

A Review on Diabetes Mellitus (DM)

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Submitted: 01-05-2023

Accepted: 08-05-2023

ABSTRACT:

Diabetes mellitus (DM) is a group of metabolic diseases in which a person has high blood sugar, either because the body does not produce enough insulin, or because cells do not respond to the insulin that is produced.

Conventionally, diabetes has been classified into three parts namely: Type 1 Diabetes Mellitus or insulin-dependent diabetes mellitus In which body fails to produce insulin, and presently requires the person to inject insulin. It is also known as "Juvenile diabetes". Type 2 Diabetes Mellitus or non-insulin-dependent diabetes mellitus results from insulin resistance, a condition in which cells fails to use the properly insulin, with or without an absolute insulin deficiency, which accounts for more than 90% of all types diabetes cases The third main type is gestational diabetes which occurs when women without a previous history of diabetes develop a high blood glucose level during her pregnancy

Diabetes mellitus is a growing health problem in the world that causes severe morbidity and mortality. The main aim of the present review is to compile the reports related to diabetes and their prevalence in India as well as in the world. This review includes the contents which briefly explain the facts related to the development of diabetes, history of diabetes, burden of diabetes in the world as well as in India, complications of diabetes, its treatment and the alternative remedies.

Until now injectable medications are more frequently used in order to achieve the desirable treatment. Patients prefer oral antidiabetic medications since are easier to be administered and for this reason researchers focus their studies at this direction. However these current drugs do not restore normal glucose homeostasis for longer period and they are not free from side effects such as hypoglycaemia, kidney diseases, GIT problems, hepatotoxicity, heart risk problems, insulinoma and

they have to take rest of life. Various herbal drugs have been also proved effective due to their beneficial contents in treatment of diabetes.

KEYWORDS: Diabetes mellitus, non communicable, Insulin,

I. INTRODUCTION :

[1,2,3] Diabetes mellitus is a chronic condition of carbohydrate, lipid, and protein metabolism. Diabetes mellitus is characterised by an inadequate or deficient insulin secretion response, which translates into impaired carbohydrate (glucose) consumption as well as the consequent hyperglycaemias. Diabetes mellitus (DM) is frequently referred to as a "sugar" disease and is the most common endocrine ailment that arises when there is a deficit or lack of insulin or, in rare cases, an impairment of insulin function (insulin resistance).

[4,5] The pancreas produces both insulin and glucagon hormones. Insulin is released by beta (β) cells and glucagon by alpha (α) cells, both of which are found in the Langerhans islets. Insulin lowers blood glucose levels through glycogenesis and transports glucose to muscles, the liver, and adipose tissue. Although neural tissue and erythrocytes do not require insulin to utilise glucose, alpha (α) cells play an important role in controlling blood glucose by producing glucagon and increasing blood glucose levels by accelerating glycogenesis. 14,5

[6,7,8] In addition to increased risk of obesity, metabolic and cardiovascular disorders, and malignancy in future life of fetus after delivery I. Type II diabetes mellitus comprises 80% to 90% of all cases of diabetes mellitus. Geographical variation can contribute in the magnitude of the problems and to overall morbidity and mortality 17. 81. Moreover, people with diabetes who undertake moderate amounts of physical activity

are at inappreciably lower risk of death than inactive persons (24)

It is now well established that a specific genetic constitution is required for such an event to cause [9].

In diabetes, there is an aberration either in the synthesis or secretion of insulin as seen in Type 1 diabetes mellitus (T1DM) and stenosis in the pancreatic duct, or the development of resistance to insulin or its subnormal production as in the case of [10,11] Type 2 diabetes (T2DM) and certain secondary diabetes. Diabetes mellitus, often simply referred to as diabetes, is a group of metabolic diseases in which a person has high blood glucose, either because the body does not produce enough insulin, or because cells do not respond to the insulin that is produced. This high blood glucose produces the classical symptoms of polyuria (frequent urination), polydipsia (increased thirst) and polyphagia (increased hunger) .

Types of diabetes

There are three main types of diabetes.

Diabetes mellitus type 1:

The loss of the insulin-producing beta cells of the islets of Langerhans in the pancreas causes an insulin deficit in type 1 diabetes mellitus, also known as insulin-dependent diabetes mellitus or juvenile diabetes. It might be autoimmune or idiopathic-mediated. Patients with type 1 diabetes mellitus, which often appears in infancy or adolescence, need exogenous insulin because an autoimmune reaction destroys the pancreatic B-cells that produce insulin. When symptoms first appear, the majority of affected patients are healthy overall and at a healthy weight. Insulin sensitivity and response are often normal, especially early on. [12,13]

Type 2 diabetes mellitus

Type 2 diabetes mellitus (also referred as Non-Insulin-Dependent Diabetes Mellitus, NIDDM or adult-onset diabetes) is characterized by insulin resistance (a condition in which cells fail to use insulin properly, sometimes combined with an absolute insulin deficiency). The defective responsiveness of body tissues to insulin is believed to involve the insulin receptor. Type 2 diabetes mellitus is the most common type. Type 2 diabetes mellitus ranges from those with predominant insulin resistance associated with relative insulin deficiency to those with a predominantly insulin secretory defect with insulin

resistance. The prevalence of type 2 diabetes mellitus begins to rise in early middle age and increases along with age.

Exogenous insulin is not always a necessity for these patients because insulin production is frequently high compared to that of type 1 diabetes mellitus. In the early stage of type 2 diabetes mellitus, the predominant abnormality is reduced insulin sensitivity. At this stage, hyperglycemia can be reversed by a variety of measures and medications that improve insulin sensitivity or reduce glucose production by the liver [14]

Gestational diabetes mellitus

Gestational diabetes mellitus (GDM) is seen in pregnancy when women, who have never had diabetes before, have a high blood glucose level during pregnancy. It may precede the development of type 2 diabetes mellitus. It resembles type 2 diabetes mellitus in several respects, involving a combination of relatively inadequate insulin secretion and responsiveness. It occurs in about 2-5% of all pregnancies and may improve or disappear after delivery [15,16]

Signs of Diabetes Mellitus:

High blood sugar (hyperglycaemia)
Increased ketones in your urine (diabetic ketoacidosis)
Hyperglycaemic hyperosmolar nonketotic syndrome

Symptoms Diabetes Mellitus :

Diabetes mellitus symptoms vary depending on how much your blood sugar is elevated. Some people, especially those with pre-diabetes or Non-Insulin Dependent Diabetes mellitus, may sometimes not experience symptoms. In Insulin Dependent Diabetes mellitus, symptoms tend to come on quickly and be more severe.

The signs and symptoms of type 1 diabetes and type 2 diabetes are:

- 1) Irritability
- 2) Presence of ketones in the urine (ketones are a by product of the breakdown of muscle and fat that
- 3) happens when there's not enough available insulin)
- 4) Frequent infections, such as gums or skin infections and vaginal infections
- 5) Frequent urination
- 6) Unexplained weight loss

7) Polyphagia (excessive hunger)

Risk factors of Diabetes mellitus:

The several risk factors have been associated with the development of diabetes. The risk factors differ depending on the type of diabetes you ultimately develop.

Risk factors for Type 1 diabetes-

Physical stress (such as surgery or illness).

Injury to the pancreas (such as by infection, tumor, surgery or accident).

Presence of autoantibodies (antibodies that mistakenly attack your own body's tissues or organs).

Risk factors for Type 2 diabetes.

High blood pressure.

Family history (parent or sibling) of type 2 diabetes.

Overweight. Heart disease or stroke.

Smoking Low HDL cholesterol (the "good" cholesterol) and high triglyceride level.

Risk factors for gestational diabetes-

The overweight before the pregnancy.

Family history (parent or sibling) of type 2 diabetes.

Age above the 25 years.

Etiology of Diabetes Mellitus:

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 is arise. It includes –

1. It is currently believed that the juvenile-onset (insulin dependent) form has an auto immune etiology.

2. Viruses may also play a role in the etiology of diabetes like coxsackieB.

3. Mumps and rubella viruses all have been shown to produce morphologic changes in the islet-cell structure.

4. 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 [45]

Diagnosis of Diabetes Mellitus-

Diagnosis

Diabetes mellitus is characterized by recurrent or persistent hyperglycemia, and is diagnosed by demonstrating any one of the following:

• Fasting plasma glucose level ≥ 7.0 mmol/l (126 mg/dL).

• Plasma glucose ≥ 11.1 mmol/l (200 mg/dL) two hours after a 75 g oral glucose load as in a glucose tolerance test.

Hyperglycemia and casual plasma glucose (200 mg/dL).

Glycatedhemoglobin (HbA1C) $\geq 85\%$.

Prevention :

Proper eating and regular exercise can postpone or prevent the onset of type 2 diabetes. Intensive lifestyle changes could cut the risk in half or more.

Management

Management of type 2 diabetes focuses on lifestyle interventions. lowering other cardiovascular risk factors, and maintaining blood glucose levels in the normal range. Self-monitoring of blood glucose for people with newly diagnosed type 2 diabetes is recommended by national health services

Lifestyle

Aerobic exercise is beneficial in diabetes with a greater amount of exercise yielding better results. It leads to a decrease in HbA1C improved insulin resistance, and a better VO: max. Resistance training is also useful, and the combination of both types of exercise may be most effective. A diabetic diet that promotes weight loss is important. The best diet type is a low glycemic index diet has been found to improve blood sugar control. Culturally appropriate education may help people with type 2 diabetes control their blood sugar levels, for up to six months at least

Medications

The two major categories of Oral Hypoglycemic Drugs are Insulin Secretagogues and Insulin Sensitizers that enhance insulin action.

Insulin secretory processes

It increases insulin release from the pancreas, which reduces hepatic glucose synthesis and improves the absorption of glucose by muscle. Secretagogues fall into one of two categories: sulfonylurea secretagogues or non-sulfonylurea secretagogues.

Sensitivity to insulin

The processes by which substances that improve insulin activity operate are varied. They could reduce the absorption of glucose, stop

hepatic gluconeogenesis and glycogenolysis, or boost the uptake of glucose by muscle and fat. Iguanid's (metformin), thiazolidinediones, and alpha-glucosidase inhibitors are the three groups into which these drugs fall [14, 15].

Treatment of Diabetes Mellitus

The treatment for Diabetes mellitus to give high doses of regular insulin to patient.

The goal of diabetes management is to keep blood glucose levels as close to normal as safely possible. People with diabetes must take responsibility for their day to day care.

The diabetes patient monitoring blood glucose levels, dietary management, maintaining physical activity, keeping weight and stress under control, oral medications and, if required, insulin use via injections.

To help patients achieve this. UCSF's Diabetes Teaching Center offers self-management educational programs that emphasize individualized diabetes care.

The program enables patients to make more consistent and appropriate adjustments in their therapy and lifestyle. The aims of management of diabetes mellitus can provide the patient with knowledge, motivation and Means to undertake this own enlightened care.

Dietary Management and Physical Activity-

The Diabetes patient's changes the eating habits and increasing physical activity are typically the first steps toward reducing blood sugar levels.

To provide patients with Information on food nutrient content, healthy cooking and exercise and Food intake should be divided into regularly spaced meals of similar size. The diabetic patient balanced in regard to protein, carbohydrate and

fats, in all cases it is necessary to restrict carbohydrate intake.

Insulin Therapy

The type 1 diabetes requires multiple insulin injections each day to maintain safe insulin levels. Insulin is often required to treat type 2 diabetes patients. These are insulin syringes, implantable pumps, pen devices, inhaled insulin, insulin pumps, and other routes of insulin delivery. The pump is about the size of a pager and is usually worn on your belt, Insulin is delivered through a small tube (catheter) that is placed under the skin (usually in the abdomen).

There are four major types of insulin:

- Rapid-acting
- Short-acting
- Intermediate acting
- Long-acting

There is no standard insulin dose as it depends on factors such as your body weight, when you eat, how often you exercise and how much insulin your body produces.

Oral Medications

Sulphonylureas such as glibenclamide glipizide and biguanides such as metformin, phenformin are oral hypoglycemic drugs. Newer approaches have constantly been explored and have lately yielded thiazolidinediones, meglitimide analogues, α -glucosidase inhibitors, and the latest are dipeptidyl peptidase-4 (DPP 4) inhibitors. These include Improve the effectiveness of the body's natural insulin, reduce blood sugar production, increase insulin production and inhibit blood sugar absorption. Oral Hypoglycaemic diabetes medications are sometimes taken in combination with insulin.

2: Diabetes criteria

Condition	Glucose after 2 h mmol/l (mg/dL)	Fasting glucose mmol/l (mg/dL)
Normal	<7.8	<8.1
Impaired fasting glycaemia	<7.8	≥ 8.1 (≥ 110)
Impaired glucose tolerance	≥ 7.8	<7.0
Diabetes	≥ 11.1	≥ 7.0

Table 3: Medications for type 2 diabetes

Drug	Comments
Secretagogues: Sulfonylureas- 1st generation e. g Tolbutamide Tolazamide Chlorpropamide	• largely replaced by 2 nd generation sulfonylureas. Because they are clear these medications should be avoided in patients with abnormal liver function

<p>Secretagogues: Sulfonylureas- 2nd generation e. g. Glyburide Glipizide Glimepiride</p>	<ul style="list-style-type: none"> • Consider using in patients starting oral therapy who have normal function and in patients already on an insulin sensitizer who need additional lowering. • Avoid using in patients with impaired renal function (creatinine > 3.0 mg/dl) or who are elderly. There is a risk of hypoglycemia for those who skip meals.
<p>Secretagogues: Nonsulfonylurea e. g. Repaglinide Nateglinide</p>	<ul style="list-style-type: none"> • Consider using in patients with modest postprandial hyperglycemia and in patients who have the irregular timing of meals. These agents can be used in patients with renal impairment.
<p>Biguanides: e. g. Metformin</p>	<p>Good first-line agent for overweight or obese patients. Consider using in patients on a secretagogue who need additional glucose lowering.</p> <p>Avoid in patients with renal or hepatic impairment or class III or IV heart failure.</p>
<p>Alpha-glucosidase inhibitors: e. g. Acarbose Miglitol</p>	<p>Consider using in patients who have primarily postprandial hyperglycemia.</p> <p>Avoid in patients with gastrointestinal disease or hepatic or renal insufficiency.</p> <p>May be used in combination with sensitizers or sulfonylurea secretagogues or non sulfonylurea secretagogues.</p>
<p>Thiazolidinediones: e. g. Rosiglitazone Pioglitazone</p>	<p>These agents are used as monotherapy in patients on a secretagogue or metformin.</p> <p>Avoid in patients with abnormal hepatic function or class III or IV heart failure.</p> <ul style="list-style-type: none"> • They may cause weight gain and/or peripheral edema.
<p>Dipeptidyl peptidase inhibitors e. g. Sitagliptin</p>	<p>IV This drug is used as monotherapy or in conjunction with Metformin or thiazolidinediones in patients with type 2 diabetes for whom diet and exercise or their current treatment is insufficient as treatment.</p>

II. CONCLUSION

Diabetes is a metabolic disorder that can be prevented through lifestyle modification, diet control, and control of overweight and obesity. Education of the populace is still key to the control of this emerging epidemic. Novel drugs are being developed, yet no cure is available in sight for the disease, despite new insight into the pathophysiology of the disease.

CONFLICT OF INTERESTS

Declare none

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