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Review

Unrevealing the Concept of Diabetes, Introduction, Types of Diabetes, Treatment, Pharmacokinetics, Diagnosis, Risk Factors, Conclusion

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Abstract

Diabetes mellitus (DM) is a long-lasting metabolic non-communicable disease often characterized by an increase level of glucose in the blood or hyperglycemia. Approximately, 415 million people between the ages of 20 and 79 years had DM in 2015 and this figure will rise by 200 million by 2040. In a study conducted by CARRS, it's been found that in Delhi the prevalence of diabetes is around 27% and for prediabetic cases, it is more than 46%. The disease DM can be both short-term and long-term and is often associated with one or more diseases like cardiovascular disease, liver disorder, or kidney malfunction. Early identification of diabetes may help avoid catastrophic repercussions because untreated DM can result in serious complications. Diabetes' primary symptoms are persistently high blood glucose levels, frequent urination, increased thirst, and increased hunger. Therefore, DM is classified into four major categories, namely, Type 1, Type 2, Gestational diabetes, and secondary diabetes. There are various oral and injectable formulations available in the market like insulin, biguanides, sulphonylureas, etc. for the treatment of DM. Recent attention can be given to the various nana approaches undertaken for the treatment, diagnosis, and management of diabetes mellitus. Various nanoparticles like Gold Nanoparticles, carbon nonmaterials, and metallic nanoparticles are some of the approaches mentioned in this review. Besides nanotechnology, artificial intelligence (AI) has also found its application in diabetes care self-management tools. Early detection and diagnosis of diabetes also help the patient avoid expensive treatments later in their life with the help and machine learning models. These tools will help healthcare physicians to predict the disease early. Therefore, the Nano drug delivery system along with AI tools holds a very bright future in diabetes care.

Keywords: Diabetic, Glycogeneses, Insulin, Blood sugar

INTRODUCTION

Diabetes is a disease that occurs when yours blood glucose also called blood sugar is too high. Glucose is your body main source of energy. Our body can Produce glucose, but mainly glucose comes from the food you eat. Insulin is a hormone made by the pancreas that helps glucose gets in to your cells to be used for energy. If u has diabetes, your body does not properly. Glucose then stays in your blood and doesn't reach yourself. diabetes raises the risk damage to the eyes kidney, nerves and the heart. Diabetes also linked to some type of cancers taking step to prevent is damage diabetes may lower your risk of developing diabetes health problems.

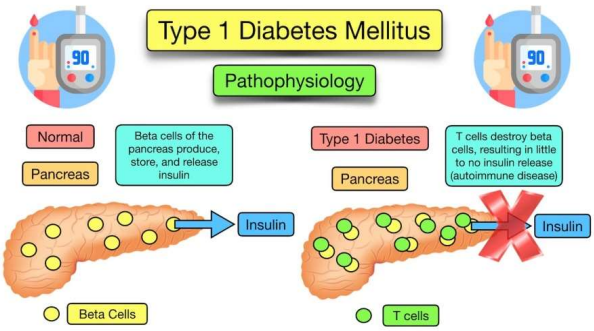
The incidence of diabetes is growing rapidly both in the United States and worldwide. For example, it is an estimate that more than 180 million people worldwide are afflicted with diabetes, and that prevalence is expected to more than double by the year 2030. In the united state, approximately 21 million people are estimated to suffer from diabetes, and it is a major cause of morbidity and morality. Diabetes is not single disease. It is a heterogenous group of syndrome characterized by an elevation of blood glucose caused by the relative absolute deficiency of insulin.

Type 1 diabetes mostly commonly afflicted individuals in puberty or early adulthood, but an absolute deficiency of insulin caused by massive B-cells necrosis. Loss of B-cells functions is usually ascribed to autoimmune medicated processes directed against the B-cells, and it may be triggered by an invasion of viruses or the action of chemical toxins. As a results of the destruction of these cells, the pancreas fails to respond to glucose, and type 1 diabetics requires exogenous insulin to avoid the catabolic state that results from and is characterized by hyperglycemia and life treating keto acid.

Type of diabetes

Cause of type 1 diabetes

In the post absorbvative period of normal individual, low, basal levels of circulating Insulin are maintained through constant beta cell secretion this suppresses biolysis, protolysis and glycogenolysis. a burst of insulin secretion occurs within 2 mintues after ingesting a meal in resoponse to transient increases in the levels of circulating glucose and amino acids. This lasts for up to 15 minutes, and, is followed by the postprandial section of insulin. However, having virtually no functional beta cells, the type 1 diabetes can neither maintain a basal secretion level of insulin nor respond to variation in circulatory flues,. The development and progression of neuropathy, nephropathy, and retinopathy are directlt reeled to the extent of glycolic control.



Treatment

To type 1 diabetic is to maintain blood glucose concentration close to normal. A type 1 diabetic must relay on exogenous insulin to control hyperglycemia, Kato acidosis and maintain acceptable levels glycocelated hemoglobin the rate of formation HBA_{1c} is proportion to the average blood glucose concentration over the previous 3 months .it provides a measure of how well treatment has normalized blood glucose in diabetes the goal in administering insulin.

Personalized diagnosis of T1D

Although all patients with overt T1D exhibit pancreatic destruction and consequent deregulations of blood glucose levels, not all cases of the disease are driven by the same factors or along the same timeline. Many patients experience a sometimes prolonged clinically silent phase in which it might have been possible to intervene and prevent or even reverse the course of disease. This knowledge has led to development of a staging classification system for T1D. Even once T1D is clinically evident, we are now beginning to appreciate that not all cases are the same, and that particular sub-types of the disease would benefit from distinct treatment strategies. We discuss both of these important advances within the field below.

Type 2 diabetes

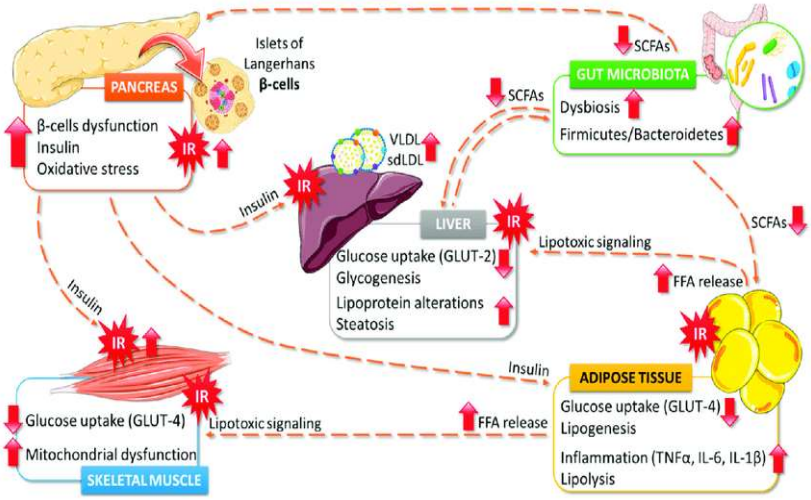
Most diabetics are type 2. Disease is influenced by genetic factor agendum, obesity, and peripheral insulin assistance rather than by autoimmune process are viruses. The metabolic alterations observed on milder than those for type 1 but the long-term clinical consequences can be just as divesting.

Cause of type 2

In type 2 diabetes the pancreas retains some beta cell function variable insulin secretion is in sufficient to maintain glucose homeoststisis. The beta cell mass may become gradually reduced in type 2 diabetes this resistance to insulin is consider to be a major cause of this type of diabetes.

Treatment

The goal in treatment type 2 diabetes is to maintain blood glucose concentration within normal limits and to prevent the development of long-term complications of the disease weight reduction, exercise and dietary modifications decreases insulin resistance and correct the hyperglycemia of type 2 diabetes some patients.



Type -2 Diabetes Mellitus

Control of blood glucose

Glucose is the obligatory source of energy for the adult brain and physiological control of blood glucose reflects the need to maintain adequate fuel supplies in the face of intermittent food intake and variable metabolic demands. More fuel is made available by feeding than is required immediately and excess colonies are stored as glycogen or fat. during fasting, these energy stores need to be mobilised in a regulated manner.The most important regularized in a regulatory hormone is insulin the actions of which are described below.Incresed blood glucose stimulates insulin secretion, whereas reduced blood glucose reduces insulin secretion. The effect of glucose on insulin secretion depends on whether the glucose load is administered intravenously or by mouth. Glucose administered by mouth is more effective in stimulating insulin secretion because it stimulates the release of incretion hormones from the gut, which promotes insulin secretion. The effect of glucose on insulin secretion is abnormal in patients with diabetes. Hyperglycemia, caused by excessive insulin, not only reduces insulin secretion but also elicits secretion of an aryl of counter regulatory hormones including glucagon, adrenaline, glucocarticoids and growth hormone, allof which increase blood glucose.Their man effects on glucose uptake and carbohydrate metabolism are summarized and contrasted with hose of insulin.

Pancreatic islets hormones

The islets of langerhan's the endocrine part of the pancreas contain four main types of peptide secreting cell's cells secrete insulin cells secrete glucagon, D cells secrete somatostatin and PP cells secrete pancreatic polypeptide. The core of each islet contains mainly the predominant B cells surrounded by a mantle of A cells interspersed with D cells or PP cells. In addition to insulin B cells secrete a peptide known as islet myeloid polypeptide or amylin,which delays gastric emptyting opposes insulin by stimulating glycogen break down in striated muscle and C peptide.Glucogon opposes insulin increasing blood glucose stimulating protein break down in muscle.somatostatin inhibits secretion of insulin and of glucogon.It is widely distributed outside the pancreas and is also released from the hypothalamus, inhibiting the release of growth hormone from the pituitary gland.

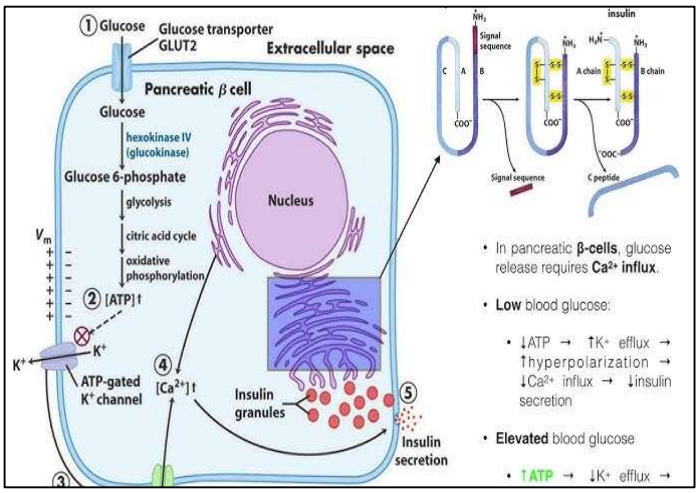
Insulin

The narrative of insulin's discovery and therapeutic use established a paradigm for the combination of biochemical and physiological methods in experimental medicine. Von Mering and Murkowski observed at the close of the 1800s that dogs with pancreatic excision developed diabetic mammary disease (DM). Schafer originally hypothesized in 1916 that pancreatic islets generated a hormone he called "insulin," which is an ant diabetic. Barron observed in 1920 that pancreatic ligation, which results in the death of the exocrine pancreas, only causes diabetes mellitus (DM) if the islets dubbed such by Langerhans in 1869 are also eliminated. Later, in the early 1920s, Banting, Best, Collip, and MacCleod's research led to the discovery of a chemical in extracts.

A key component in controlling human metabolism is insulin. The β-cells in the islets of Langerhans secrete a 51-residue anabolic protein that is the hormone. The mature hormone, proinsulin, is the result of the post-translational processing of a single-chain precursor called proinsulin. It consists of two chains, A and B, joined by disulfide bonds. D. C. Hodgkin's groundbreaking research on the three-dimensional structure of insulin has made it possible to create therapeutic analogs that can be used to treat diabetes mellitus (DM), a metabolic disease. Dominant mutations linked to diabetes mellitus are located in the insulin gene. Despite the rarity of these mutations, molecular examination of them has shed light on the metabolic underpinnings of the hormone's production process and receptor binding mechanism.

Regulation of insulin secretion

The first peptide hormone identified was insulin. All hormones were thought to be tiny molecules until Abel crystallized insulin in 1926 and Jensen and Evans discovered the N-terminal phenylalanine of the B-chain in 1935, demonstrating that insulin was in fact a protein. After Sanger determined the amino acid sequence of insulin in the middle of the 1950s (refer to Figure 1) it was discovered that insulin was a two-chain heterodimer made up of two disulfide bonds.



Functions of insulin

1. Glucose Uptake and Utilization Promotes Glucose Entry:

Insulin activates glucose transporter proteins, such as GLUT4, to encourage the uptake of glucose by cells, especially in muscle and adipose tissue.

Lower Blood Sugar Levels:

Insulin aids in lowering blood sugar levels following meals by promoting glucose absorption.

2. Glycogenesis Storage of Glucose:

Insulin induces the conversion of glucose into glycogen (glycogenesis) in the liver and muscle tissues, functioning as a stored form of energy.

3. Lipogenesis Fat Storage:

Insulin increases fat storage by encouraging the body to convert extra glucose and fatty acids into fat (lipogenesis) and by preventing the body from breaking down fat in adipose tissue (lipolysis).

4. Protein Synthesis Amino Acid absorption:

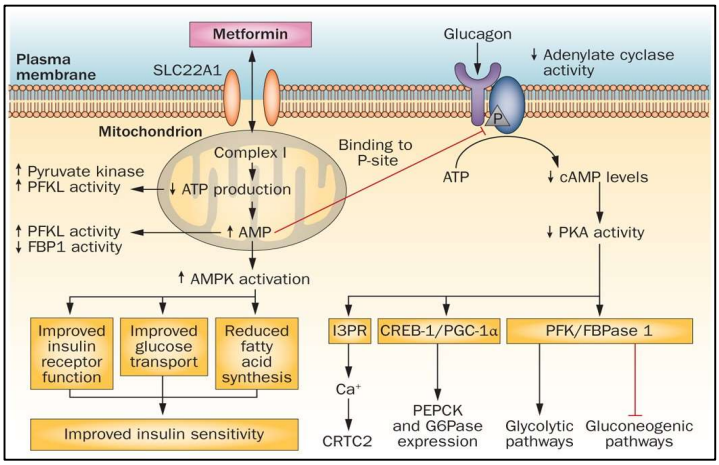
Insulin stimulates the absorption of amino acids into cells and promotes protein synthesis, which is required for growth, repair, and maintenance of tissues.

5. The Repression of Gluconeogenic:

Insulin helps to lower blood sugar levels by blocking the hepatic process known as gluconeogenesis, which generates glucose from non-carbohydrate sources.

6. Electrolyte Balance Controls Potassium Levels:
Insulin aids in potassium absorption into cells, which may have an impact on the body's overall electrolyte balance.
7. Hormonal Regulation Affects Other Hormones:
To maintain general metabolic balance, insulin regulates other hormones linked to metabolism, including glucagon and somatostatin.
8. Satiety and Appetite Regulation Influences Hunger Signals:
Insulin may have an effect on how hungry or full one feels, which may have an effect on how much food one eats.
9. Impact on Cell Development and Repair:
Insulin plays the role of a growth factor by encouraging cell division and repair, both of which are essential for the development and repair of tissues.

Pharmacokinetics



One of the main areas of interest in the search and development of new treatment possibilities is the nonspecific pharmacology of many molecules to cause torsades de pointes (TDP), a kind of ventricular tachycardia. Given the potentially lethal nature of TDP and the numerous drug withdrawals and use limitations that have resulted from it, it is obviously preferable to recognize the risk and steer clear of producing chemicals that might be connected to TDP. The risk of TDP has been shown to be predicted by prolongation of the QT interval, as established in the terfenadine instance. Numerous in vitro and in vivo methods have been developed to evaluate QT prolongation, and these have been utilized in the process of choosing drugs with low risk.

Risk Factors Of Insuline
Sign And Symptoms Of Diabete Mellitus

- Increased Thirst
- Frequent Urination
- Burning sensation on feet
- Unexpected Weight Loss
- Increased Fatigue
- Blurred Vision
- Numbness And Tingling, Especially In Your Feet and Hands
- Slow Healing Sores
- Red, Swollen, Tender Gums
- Skin Itchy
- Irritability

Diagnose Test For Diabetes Mellitus
Tests for Type 1 and Type 2 Diabetes MELLITUS

Gyrated hemoglobin (A1C) test

This blood test, which doesn't require fasting, indicates your average blood sugar level for the past two to three months. It measures the percentage of blood sugar attached to hemoglobin. The oxygen carrying protein in red blood cells. The higher your blood sugar levels, the more hemoglobin you'll have with sugar attached. An A1C level of 6.5 percent or higher on two separate a test indicates that you have diabetes. [15] An A1C between

5.7 and 6.4 percent indicates pre diabetes (A condition in which blood sugar is high but not high enough to be type 2 diabetes) Below 5.7 is Considered normal. If the A1C test results aren't consistent, the test isn't available, or you have certainconditions that can make the A1C test inaccurate such as if you're pregnant or uncommon form ofhaemoglobin (known as a haemoglobin variant) - your doctor m the following tests to diagnose

Random blood sugar test

A blood sample will be taken at a random time. Regardless of when you last ate, a random blood sugar level of 200 milligrams per deciliter (mg/dL) -11.1 millimeters per litter (mmol/L) or higher suggests diabetes.

Fasting blood sugar test

A blood sample will be taken after an overnight fast. A fasting blood sugar level less than 100 mg/dL (5.6 mmol/L) is normal. A fasting blood sugar level from 100 to 125 mg/dl (5.6 to 6.9 mmol/L) isconsidered prediabetes. If it's 126 mg/dL (7 mmol/L) or higher on two separate tests, you have diabetes.

Oral glucose tolerance test

For this test, you fast overnight, and the fasting blood sugar level is measured. Then drink a sugary liquid, and blood sugar levels are tested periodically for the next two hours. A blood sugar level lessthan 140 mg/dL (7.8 mmol/L) is normal. A reading of more than 200 mg/dL (11.1 mmol/L) after two hours indicates diabetes. A reading between 140 and 199 mg/dL (7.8 mmol/L and 11.0 mmol/L).

Tests for gestational diabetes mellitus

Your doctor will likely evaluate your risk factors for gestational diabetes early in your pregnancy:

- Initial glucose challenge test: You'll begin the glucose challenge test by drinking syrupy glucose solution.
- One hour later, you'll have a blood test to measure your blood sugar level. A blood sugar level below 140 mg/dl (7.8 mol/L) is usually considered normal on a glucose challenge test, although this may vary at specific clinics or labs. If your blood sugar level is higher than normal, itonly means you have a higher risk of gestational diabetes.
- Follow-up the glucose tolerance testing: - For the follow-up test, you'll be asked to far
- Overnight and then have your fasting blood sugar level measured. Then you'll drink another
- Sweet solution - this one containing a higher concentration of glucose and your bloom
- Sugar level will be checked every hour for a period of three hours.
- If at least two of the blood sugar readings are higher then the normal values established.

Treatment for all types of diabetes

Healthy Eating

Contrary to popular perception, there's no specific diabetes diet. You'll need to Centre your diet on more fruits, vegetables, lean proteins and whole grains foods that are high innutrition and fiber and low in fat and calories and cut down on saturated fats, refined carbohydrates and sweets. In fact, it's the best eating plan for the entire family. Sugary foods are OK in a while, aslong as they're counted as part of your meal plan.

Physical Activity

Everyone needs regular aerobic exercise, and of the three hours of the test, you'llbe diagnosed with gestational diabetes. People who have diabetes are no exception. Exercise lowersyour blood sugar level by moving sugar into your cells, where it's used for energy. Exercise alsoincreases your sensitivity to insulin, which means your body needs less insulin to transport sugar to your cells.

Treatments for type 1 diabetes mellitus

Insulin: People with type 1 diabetes need insulin therapy diabetes or gestational diabetes also need Insulin therapy. To survive. Many people with type 2 Insulin is usually given subcutaneously either by Injections or by an insulin pump Research of other routes of administration is underway. In acute-care settings, insulin may also be given intravenously general, there are three types of insulin, characterized by the rate which they are metabolized by the body. They are rapid acting insulin's, intermediate acting insulin's and long-acting insulin's.

Herbal drug used for the treatment of diabetes mellitus

- Acacia Arabica
- Achyranthes aspire
- Alliums sativa (garlic)
- Alliums crêpe: (onion)
- Azedarachta indicia
- Tinospora cordifolia (Gauche)

- Cinnamon
- Bitter Melon
- Fenugreek
- Gymea

Lifestyle for type 1 and type 2 DM

Identify you

Wear a tag or bracelet that says you have diabetes. Keep a glucagon kit nearbyin case of a low blood sugar emergency and make sure your friends and loved ones know how to use it.

Pay attention to your feet

Wash your feet daily in lukewarm water. Dry them gently, especially between the toes. Moisturize with lotion, but not between the toes. Check your feet every day for blisters, cuts, sores, redness or ears, cu swelling. Consult your doctor if you have a sore or other foot problem that doesn't start to [28] heals on its own.

Keep your blood pressure and cholesterol under control

Eating healthy foods and exercisingregularly can go a long way toward controlling high blood pressure and cholesterol. Medication may be needed too.

Take care of your teeth

Diabetes may leave you prone to gum infections. Brush and floss your teeth at least twice a day. And if you have type 1 or type 2 diabetes schedule dental exams at least once a year. Consult your dentist right away if your gums bleed or look red or swollen.

CONCLUSION

Diabetes is the complex diseases that can be affect many parts of the body. The goal is to prevent the severe complications. Diabetes is a slow killer with known curable treatments however; its complications can be reduced through proper wariness and timely treatment. Three major complications are related to blindness, kidney damage and heart attack. The study shows that the gestational diabetic mellitus is increasing in Makah and there is a risk of type 2 DM diabetes mellitus consider to be major health health problem that is predicted to turn into a global epidemic in developing countries the number of people gradually increased day by day. Incline plays major role in diabetes. Insulin main job is to move glucose from our bloodstream in to body cells to make energy. Creating a balance diet and proper meal planning is essential for managing diabetes. The goal of this paper is to give a general idea of the current status of diabetes research.

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