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A Brief Look at Diabetes Mellitus

Medical Science

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ABSTRACT

Overview: *Diabetes Mellitus, commonly known as diabetes, is a group of metabolic diseases characterised by hyperglycemia due to defects in insulin action, insulin secretion or both. The main types of diabetes are Type 1 DM which is due to insulin deficiency resulting from pancreatic failure and Type 2 DM which begins with insulin resistance and may progress to insulin deficiency. 90% of the cases are that of Type 2 DM1. Another type of diabetes is gestational diabetes which occurs in pregnancy in a female who previously did not have diabetes. Other rarer forms of diabetes have also been described. As of 2015 it is estimated that 415 million people have diabetes worldwide which is about 8.3% of the world's adult population2. It doubles a person's risk of early death. Diabetes is estimated to cause 1.5 to 5 million deaths yearly3. Coronary artery disease is the main cause of death in Diabetes accounting for 75% of all deaths4. The prevention and treatment of diabetes usually involves lifestyle modifications to decrease weight, consume a healthier diet, exercise and tobacco cessation. Type 1 DM is treated with insulin therapy and Type 2 DM is managed with oral medication with or without the addition of insulin.*

INTRODUCTION

The main cause of morbidity and mortality in Diabetes are due to its complications. These usually occur 10-20 years after the diagnosis or can be the presenting complaint in an individual who has not been diagnosed. These complications are due to the damage done to the blood vessels. Macrovascular (large vessel disease) complications are coronary artery disease, stroke, peripheral artery disease and gangrene leading to limb loss. Microvascular (small vessel disease) complications include retinopathy, glaucoma and diabetic nephropathy. Other potentially lethal complications of diabetes are diabetic ketoacidosis (see more in individuals with Type 1 DM) and hyperosmolar hyperglycemic state (seen more in individuals with Type 2 DM).

TYPE 1 DIABETES MELLITUS

Type 1 Diabetes Mellitus (previously known as juvenile onset diabetes or insulin-dependent diabetes) is a chronic state of hyperglycemia resulting from the autoimmune destruction of the insulin producing beta cells in the pancreas. About 80,000 children develop this disease every year5. The exact cause is not fully understood but some of the theories put forward are that of genetic susceptibility, environmental factors, virus exposure and chemical/drug exposure. Whatever the trigger or cause may be the pathophysiology of Type 1 DM involves the destruction of the beta cells of the pancreas. The classical signs and symptoms include polyuria, polydipsia and polyphagia, fatigue, weight loss and dry mouth. It is diagnosed by having one of the following: Two fasting glucose levels >125mg/dl, one random glucose level >200mg/dl with symptoms of diabetes as stated above, an abnormal 2 hour glucose tolerance test (>200mg/dl) with 75g glucose load or a haemoglobin A1c >6.5%. Autoantibodies can be present as well. Insulin therapy is the mainstay in the treatment of Type 1 DM. These patients will not respond to weight loss and dietary modifications alone. Insulin is administered either subcutaneously or via an insulin pump. One of the regimens that can be followed is a long acting insulin, such as glargine, being administered once a day in combination with a rapid acting insulin (lispro, aspart) being given before mealtimes. Patients should be started on a low carbohydrate diet and thought how to monitor their blood glucose levels at home. Since many of the individuals are usually in the paediatric age group, their parents should be counselled in detail about the disease, its progression and potential complications. They should attend diabetes classes with their children to get a better understanding of the disease and eliminate other myths and misconceptions they may have. The main goal of treatment is to lower the blood glucose to a normal range (80-140 mg/dl), thereby preventing its long term complications. The best way to check for compliance with the treatment regimen is to measure the HbA1c level which is a measure of the blood glucose over the past 6-8 weeks. It should ideally be under 7.5%. Screening for complications of Type 1 DM should begin 5 years after the initial diagnosis. This includes blood pressure management (goal is <130/80 mmHg), lipid management (LDL goal is <100 or <70 in those individuals with coronary artery disease and diabetes), yearly dilated eye exam (to screen for retinopathy), urine microalbumin (to screen for diabetic nephropathy), yearly podiatry examination (to screen for neuropathy), erectile dysfunction (treated with sildenafil) and gastroparesis (treated with erythromycin or metoclopramide). Untreated or poorly treated diabetes can also lead to a potentially life threatening condition known as diabetic ketoacidosis which can cause cerebral edema and coma if not properly treated. There is no preventive measure for Type 1 diabetes mellitus.

TYPE 2 DIABETES MELLITUS

Type 2 diabetes mellitus (previously known as maturity onset diabetes or non-insulin dependent diabetes mellitus) is a chronic state of hyperglycemia due to insulin resistance and sometimes a relative insulin deficiency as well. It is primarily due to obesity and leading a sedentary lifestyle without exercise. As of 2013 there are approximately 368 million individuals diagnosed with this disease worldwide6. It is usually diagnosed in middle or older aged individuals, however with the rising obesity rates amongst children it is now being diagnosed as often as Type 1 DM in teenagers. It is caused due to a number of lifestyle factors such as obesity, poor diet, stress and lack of physical activity. There is a genetic association to developing Type 2 DM as well. The pathophysiology includes insulin resistance in the setting of insufficient insulin production by the beta cells of the pancreas. The diagnosis is made in the same way as was for diagnosing Type 1 DM. To differentiate the two diseases C-peptide testing can be useful in Type 2 DM and antibody testing in Type 1 DM. The management focuses on lifestyle modifications with or without the addition of oral medications to keep the blood glucose in a normal range and prevent the development of other complications. Lifestyle modifications include exercise and a proper diet. In milder cases these may be enough to control the glucose level. If improvement in glycemic control is not seen in 6 weeks then medications should be considered. There are several classes of anti-diabetic medications available presently. Biguanides (metformin) is the first line therapy in most patients. Patients with severely

impaired kidney function should avoid metformin as it can cause lactic acidosis. Other classes of anti-diabetic medications include sulfonylureas, thiazolidinediones, dipeptidyl peptidase-4 inhibitors, SGLT2 inhibitors and glucagon-like peptide-1 analog. Insulin can be added to the medication regimen or used alone. Bariatric surgery is an option to decrease weight in obese patients to help with better glycemic control. Screening for complications should begin immediately after diagnosis as it is not known for how long these individuals may have had the disease for. Hyperosmolar hyperglycemic state is a complication seen mostly in individuals with Type 2 DM characterised by hyperglycemia causing dehydration, hyperosmolarity and if not appropriately treated coma followed by death. Unlike Type 1 DM, Type 2 DM is potentially preventable with regular exercise and proper nutrition.

	Type 1 DM	Type 2 DM
Primary defect	Autoimmune destruction of beta cells of pancreas.	Insulin resistance with or without insulin deficiency.
Age (usually)	<30	>40
Obesity associated	No	Yes
Insulin sensitivity	High	Variable
Seruminsulin level	Decreased	Variable
Ketoacidosis	Common	Rare
Autoantibodies	Usually present	Absent
Prevalence	About 10%	About 90%

CONCLUSION

In 2014 the global economic cost related to Diabetes was estimated to be 612 billion dollars7. By 2035 the number of people living with diabetes is estimated to cross 592 million8. It is one of the biggest epidemics of the 21st century. Even though there is immense research on diabetes being done, people should be educated about the disease, its signs and symptoms and how with appropriate lifestyle modifications they may even be able to prevent Type 2 DM from developing. Those who already have the disease should be counselled on medication and lifestyle modification compliance, glycemic monitoring and appropriate follow up management for prevention of complications.

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