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DIABETES WITH METABOLIC SYNDROME: AN OVERVIEW

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ABSTRACT

Diabetes mellitus (DM) is a disease that disturb of glucose levels in blood. It divided into two types Type 1 Diabetes mellitus and 2 Diabetes mellitus, each with different pathophysiology, presentation, and management, but both have a potential for hyperglycemia. Metabolic syndrome is a constellation of interconnected physiological, biochemical, clinical, and metabolic factors that directly increases the risk of cardiovascular disease, type 2 diabetes mellitus, and all-cause mortality. In this article we are discuss about diabetes with metabolic syndrome and its epidemiology, underlying pathogenesis, and treatment approaches of each of the risk factors comprising.

KEYWORDS: Diabetes mellitus, Metabolic syndrome, Diagnosis, Epidemiology, etc.

INTRODUCTION

Diabetes mellitus is a chronic and progressive metabolic disorder characterized by chronic hyperglycemia due to defects of the metabolism of carbohydrate, fat and protein in our body. High level of glucose in blood is associated with long-term damage, dysfunction, and failure of various organs, especially the eyes, kidneys, nerves, heart, and blood vessels.[1] DM has several categories, including type 1, type 2, maturity-onset diabetes of the young, gestational diabetes, neonatal diabetes, and secondary causes due to endocrinopathies, steroid use, etc. The main subtypes of DM are Type 1 diabetes mellitus and Type 2 diabetes mellitus, which classically result from defective insulin secretion and/or action. T1DM presents in children or adolescents, while T2DM is thought to affect middle-aged and older adults who have prolonged hyperglycemia due to poor lifestyle and dietary choices. The pathogenesis for T1DM and T2DM is drastically different, and therefore each type has various etiologies, presentations, and treatments.[2,3]

Metabolic syndrome

Metabolic syndrome is a cluster of conditions that occur together, increasing your risk of heart disease, stroke and type 2 diabetes. These conditions include increased blood pressure, high blood sugar, excess body fat around the waist, and abnormal cholesterol or triglyceride levels.

Who typically has metabolic syndrome?

1. People with central obesity (Increased fat in the abdomen/waist).
2. People with diabetes mellitus or a strong family history of diabetes mellitus.
3. People with other clinical features of "insulin resistance" including skin changes of acanthosis nigricans ("Darkened skin" on the back of the neck or underarms) or skin tags (Usually on the neck).
4. Certain ethnic backgrounds are at a higher risk of developing metabolic syndrome.

Causes

The exact cause of metabolic syndrome is not known. Many features of the metabolic syndrome are associated with "insulin resistance." Insulin resistance means that the body does not use insulin efficiently to lower glucose and triglyceride levels. A combination of genetic and lifestyle factors may result in insulin resistance. Lifestyle factors include dietary habits, activity and perhaps interrupted sleep patterns (Such as sleep apnea).

Symptoms

Usually, there are no immediate physical symptoms. Medical problems associated with the metabolic syndrome develop over time. If you are unsure if you have metabolic syndrome, see your healthcare provider. He or she will be able to make the diagnosis by obtaining the necessary tests, including blood pressure, lipid profile (Triglycerides and HDL) and blood glucose.

Treatment of metabolic syndrome

The main goals of treating metabolic syndrome are to lower your risk of heart disease and to prevent type 2 diabetes if it hasn't already developed. If you already have type 2 diabetes, treatment can lower your risk of heart disease by controlling all your risk factors.

Heart-healthy lifestyle changes are the first line of treatment for metabolic syndrome. You may have to see a dietitian and a physical therapist to help find a diet and exercise plan that works for you. If healthy lifestyle

changes do not work, you may need medicines or weight loss surgery.

You may also need treatment for other health conditions that caused your metabolic syndrome or can make it worse.

Etiology

In the islets of Langerhans in the pancreas, there are two main subclasses of endocrine cells: insulin-producing beta cells and glucagon secreting alpha cells. Beta and alpha cells are continually changing their levels of hormone secretions based on the glucose environment. Without the balance between insulin and glucagon, the glucose levels become inappropriately skewed. In the case of DM, insulin is either absent and/or has impaired action (insulin resistance), and thus leads to hyperglycemia.[2]

T1DM is characterized by the destruction of beta cells in the pancreas, typically secondary to an autoimmune process. The result is the absolute destruction of beta cells, and consequentially, insulin is absent or extremely low.

T2DM involves a more insidious onset where an imbalance between insulin levels and insulin sensitivity causes a functional deficit of insulin. Insulin resistance is multifactorial but commonly develops from obesity and aging.

Causes

Despite the volume of research that has been invested in diabetes research over past decades, the pathogenesis of type 1 diabetes is not fully understood but is thought to stem from multiple factors involving genetic abnormalities and/or environmental factors, leading to either a loss of insulin secretion or a decrease in insulin action. The pathophysiology of type 2 diabetes is simply characterized by insulin resistance, impairment of hepatic glucose production regulation and reduced β cells function subsequently leading failure of β cells. The primary outcome thus is believed to be an initial reduction in insulin secretion secondary to genetic abnormalities and other risk factors involved in most type 2 diabetes patients. These result in beta-cells responding less effectively to hyperglycemia or to a decrease in the insulin biological response at the target tissues. The decreased insulin biological response (insulin resistance) occurs because insulin is unable to bind to its receptor due to defects in the insulin receptor binding sites or disturbances in the insulin signal transduction pathway. Overcoming insulin resistance requires the pancreatic β cells to increase the amount of insulin secreted, a state called hyperinsulinemia. Because accelerated endogenous glucose output occurs simultaneously with hyperinsulinemia, at least in early and mid-disease stages, insulin resistance in hepatic cells becomes the major driver of hyperglycemia in type 2 diabetes. The release of pro-inflammatory adipose tissue-derived cytokines and elevated level of free fatty acids have also been shown to play a role in the development of insulin resistance in the liver and skeletal muscle and fat cells.[4,5]

Epidemiology

Rising combinations of the aforementioned risk factors have contributed to the global epidemiology of both type 1 and type 2 diabetes. Type 2 diabetes is now one of the most common diseases in the world. The number of people with type 2 diabetes is increasing in every nation. The global prevalence of diabetes among adults is currently estimated to be about 382million; with 175million undiagnosed and the greatest incident is between 40 and 59years of age. By 2035, this number is expected to increase to over 592million. In 2014, it is estimated that diabetes affects 422million (8.5%) of the population in the world. These numbers are far greater than previous estimates. Diabetes is considered one of the major problems and greatest challenges facing the health systems. The incidence of diabetes in the world is increasing, particularly among children. In a WHO report, it was estimated that the global diabetes occurrence would increase to about 4.4%, affecting more than 366,212million in 2030 with a change of around 114% since 2000. It is estimated that 23% of Saudis are in diabetes or pre-diabetes phase.[6-12]

Some common Sign and Symptoms

In diabetes mellitus, cells fails to metabolized glucose in the normal manner, effectively become starved. The long term effect of diabetes mellitus which includes progressive development of the specific complications of retinopathy with potential blindness, nephropathy that may lead to renal failure, and neuropathy with risk of foot ulcer, Charcot joint and features of autonomic dysfunctions and sexual dysfunction People with diabetes are at increases risk of diseases. See table. Other, various symptoms are observed due to-

i. Gluconeogenesis from amino acids and body protein, causing muscle wasting, tissue breakdown and further increases the blood glucose level.
ii. Catabolism of body fat, releasing some of its energy and excess production of ketone bodies.[13-15]

Diagnosis of diabetes mellitus

The diagnosis of diabetes in an asymptomatic subject should never be made on the basis of a single abnormal blood glucose value. If a diagnosis of diabetes is made, the clinician must feel confident that the diagnosis is fully established since the consequences for the individual are considerable and lifelong. The diagnosis of diabetes mellitus include, urine sugar, blood sugar, glucose tolerance test, renal threshold of glucose, diminished glucose tolerance, increased glucose tolerance, renal glycosuria, extended glucose tolerance curve, cortisone stressed glucose tolerance

test, intravenous glucose tolerance test, oral glucose tolerance test.[16]

Treatment of diabetes mellitus

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 too 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 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.[17] Stem cell educator therapy, a novel technology, is designed to control or reverse immune dysfunctions.[18] 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.

2. 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.[19] Antioxidant which play an important role in lowering the risk of developing diabetes and its complications.

3. 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 chemokine's, the number and activation state of different leukocyte populations, increased apoptosis and tissue fibrosis, Immunomodulatory drugs are provided.[20-23]

B. Dietary management

Adequate caloric value Dietary management should be taken properly by the both diabetic and non-diabetic patient 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.

C. Newer insulin delivery devices

A number of innovations have been 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.

D. Oral hypoglycaemic or antidiabetic agents

Clinically useful biguanide, phenformin was produced parallel to sulfonylureas in 1957. Newer approaches have constantly been explored and have lately yielded thiazolidinedione's, meglitinide analogues, α-glycosidase inhibitors, and the latest are dipeptidyl peptidase-4(DPP-4) inhibitors.

Important features of oral hypoglycaemic agents

Diabetes mellitus can be considered a disease of the modern world with a great impact of morbidity, morality and the quality of type of the affected individual. Diabetes mellitus is a frequent complication of Cushing syndrome which is caused by chronic exposure to Glucocorticoids by several clinical symptoms such as central obesity, proximal muscles weakness, hirsutism and neurophysiological disturbance, macro-vascular complication autonomic neuropathy, digestive problems, dental problems etc.

CONCLUSION

Diabetes mellitus is a serious complication in today life. The lifestyle and day today circumstances are play major role in occurring this type of serious complications. In this review we get some idea regarding diabetes mellitus.

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