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A Review on Management of Diabetes

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Abstract: *Diabetes is a prevalent systemic disease affecting a significant proportion of the population worldwide. The effects of diabetes are devastating and well documented. There is increasing evidence that in certain pathologic states, especially chronic diseases, the increased production and/or ineffective scavenging of reactive oxygen species (ROS) may play a critical role. High reactivity of ROS determines chemical changes in virtually all cellular components, leading to lipid peroxidation. Production of ROS and disturbed capacity of antioxidant defense in diabetic subjects have been reported. It has been suggested that enhanced production of free radicals and oxidative stress is a central event to the development of diabetic complications. This suggestion has been supported by demonstration of increased levels of indicators of oxidative stress in diabetic individuals suffering from complications. Therefore, it seems reasonable that antioxidants can play an important role in the improvement of diabetes. There are many reports on the effects of antioxidants on the management of diabetes. In this paper, after completing bibliography and criticizing all relevant articles, the relationships between diabetes and oxidative stress and use of antioxidants in the management of diabetes and its complications have been well reviewed. This review well indicates that oxidative stress is involved in the pathogenesis of diabetes and its complications. Use of antioxidants reduces oxidative stress and alleviates diabetic complications.*

Keywords: Diabetes, Oxidative stress, Antioxidants, Glycaemia, Obesity, Hyperglycemia

I. INTRODUCTION

Diabetes Mellitus, or simply diabetes, is a group of metabolic diseases in which a person has high blood sugar, either because the pancreas does not produce enough insulin, or because cells do not produce enough insulin, or because cells do not respond to the insulin that is produced. This high blood sugar produces the classical symptoms of polyurea (frequent urination), polydipsia (increased thirst), and polyphagia (increased hunger).[2] Diabetes mellitus is not a single disorder; it represents a series of metabolic conditions associated with hyperglycemia and caused by defects insulin secretion and/or insulin action. Exposure to chronic hyperglycemia may result in microvascular complications in the retina, kidney, or peripherals.[3]

There are three main types of diabetes mellitus (DM).

• Type 1 DM results from the body's failure to produce insulin and presently requires the person to inject insulin or wear an insulin pump. This form was previously referred to as "insulin-dependent diabetes mellitus" (IDDM) or "juvenile diabetes."

• Type 2 DM results from insulin resistance, a condition in which cells fail to use insulin properly, sometimes combined with an absolute insulin deficiency. This form was previously referred to as non-insulin-dependent diabetes mellitus (NIDDM) or "adult-onset diabetes".

• The third main form, gestational diabetes occurs when pregnant women without a previous diagnosis of diabetes develop a high blood glucose level.

Diabetes mellitus (DM) is a set of related diseases in which the body cannot regulate the amount of sugar (specifically, glucose) in the blood.

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The blood delivers glucose to provide the body with energy to perform all a person's daily activities. The liver converts the food a person eats into glucose. The glucose is then released into the bloodstream. In a healthy person, the blood glucose level is regulated by several hormones, primarily insulin.[4-5]

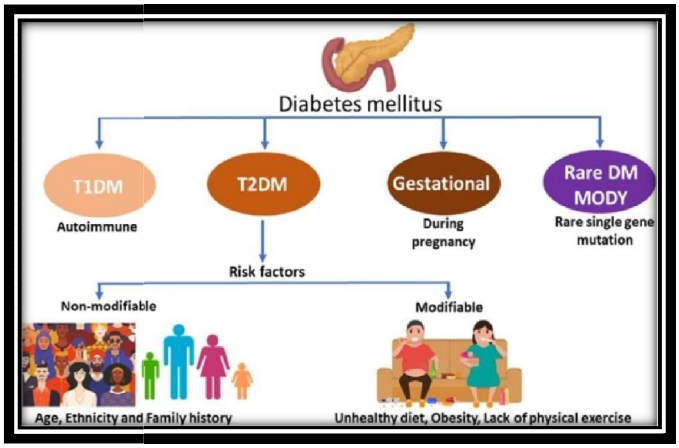

FIG NO 1. TYPES OF DIABETES

ETIOLOGY OF DIABETES

Genetic factors – Family history increases risk.
Autoimmune destruction of β-cells (in Type 1) – Body attacks pancreas.
Insulin resistance (in Type 2) – Body cells do not respond to insulin.
Pancreas are not making enough insulin.
Obesity and lack of exercise – Major causes of Type 2.
Unhealthy diet – High sugar, junk food, excess calories.
Age – Risk increases with age.
Hormonal disorders – e.g., Cushing syndrome.
Infections – Some viral infections may trigger Type 1 diabetes.
Drugs – Steroids, thiazide diuretics, antipsychotics can increase blood sugar.[5-6]

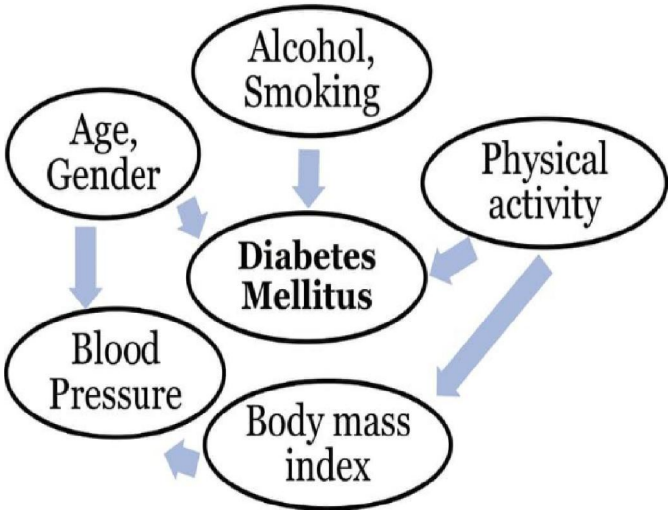

FIG NO 2. RISK FACTORS

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PATHOPHYSIOLOGY OF DIABETES

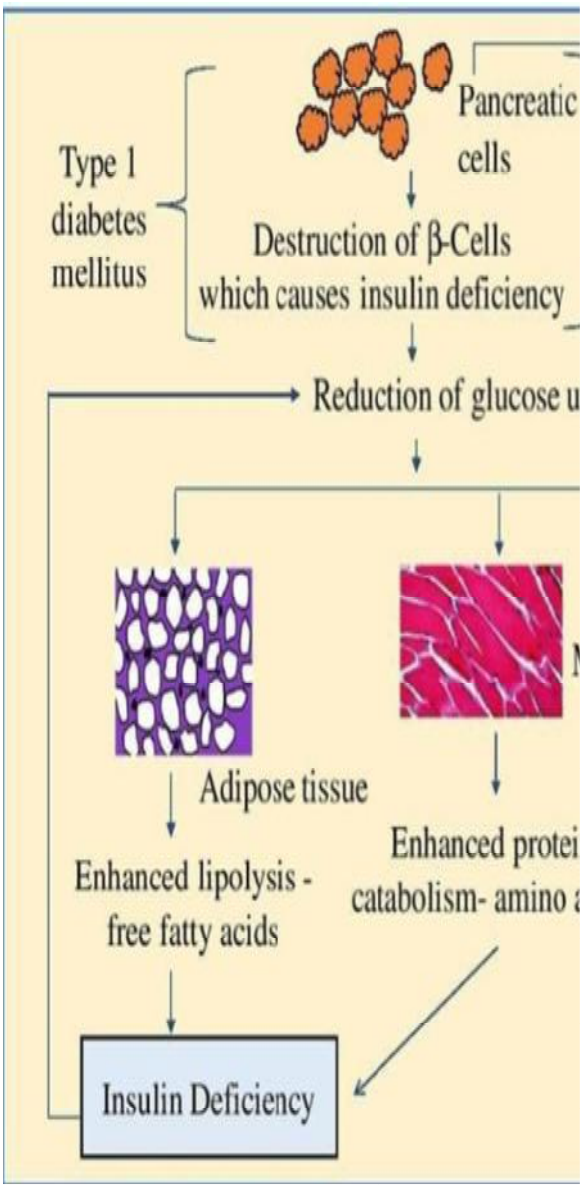

FIG NO 3. PATHOPHYSIOLOGY OF DIABETES

CLINICAL MENIFESTION

Common symptoms include:

1. Classic Symptoms

Polyuria (frequent urination)
Polydipsia (excessive thirst)
Polyphagia (increased hunger)
Unexplained weight loss

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2. General Symptoms
Fatigue
Blurred vision
Slow wound healing
Recurrent infections (skin, urinary tract, oral infections)

3. Acute Complications
Diabetic ketoacidosis (DKA) – common in Type 1
Hyperosmolar hyperglycemic state (HHS) – common in Type 2

4. Chronic Complications
Microvascular: Neuropathy, nephropathy, retinopathy
Macrovascular: Coronary artery disease, stroke, peripheral vascular disease

5. Severe Symptoms
Nausea, vomiting
Abdominal pain
Ketoacidosis (fruity breath smell) – mainly in Type 1
Recurrent dehydration

FIG NO 4. SYMPTOMS

DIAGNOSTIC TEST

Oral Glucose Tolerance Test (OGTT)

• Person to be tested should be on a normal diet (with at least 200 g of carbohydrate/day) for at least 3 days before the test.
• The test should be done after an overnight fast of 8-10 hours and comprises of two blood samples: fasting and 2 hours after glucose load.[6-7]

Testing for Type 2 Diabetes in Children and Adolescents

Children and adolescents aged 18 years and below should be screened for diabetes if they are overweight (weight>120% of ideal body weight) and have any of the following risk factors:
• Family history of type 2 diabetes in first degree relatives
• Signs of insulin resistance (Acanthosis nigricans)
• Hypertension

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• Dyslipidemia
• Polycystic Ovary Syndrome (PCOS)[8-9]

HBA1c test

- The most accurate and reliable approach for detecting diabetes mellitus is the Glycosylated Hemoglobin (HbA1C) method. >126 mg/dl is the fasting blood glucose level. Blood sugar levels post meal are above 200 mg/.
- The average HbA1C value is 6.5 g%. Diabetes mellitus is identified when the HbA1C value is greater than 6.5g%.
- If it is less than 4 g%, the person does not have any type of diabetes.
- If it is between 5.5 and 5.5 g%, the person is prediabetic, which means that although they do not now have diabetes, they may do so in the future.[10-11]

DIABETES MANAGEMENT

• Non-Pharmacological Treatment:

The primary non-pharmacological approaches are:

- Medical Nutrition Therapy (MNT) / Diet Modification: This involves managing blood glucose levels by regulating the quality and quantity of nutritional intake. A registered dietitian can provide an individualized plan, which may include a low-calorie or low-carbohydrate diet, increased fiber intake, and the use of low glycemic index foods.
- Physical Activity / Exercise: Regular exercise helps manage blood glucose levels, improves insulin sensitivity, and can aid in weight management.
- Weight Management: Achieving and maintaining a healthy weight is crucial, as obesity is a major risk factor for type 2 diabetes. Weight loss can delay or prevent the progression of prediabetes to full-blown disease.[12]
- Diabetes Self-Management Education and Support (DSMES): This involves educating patients about their condition and providing the skills and support needed for effective self-care.
- Psychosocial Care: Managing the mental and emotional aspects of living with chronic conditions like diabetes is an important part of non-pharmacological treatment.
- Smoking Cessation: For individuals who smoke, quitting is a critical non-pharmacological intervention that improves overall health and diabetes management.[13]

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• **Pharmacological Treatment:**

Sr.No.	Drug (Brand Name)	Classification
1	Miglitol (Glyset), Acarbose (Precose)	Alpha-Glucosidase inhibitory activity
2	Repaglinide (Prandin), Nateglinide (Starlix)	Meglitinides
3	Pioglitazone (Actos), Rosiglitazone (Avandia)	Thiazolidinediones
4	Alogliptin (Nesina), Sitagliptin (Januvia), Linagliptin (Tradjenta), Saxagliptin (Onglyza)	DPP-4 Inhibitors
5	Glipizide (Glucotrol), Glyburide (Diabeta, Glynase), Chlorpropamide (Diabinese), Glimepiride (Amaryl), Tolazamide, Tolbutamide	Sulfonylureas
6	Metformin (Fortamet, Glucophage, Glucophage XR, Glumetza, Riomet)	Biguanides
7	Dapagliflozin (Farxiga), Canagliflozin (Invokana), Empagliflozin (Jardiance)	SGLT2 Inhibitors

COMPLICATIONS

As the disease progresses, tissue or vascular damage ensues leading to severe diabetic complications such as retinopathy, neuropathy, nephropathy, cardiovascular complications and ulceration. Long standing type 1 DM patients are susceptible to microvascular complications; and macrovascular disease (coronary artery, heart and peripheral vascular diseases). Type 2 DM carries a high risk of large vessel atherosclerosis commonly associated with hypertension, hyperlipidemia, and obesity. Most patients with type 2 diabetes die from cardiovascular complications and end stage renal disease.[14]

Result:

This review highlights that effective management of diabetes requires an integrated approach including early diagnosis, lifestyle modification, regular monitoring of blood glucose levels, and appropriate pharmacological therapy. Proper diet

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control, physical activity, patient education, and adherence to treatment significantly improve glycemic control and reduce the risk of acute and chronic complications.[15]

II. CONCLUSION

This review included 23 studies investigating the impact of diabetes on ability-to-work outcomes. Methods used in the included studies varied widely and so limited comparability. Studies were conducted in many countries using different study designs and involving different settings (general population or specific population of workers) and age groups. Moreover, assessment of diabetes varied greatly across studies, not to mention different mixes of diabetes or diabetes subpopulations that were included (type 1 and type 2 diabetes, type 2 diabetes, diabetes with obesity, diabetes with morbid obesity, painful diabetic peripheral neuropathy, diabetes with depression, diabetes in men, and diabetes in women).

In addition, outcomes definitions, productivity measures, recall periods, statistical analyses, and the variables used for adjustment differed considerably across those studies that assessed the same outcomes. Since the results of the review are somewhat influenced by the high risk of bias in the included studies, we have based our discussion on only the 11 studies with high methodological quality scores.[16]

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