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Review Article on Diabetes

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Abstract

Diabetes is a chronic disease that occurs either when the pancreas does not produce enough insulin or when the body cannot effectively use the insulin it produces. Insulin is a hormone that regulates blood glucose. Hyperglycaemia, also called raised blood glucose or raised blood sugar, is a common effect of uncontrolled diabetes and over time leads to serious damage to many of the body's systems, especially the nerves and blood vessels.

In 2014, 8.5% of adults aged 18 years and older had diabetes. In 2019, diabetes was the direct cause of 1.5 million deaths and 48% of all deaths due to diabetes occurred before the age of 70 years. Another 460 000 kidney disease deaths were caused by diabetes, and raised blood glucose causes around 20% of cardiovascular deaths.

Between 2000 and 2019, there was a 3% increase in age-standardized mortality rates from diabetes. In lower middle-income countries, the mortality rate due to diabetes increased 13%.

By contrast, the probability of dying from any one of the four main noncommunicable diseases (cardiovascular diseases, cancer, chronic respiratory diseases or diabetes) between the ages of 30 and 70 decreased by 22% globally between 2000 and 2019NIH: National Institute of Diabetes and Digestive and Kidney Diseases

Introduction:

Diabetes is a disease that occurs when your blood glucose, also called blood sugar, is too high. Glucose is your body's main source of energy. Your body can make glucose, but glucose also comes from the food you eat.

Insulin is a hormone made by the pancreas that helps glucose get into your cells to be used for energy. If you have diabetes, your body doesn't make enough—or any—insulin, or doesn't use insulin properly. Glucose then stays in your blood and doesn't reach your cells.

Diabetes raises the risk for damage to the eyes, kidneys, nerves, and heart. Diabetes is also linked to some types of cancer. Taking steps to prevent or manage diabetes may lower your risk of developing diabetes health problems.

Keywords: Diabetes, Classification of diabetes, Type 1 diabetes, Type 2 diabetes, Gestational diabetes, Diagnosis, Etiology, Genetics

Classification of diabetes:

Type 1 diabetes:

Type 1 diabetes (previously known as insulin-dependent, juvenile or childhood-onset) is characterized by deficient insulin production and requires daily administration of insulin. In 2017 there were 9 million people with type 1 diabetes; the majority of them live in high-income countries. Neither its cause nor the means to prevent it are known

Type 2 diabetes:

Type 2 diabetes affects how your body uses sugar (glucose) for energy. It stops the body using insulin properly, which can lead to high levels of blood sugar if not treated
Over time, type 2 diabetes can cause serious damage to the body, especially nerves and blood vessels.

Diabetes is often preventable. Factors that contribute to developing type 2 diabetes include being overweight, not getting enough exercise, and genetics.

Early diagnosis is important to prevent the worst effects of type 2 diabetes. The best way to detect diabetes early is to get regular check-ups and blood tests with a healthcare provider.

Symptoms of type 2 diabetes can be mild. They may take several years to be noticed. Symptoms may be similar to those of type 1 diabetes but are often less marked. As a result, the disease may be diagnosed several years after onset, after complications have already arisen.

More than 95% of people with diabetes have type 2 diabetes. Type 2 diabetes was formerly called non-insulin dependent, or adult onset. Until recently, this type of diabetes was seen only in adults but it is now also occurring increasingly frequently in children.

Gestational diabetes is hyperglycaemia with blood glucose values above normal but below those diagnostic of diabetes. Gestational diabetes occurs during pregnancy.

Gestational diabetes:

Women with gestational diabetes are at an increased risk of complications during pregnancy and at delivery. These women and possibly their children are also at increased risk of type 2 diabetes in the future.

Gestational diabetes is diagnosed through prenatal screening, rather than through reported symptoms.

Symptoms:

Diabetes symptoms depend on how high your blood sugar is. Some people, especially if they have prediabetes, gestational diabetes or type 2 diabetes, may not have symptoms. In type 1 diabetes, symptoms tend to come on quickly and be more severe.

Some of the symptoms of type 1 diabetes and type 2 diabetes are:

- Feeling more thirsty than usual.

- Urinating often.

· Losing weight without trying.

· Presence of ketones in the urine. Ketones are a byproduct of the breakdown of muscle and fat that happens when there's not enough available insulin.

· Feeling tired and weak.

· Feeling irritable or having other mood changes.

· Having blurry vision.

· Having slow-healing sores.

· Getting a lot of infections, such as gum, skin and vaginal infections.

Causes:
Too much glucose circulating in your bloodstream causes diabetes, regardless of the type. However, the reason why your blood glucose levels are high differs depending on the type of diabetes.
Causes of diabetes include

Insulin resistance: Type 2 diabetes mainly results from insulin resistance. Insulin resistance happens when cells in your muscles, fat and liver don't respond as they should to insulin. Several factors and conditions contribute to varying degrees of insulin resistance, including obesity, lack of physical activity, diet, hormonal imbalances, genetics and certain medications

Autoimmune disease: Type 1 diabetes and LADA happen when your immune system attacks the insulin producing cells in your pancreas.

Harmonal balances:

During pregnancy, the placenta releases hormones that cause insulin resistance. You may develop gestational diabetes if your pancreas can't produce enough insulin to overcome the insulin resistance.

Other hormone-related conditions like acromegaly and Cushing syndrome can also cause Type 2 diabetes

Pancreas damage: Physical damage to your pancreas — from a condition, surgery or injury — can impact its ability to make insulin, resulting in Type 3c diabetes

Genetic mutations: Certain genetic mutations can cause MODY and neonatal

PATHOPHYSIOLOGY OF DIABETES:

Pathophysiology of type 1 diabetes

In this condition the immune system attacks and destroys the insulin producing beta cells of the pancreas. There is beta cell deficiency leading to complete insulin deficiency. Thus it is termed an autoimmune disease where there are anti insulin or anti-islet cell antibodies present in blood. These cause lymphocytic infiltration and destruction of the pancreas islets. The destruction may take time but the onset of the disease is rapid and may occur over a few days to weeks.

There may be other autoimmune conditions associated with type 1 diabetes including vitiligo and hypothyroidism. Type 1 diabetes always requires insulin therapy, and will not respond to insulin-stimulating oral drugs.

Pathophysiology of type 2 diabetes

This condition is caused by a relative deficiency of insulin and not an absolute deficiency. This means that the body is unable to produce adequate insulin to meet the needs. There is Beta cell deficiency coupled with peripheral insulin resistance.

Peripheral insulin resistance means that although blood levels of insulin are high there is no hypoglycaemia or low blood sugar. This may be due to changes in the insulin receptors that bring about the actions of the insulin.Obesity is the main cause of insulin resistance. In most cases over time the patients need to take insulin when oral drugs fail to stimulate adequate insulin release.

Pathophysiology of gestational diabetes:Gestational diabetes is caused when there are excessive counter-insulin hormones of pregnancy. This leads to a state of insulin resistance and high blood sugar in the mother

Diabetes Prevention:

Lifestyle changes are the best way to prevent or delay the onset of type 2 diabetes. To help prevent type 2 diabetes and its complications, people should:

· Reach and keep a health body weight

· Stay physically active with at least 30 minutes of moderate exercise each day

· Eat a healthy diet and avoid sugar and saturated fat

· Not smoke tobacco.

COMMON DRUGS USED FOR DIABETES:

Sulfonylureas

Sodium glucose co- transporters type 2 (SGLT-2) inhibitors

Insulin injections

Phenylalanine analogues

Biguanide

Dipeptidyl peptidase-4

Dopamine D2 agonist

Amylin analogue

1. Mechanism of Action of sulfonyl ureas;

Sulfonylureas are a class of drugs that treat type 2 diabetes by stimulating insulin secretion from the pancreas:

1. Binding to K-ATP channels

Sulfonylureas bind to the adenosine triphosphate-sensitive potassium (K-ATP) channels on the surface of pancreatic beta cells.

2. Inhibiting K-ATP channels

This binding inhibits the K-ATP channels, which decreases the efflux of potassium from the cell.

3. Depolarizing the membrane

The decrease in potassium efflux causes the beta-cell membrane to depolarize.

4. Opening calcium channels

The depolarization opens voltage-gated calcium channels, which allows calcium to flow into the cell.

5. Stimulating insulin secretionThe increased calcium inside the cell stimulates the exocytosis of insulin-containing granules.

Adverse effects

Sulfonylureas are a class of drugs used to treat type 2 diabetes. They can have a number of adverse effects, including:

Hypoglycemia: The most common side effect of sulfonylureas, hypoglycemia occurs when blood glucose levels drop below 70 mg/dL. Symptoms include sweating, shakiness, confusion, and hunger.

Weight gain: Sulfonylureas can cause weight gain. The ADA recommends considering a patient's weight when choosing an antidiabetic drug.

Nausea and diarrhea: These are common side effects of sulfonylureas.

Skin allergies and reactions: Sulfonylureas can cause skin allergies and reactions.

Liver injuries: Rare, but liver injuries have been reported from sulfonylureas within 2–12 weeks of starting therapy.

Alcohol intolerance: First-generation sulfonylureas can cause alcohol intolerance or flushing.

USES:

Sulfonylureas are used in the treatment of Diabetes. However, this is not the only treatment protocol recommended for Diabetics. Doctors usually prescribe Sulfonylureas along with lifestyle changes such as a balanced diet and a strict exercise regimen. Taking these drugs and managing diabetes with lifestyle changes can prevent cardio-vascular diseases and other complications.

2. Mechanism of action of human insulin

Adverse Effects:

- Rash or itching over the whole body
- Shortness of breath
- Wheezing
- Difficulty breathing or swallowing

- Weakness
- Muscle cramps
- Abnormal heartbeat
- Large weight gain in a short period of time
- Swelling of the arms, hands, feet, ankles, or lower legs

Uses:

Human insulin is used in the treatment of diabetes mellitus (Type 1 & Type 2)

3. Mechanism of action of metformin;

Metformin works in a few different ways to help keep your blood glucose (sugar) from getting too high.Metformin decreases the amount of glucose your body absorbs from things you eat and drink. Metformin reduces the amount of glucose that your liver makes. Metformin also helps your body's own insulin to work better. (Insulin is a hormone that helps your body use glucose as a source of energy.)

Adverse Effects:

- Feeling sick (nausea) Take metformin with food to reduce the chances of feeling sick. ...
- Being sick (vomiting) Take small, frequent sips of water or squash to avoid dehydration. ...
- Diarrhoea. ...
- Stomach ache. ...
- Loss of appetite. ...
- A metallic taste in the mouth

Uses; Metformin may also be used for other conditions as determined by your healthcare provider.

Diagnosis and treatment:

Early diagnosis can be accomplished through relatively inexpensive testing of blood glucose. People with type 1 diabetes need insulin injections for survival.

One of the most important ways to treat diabetes is to keep a healthy lifestyle.

Some people with type 2 diabetes will need to take medicines to help manage their blood sugar levels. These can include insulin injections or other medicines. Some examples include:

Metformin Sulfonylureas

Sodium-glucose co-transporters type 2 (SGLT-2) inhibitors.

Along with medicines to lower blood sugar, people with diabetes often need medications to lower their blood pressure and statins to reduce the risk of complications.

Additional medical care may be needed to treat the effects of diabetes: Foot care to treat ulcers

Screening and treatment for kidney diseaseEye exams to screen for retinopathy (which causes blindness).

Lifestyle:

People with diabetes can benefit from education about the disease and treatment, good to achieve a normal body weight, and sensible exercise, with the goal of keeping nutrition. In addition, within acceptable boundsterm blood glucose levels -term and long-both shortgiven the associated higher risks of cardiovascular disease, lifestyle modifications are recommended to control blood pressure.

Conclusion **;**

Diabetes is a serious medical condition that affects millions of people worldwide. It can cause various health complications and should be treated promptly to prevent long-term damage to the body. By understanding the types, causes, symptoms, and treatment options for diabetes, individuals can take steps to manage the condition effectively and lead a healthy life. If you experience any symptoms of diabetes, it is crucial to seek medical attention immediately.

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