Diabetes:

The body loses the ability to make insulin or can only make a very small amount of insulin. Type 1 diabetes is usually caused by an autoimmune process, and your body's immune system mistakenly destroys the insulin-producing cells. About 10% of individuals with diabetes have type 1 diabetes. Type 1 Diabetes Symptoms

SIGNS

- Increased hunger (especially after eating), Dry mouth, Upset stomach and vomiting,
- Frequent urination, Unexplained weight loss, even though eating and feeling hungry, Fatigue, Blurry vision,
- Infections on skin, urinary tract, or vagina, Crankiness or mood changes, Bedwetting in a child, being dry at night.
- Signs of an emergency with type 1 diabetes
- Shaking and dizziness, Rapid breathing, Fruity smell to your breath,
- Belly pain, Loss of consciousness (rare).

Type 1 Diabetes Causes

Insulin is a hormone that helps move sugar, or glucose, into body's tissues. Cells use it as fuel. Damage to beta cells from type 1 diabetes throws the process off. Glucose doesn't move into cells because insulin isn't there to do the job. Instead,

it builds up in blood, and cells starve. This causes high blood sugar, which can lead to:

Dehydration. When there's extra sugar in blood, body's way of getting rid of it. A large amount of water goes out with that urine, causing body to dry out.

Weight loss. The glucose that goes out when pee takes calories with it. That's why many people with high blood sugar lose weight. Dehydration also plays a part.

Diabetic ketoacidosis (DKA). If body can't get enough glucose for fuel, it breaks down fat cells instead. This creates chemicals called ketones. Liver releases the sugar it stores to help out. But body can't use it without insulin, so it builds up in blood, along with the acidic ketones. This mix of extra glucose, dehydration, and acid builds up in known ketoacids and can be life-threatening if not treated right away.

Damage to body. Over time, high glucose levels in your blood can harm the nerves and small blood vessels in eyes, kidneys, and heart. They can also make you more likely to get hardened arteries, or atherosclerosis, which can lead to heart attacks and strokes. [3]

Type 1 Diabetes

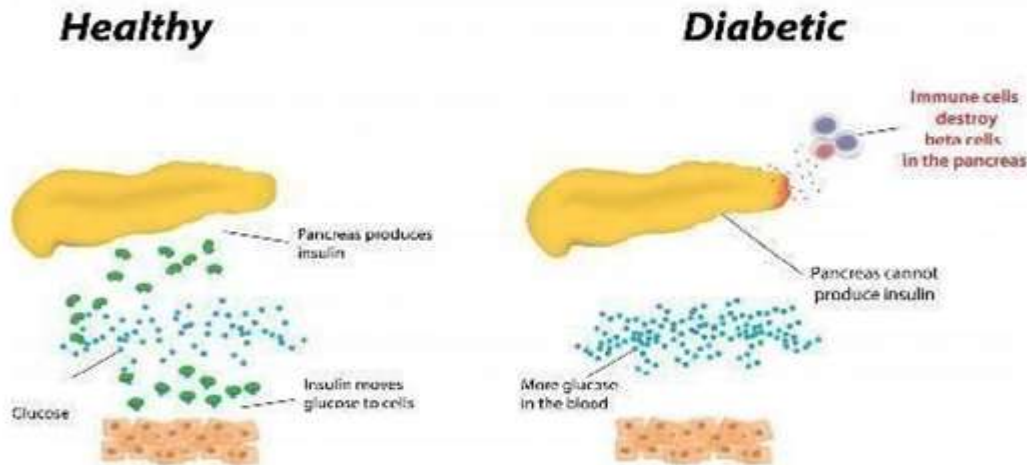


FIGURE NUMBER 1. TYPE 1 DIABETES

Type 2 Diabetes:

caused by a dual defect of resistance to the action of insulin combined with an inability to make enough insulin to overcome the resistance. Type 2 diabetes is the most common form of diabetes and represents 80% to 90% of diabetes worldwide

SIGNS AND SYMPTOMS

Augmented thirst, Frequent urination, Increased hunger, Unintended weight loss, Fatigue, Blurred vision,

Slow-healing sores, Frequent infections, Numbness or tingling in the hands or feet, Areas of darkened skin, usually in the armpits and neck.

CAUSES

Type 2 diabetes is mainly the result of two problems: Cells in muscle, fat and the liver become resistant to insulin. As a result, the cells don't take in enough sugar. The pancreas can't make enough insulin to keep blood sugar levels within a healthy range.

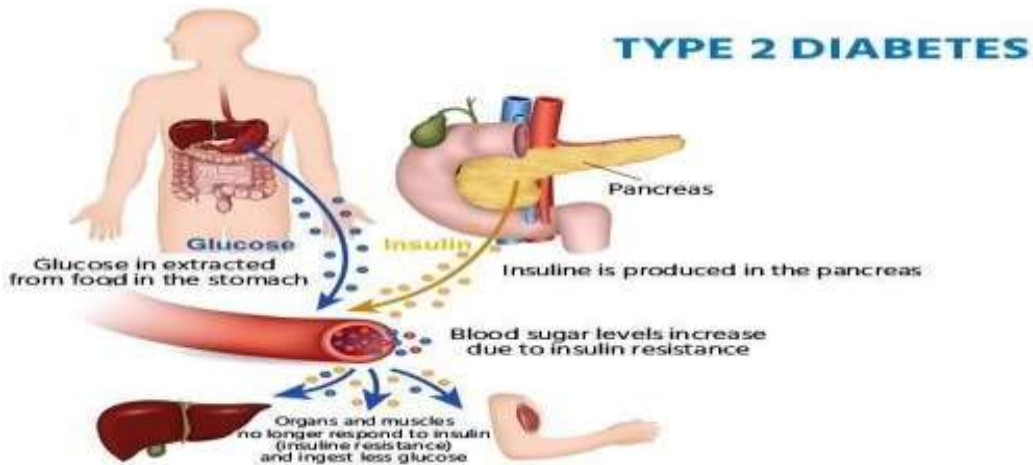


FIGURE NUM 2 .TYPE 2 DIABETES

Other Types of Diabetes:

A miscellaneous category that includes unusual or rare inherited or acquired

causes of diabetes. This represents the minority of people with diabetes. Besides T1DM, T2DM, and GDM, diabetes in

various other forms, though in smaller percentages with respect to overall diabetic incidence scenario, has been found to be associated with some specific conditions including various pathologies and/or several disorders. The prominent among these types of diabetes included diabetes resulting from the monogenic defects in β -cell function and those due to genetic abnormalities in insulin action, endocrinopathies, exocrine pancreatic pathologies, and several others specific conditions.

Gestational Diabetes:

Diabetes diagnosed during pregnancy. GDM is defined as any degree of glucose intolerance or diabetes diagnosed at the outset or during pregnancy, usually the second or third trimester. This definition earlier also included any undetected T2DM which may begin prior to or occur at the time of pregnancy onset. However, the latest recommendations of the International Association of Diabetes and Pregnancy Study Groups exclude from this definition diabetes diagnosed at the pregnancy onset or afterward in high-risk women such as with obesity where any degree of glucose intolerance is described as previously undiagnosed overt diabetes rather than GDM. GDM is different from any preexisting diabetes in women undergoing pregnancies and usually resolves soon after child birth or termination of pregnancy.

During early pregnancy, both the fasting and post-prandial blood glucose levels are usually lower than normal but the blood glucose levels increase during the third trimester of pregnancy, and in cases where this blood glucose level reaches the diabetic levels, the condition is described as GDM. More than 90% of all the cases of diabetes and its complications that occur during pregnancy can be attributed to GDM. The incidence of GDM varies from 1% to 14% of all pregnancies and its prevalence is greatly influenced by the populations under study. GDM occurs more frequently in certain racial or ethnic groups than others and this influence of ethnicity on risk of GDM is very important and has long been established. The prevalence of GDM is highest among Asian Indians, higher in aboriginal Australians, Middle Eastern (Lebanese, Syrian, Iranian, Iraqi, or Afghanistan), Filipina, Pacific Islanders, and Chinese, Japanese, Korean, and Mexican women. The prevalence is lower in blacks and lowest among non-Hispanic white women. The risk of GDM increases with age, obesity, previous pregnancy with large babies, and any previous history of impaired glucose tolerance or GDM. Furthermore, GDM has been associated with an increased lifetime risk of developing T2DM. There is regular and lifetime screening for any kind of glucose impairment is, therefore, highly recommended in order to ensure early diagnosis of T2DM in such individuals. [4]

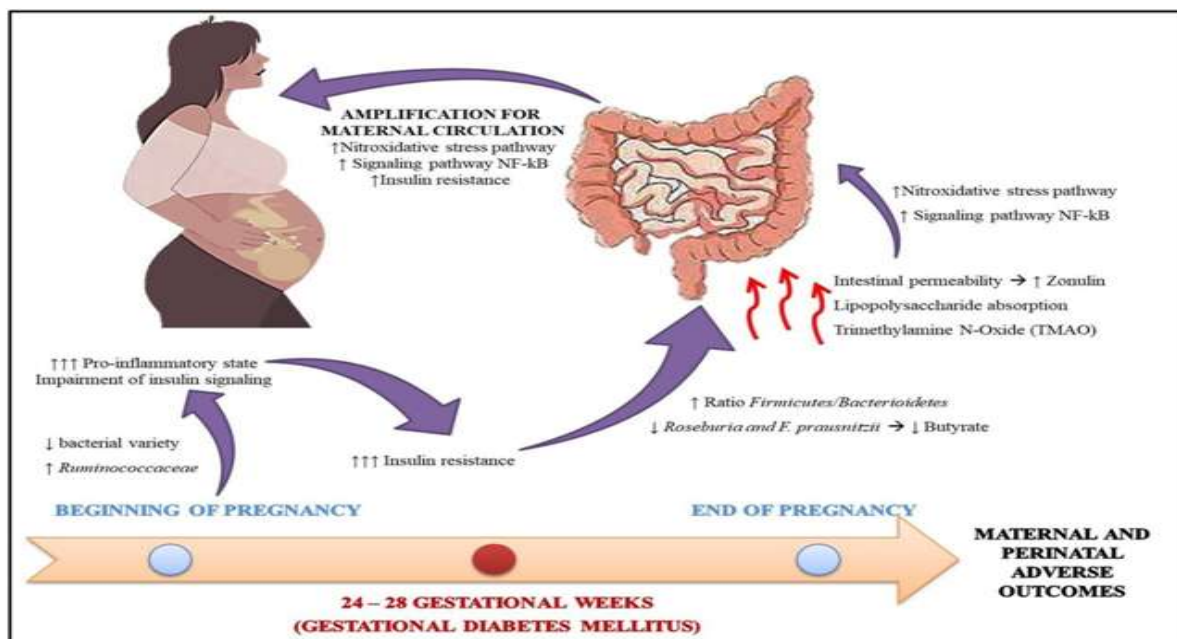


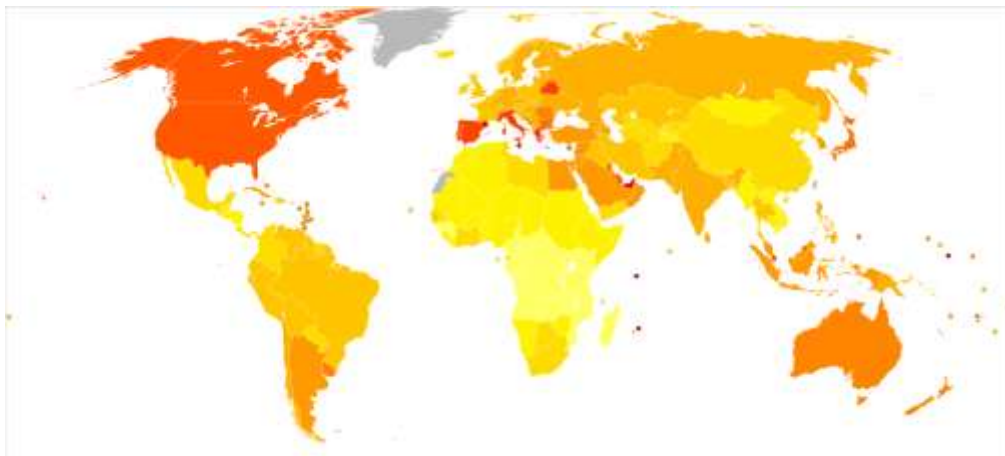
FIGURE NUM 3. GESTATIONAL DIABETES MELLITUS

EPIDERMIOLOGY

Globally, an estimated 537 million adults are living with diabetes, according to the latest 2019 data from the International Diabetes Federation. Diabetes is the 9th leading cause of mortality globally in 2020, attributing to over 2 million deaths annually due to diabetes directly and kidney disease due to diabetes. The primary causes of type 2 diabetes is diet and physical activity, which can contribute to increased BMI, poor nutrition, hypertension, alcohol use and smoking, while genetics is also a factor. Diabetes prevalence is increasing rapidly; previous 2019 estimates put the number at 463 million people living with diabetes, with the distributions being equal between both sexes incidence peaking around age 55 years old. The number is projected to 643 million by 2030, or 7079 individuals per 100,000, with all regions around the world continue to rise. Type 2 diabetes makes up about 85-90% of all cases. Increases in the overall diabetes prevalence rates largely reflect an increase in risk factors for type 2, notably greater longevity and being overweight or obese. The prevalence of African Americans with diabetes is estimated to triple by 2050, while the prevalence of whites is estimated to double. The overall prevalence increases with age, with the largest increase in people over 65 years of age. The prevalence of diabetes in America is estimated to increase to 48.3 million by 2050. Diabetes mellitus occurs throughout the world, but is more common (especially type 2) in the more developed countries. The greatest increase in prevalence is, however, occurring in low- and

middle-income countries including in Asia and Africa, where most patients will probably be found by 2030. The increase in incidence in developing countries follows the trend of urbanization and lifestyle changes, including increasingly sedentary lifestyles, less physically demanding work and the global nutrition transition, marked by increased intake of foods that are high energy-dense but nutrient-poor (often high in sugar and saturated fats, sometimes referred to as the Western pattern diet). The risk of getting type 2 diabetes has been widely found to be associated with lower socio-economic position across countries.

The WHO estimates that diabetes resulted in 1.5 million deaths in 2012, making it the 8th leading cause of death. However another 2.2 million deaths worldwide were attributable to high blood glucose and the increased risks of associated complications (e.g. heart disease, stroke, kidney failure), which often result in premature death and are often listed as the underlying cause on death certificates rather than diabetes. The burden of diabetes (both type 1 and 2) has a possibility to lead to complications of multiple body systems including nephropathy, neuropathy and retinopathy. About half of patients with type 2 diabetes die due to cardiovascular disease and 10% from kidney failure. A study done on Gomel city population with radiation exposure after the Chernobyl incident demonstrated increased incidence of type 1 diabetes mellitus. Women who had gestational diabetes during pregnancy have a 20-50% increased risk of developing type 2 diabetes later in life. [5]



Prevalence(per1,000inhabitants)ofdiabetesworldwidein2000-worldaveragewas2.8%.

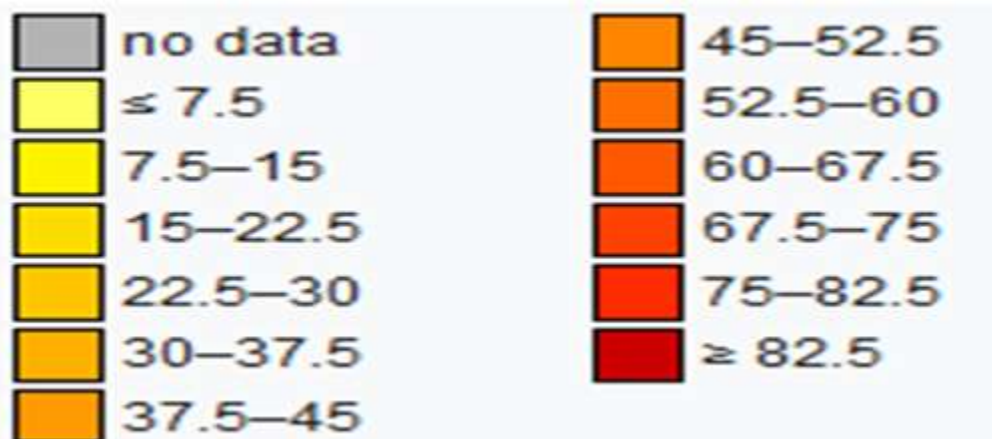


FIGURE NUM 4. WORLD WIDE DIABETES MELLITUS

India has an estimated 77 million people (1 in 11 Indians) formally diagnosed with diabetes, which makes it the second most affected in the world, after China. Furthermore, 700,000 Indians died of diabetes, kidney disease or other complications of diabetes in 2020. One in six people in the world with diabetes is from India. (India's population as calculated in October 2018 was about 17.5% of the global total.) The number is projected to grow by 2045 to become 134 million per the International Diabetes Federation.

In India, type 1 diabetes is rarer than in western countries, and about 90 to 95% of Indians who were diagnosed had type 2

diabetes. Only about one-third of type 2 diabetics in India have a Body Mass Index above 25. A 2004 study suggests that the prevalence of type 2 diabetes in Indians may be due to environmental and lifestyle changes resulting from industrialization and migration to urban environment from rural. This lifestyle change has led to the increased consumption of energy intake from animal foods in Asian populations. This change has been seen in India where urban residents consumed 32% of energy from animal fats compared to 17% of rural residents. These changes also occur earlier in life, which means chronic long-term complications are more common. [11]

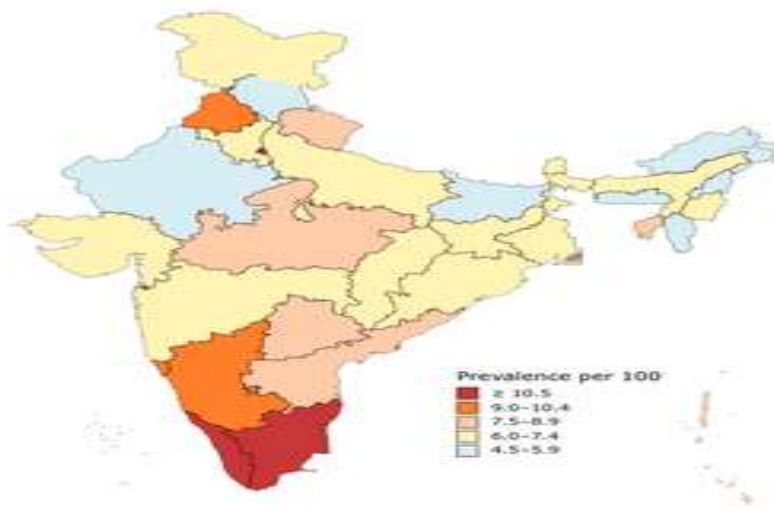


FIGURE NUM 5. INDIA WIDE DIABETES MELLITUS

ETIOLOGY

The word etiology is derived from Greek word "aetiologia". Hence, etiology is defined as the science of finding causes and origins in which a disease arises. It includes—

1. It is currently believed that the juvenile-onset (insulin dependent) form has an autoimmune etiology.
2. Viruses may also play a role in the etiology of diabetes like coxsackie B, Mumps and rubella viruses all have been shown to produce morphologic changes in the islet-cell structure.
3. The genetic role in the etiology of diabetes is controversial. Possibly a genetic trait makes an individual's pancreas more susceptible to one of the above viruses. [6]

TREATMENT

The treatment is to overcome the precipitating cause and to give high doses of regular insulin. The insulin requirement comes back to normal once the condition has been controlled. The aims of management of diabetes mellitus can be achieved by:

1. To restore the disturbed metabolism of the diabetic as nearly to normal as is consistent with comfort and safety.
2. To prevent or delay progression of the short and long term hazards of the disease.
3. To provide the patient with knowledge, motivation and means to undertake this in his own enlightened care.

A. Types Of Therapy Involved In Diabetes Mellitus

1. Stem cell therapy

Researchers have shown that monocytes/macrophages may be main players which contribute to these chronic inflammations and insulin resistance in T2DM patients [28]. Stem cell education therapy, a novel technology, is designed to control or reverse immune dysfunctions [29]. The procedure includes: collection of patients' blood circulating through a closed-loop system, purification of lymphocytes from the whole blood, co-culture of them with adherent cord blood-derived multi-potent stem cells (CB-SCs) in vitro and administration of the educated lymphocytes (but not the CB-SCs) to the

patient's circulation.

Antioxidant therapy

A variety of antioxidants, such as vitamins, supplements, plant-derived active substances and drugs with antioxidant effects, have been used for oxidative stress treatment in T2DM patients. Vitamin C, vitamin E and β carotene are ideal supplements against oxidative stress and its complications. Antioxidants which play an important role in lowering the risk of developing diabetes and its complications.

2. Anti-inflammatory treatment

The changes indicate that inflammation plays a pivotal role in the pathogenesis of T2DM and its complications. In T2DM, especially in adipose tissue, pancreatic islets, the liver, the vasculature and circulating leukocytes, which include altered levels of specific cytokines and chemokines, the number and activation state of different leukocyte populations, increased apoptosis and tissue fibrosis. Immunomodulatory drugs are provided.

B. Dietary Management

Adequate caloric value Dietary management should be taken properly by the both diabetic and non-diabetic patients such as:

1. Balanced in regard to protein, carbohydrate and fats, in all cases it is necessary to restrict carbohydrate intake.
2. Should conform as closely as possible to normal
3. Food intake should be divided into regularly spaced meals of similar size
4. Reduce total calorie intake by decreasing both fat and carbohydrate
5. Patient must be advised to be constant in his dietary habits from day to day. [10]

C. Newer Insulin Delivery Devices

A number of innovations made to improve ease and accuracy of insulin administration as well as to achieve tight glycaemia control. These are insulin syringes, pen devices, inhaled insulin, insulin pumps, implantable pumps, other routes of insulin delivery. [12]

D. Oral Hypoglycaemic Or Antidiabetic Agents

Clinically useful biguanide phenformin was

produced parallel to sulfonylurea's in 1957. Newer approaches have constantly been explored and have lately yielded thiazolidinediones, meglitinide analogues, α -glucosidase inhibitors, and the latest are dipeptidyl peptidase-4 (DPP-4) inhibitors. [7]

COMPLICATIONS;

Acute complications:

These can happen at any time and may lead to chronic, or long-term, complications.

- Hypos – when your blood sugars are too low
- Hypers – when your blood sugars are too high
- Hyperosmolar Hyperglycaemic State (HHS) – a life-threatening emergency that only happens in people with type 2 diabetes. It's brought on by severe dehydration and very high blood sugars.
- Diabetic ketoacidosis (DKA) – a life-threatening emergency where the lack of insulin and high blood sugars lead to a build-up of ketones. [9]

Chronic complications:

These are long-term problems that can develop gradually, and can lead to serious damage if they go unchecked and untreated.

- Eye problems (retinopathy)
In diabetes, develop an eye disease called diabetic retinopathy which can affect their eyesight. If retinopathy is picked up – usually from an eye screening test – it can be treated and sight loss prevented.
- CC Foot problems
Diabetes foot problems are serious and can lead to amputation if untreated. Nerve damage can affect the feeling in feet and raised blood sugar can damage the circulation, making it slower for sores and cuts to heal. That's why it's important to tell that GP if notice any change in how the feet look or feel.
- Heart attack and stroke
In diabetes, high blood sugar for a period of time can da

mage blood vessels.

This can sometimes lead to heart attacks and strokes.

- Kidney problems (nephropathy)

Diabetes can cause damage to kidneys over a long period of time making it harder to clear extra fluid and waste from the body. This is caused by high blood sugar levels and high blood pressure. It is known as diabetic nephropathy or kidney disease.

- Nerve damage (neuropathy)

The diabetes may develop nerve damage caused by complications of high blood sugar levels. This can make it harder for the nerves to carry messages between the brain and every part of the body so it can affect how to see, hear, feel and move.

- Gum disease and other mouth problems

Too much sugar in the blood can lead to more sugar in saliva. This brings bacteria which produces acid which attacks to the tooth enamel and damages the gums. The blood vessels in the gums can also become damaged, making gums more likely to get infected.

- Related conditions, like cancer

In diabetes, the more of risk in developing certain cancers. And some cancer treatments can affect the diabetes and make it hard to control the blood sugar.

- Sexual problems in women

Damage to blood vessels and nerves can restrict the amount of blood flowing to your sexual organs so you can lose some sensation. If you have high blood sugar, you are also more likely to get thrush or a urinary tract infection.

- Sexual problems in men

The amount of blood flowing to the sexual organs can be restricted which may cause you to have difficulty getting aroused. It may lead to erectile dysfunction, sometimes called impotence. [8]

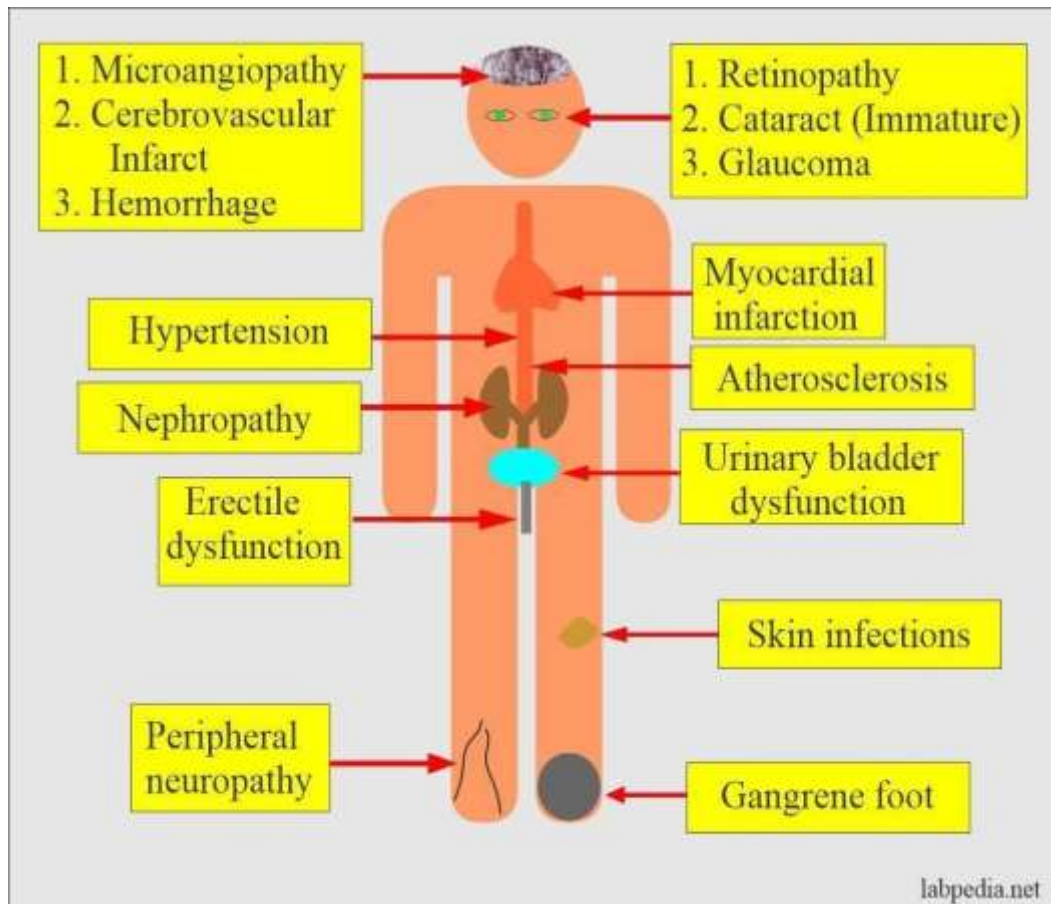


FIGURE NUM 6. COMPLICATIONS OF DIABETES MELLITUS

II. CONCLUSION

Diabetes mellitus is a serious complication in today life. The lifestyle and daytoday circumstances are play major role in occurring this of serious complications. Itis a complex multifactorial disease, leading to high morbidity. With the developmentof newer drugs and improved surgical options, and knowledge of diabetes and itsphysiology increased incrementally. However, with this increase in knowledge, weare still not able to fully understand its pathophysiology and therefore based on thecurrent literature a new reclassification is difficult to made. Future research willhopefully guide clinicians to optimal medical and or surgical treatment for diabetesandprovidefurtherstructureinapotentialreclassification ofdiabetes.[9]

REFERENCE

- [1]. Ross and Wilson, Anatomy and Pathophysiology in Healt and Illness, Churchill, Livingstone Elsevier, 11th edition, 2010.
- [2]. Kumar C, Basic Pathology, Prism PVT. Limited Bangalore, 5th edition, 1992.
- [3]. Meigs JB, Muller DC, Nathan DM. American Diabetes Association. Kitabchi AE, Um pierrez GE, Miles JM. NCD Risk Factor.
- [4]. Tsertsvadze A, Maglione M, Chou R, et al. Up dating comparative effectiveness reviews: cu rrent efforts in AHRQ's Effective Health Care Program.
- [5]. Mostafa SA, Srinivasan BT, Webb D, Sehm i S, Gray LJ, Yates T. A comparison of incide nt Type 2 diabetes using WHO 1999 and the p roposed HbA1c diagnostic
- [6]. Strawbridge LM, Lloyd JT, Meadow A, Riley GF, Howell BL. Use of Medicare's Diabetes S elf-Management Training Benefit. Health Educ Behav.
- [7]. Sherr D, Lipman RD. The Diabetes Educator and the Diabetes Self-management Education Engagement Nation al Practice Survey. Diabetes Educ.

- [8]. CoppellKJ,KataokaM,WilliamsSM,Chish olmAW,VorgersSM,Mann JI
- [9]. HoetJJ, TripathyBB, RaoRH, YajnikCS.Malnutrition and diabetes in the tropics,DiabetesCare.
- [10]. TripathyBB, SamalKC.Overview and consensus statementon diabetesin tropicalareas,DiabetesMetab Rev.1997..
- [11]. BetterleC,Zanette F,Pedini B,Presotto F, Rapp LB, Monsciotti CM Clinical andsubclinicalorgan–specificautoimmunemanifestationsintype 1 (insulin–dependent)diabeticpatientsandtheirfirst–degreerelatives,Diabetologia.
- [12]. Bears MA Jr, Han Y, Schneck ME, BarezS,JacobsenC.Localmultifocaloscillat ory potential abnormalities in diabetes and earlydiabetic retinopathy,Invest OphthalmicVis Sci.2004.
- [13]. Zimmet PZ, TuomiT, Mackay R, Rowley MJ, Knowles W, Cohen Metal. Latentautoimmune diabetes mellitus in adults (LADA): the role of antibodies to glutamicacid.