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Diabetes Mellitus



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ABSTRACT

Diabetes Mellitus is a very common disease. According to W.H.O. 415 million people are suffering from Diabetes Mellitus worldwide(1), which may go up to 435 million in 2030 (1,2,) and it may go up to 592 million by 2035.(3)In other word 8.3% adult population(4) with equal incidence in both women and men are suffering from this disease. India will become the Diabetic capital of the world as there may be 80% of all diabetics of the world.(1.2.). It is a chronic disease with long-term complications that may affect cardiovascular, renal, neural systems and also organs and tissues– skin, liver etc. Thus Diabetes Mellitus is a multisystem disorder that affects many organs of the body (5).



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INTRODUCTION

Diabetes Mellitus is a complex metabolic syndrome characterized by a disturbance of carbohydrate, protein and fat metabolism. The main defect is insulin deficiency which may be due to insulin deficiency and /or defect in its action on the target tissue (5). The cause is genetic and other factors like obesity, diet, lifestyle etc are responsible.

Diabetes Mellitus is defined as a clinical syndrome characterized by hyperglycemia due to absolute or relative deficiency of insulin. Lack of insulin affects the metabolism of carbohydrate, fat and protein and significant disturbance of water and electrolyte homeostasis.⁵

Causes –It may be due to

1. Pancrease not producing enough insulin i.e. Pancreatic failure -cause unknown.
2. Body cells not responding properly to endogenous insulin -insulin resistance.

Classification of Diabetes Mellitus –There are three main types of Diabetes Mellitus -

1. Type1 Diabetes Mellitus due to pancreatic failure to produce enough insulin. Previously it was also known as IDDM, or Juvenile Diabetes.-Type 1A 95% case, when the autoimmune process is involved and Type 1B- 5% is idiopathic.⁶
2. Type 2 Diabetes Mellitus begins with insulin resistance of body cells. That is cells fails to respond to insulin properly.⁷. Later on, lack of insulin may develop.⁸ Previously it was also known as NIDDM or Adult onset Diabetes. The primary cause is excessive body weight and lack of physical work⁷.Type 2 Diabetes Mellitus is about 90% of the disease.
3. Other types are also present but very rare –Maturity-onset diabetes of the young, Gestational diabetes, Diabetes due to mutation of insulin, insulin receptors, diabetes secondary to other causes –endocrine tumors secreting GH, Glucagon, catecholamines, glucocorticoids, drugs – corticosteroids, thiazide diuretics, beta blockers etc.

Ancient Greek διαβήτης(diabētēs) a passer through;a siphon Latin –diabētēs English Diabetes. The word diabetes' is first recorded in English in the form 'diabetes' in a medical text written around 1425.

Classical Latin word mellitus, meaning ‘mellite’ honey sweet.

Although Diabetes Mellitus was well known since antiquity and many types of local treatment were present in different regions even now its exact cause and best treatment are under investigation.

It was one of the first disease described by Egyptian in Egyptian manuscript about 1500 BCE- “Too great emptying of the urine’. It is also explained in books of ancient India, Egypt, Greece, Rome, China etc. It was well recognized that it was associated with increased thirst and increase urination now this is known as polydipsia and polyuria respectively.

Charaka and Sushruta well known ayurvedic physicians of ancient India were aware that in this disease patients pass urine frequently in a large amount and taste of urine is sweet—“rain of honey”. They named it Madhumeha. In Hindi Madhu means sweet, and meha is rain.⁷ In Charak Samhita (600 BC) Madhumeha is described in detail. Type 1 and type2 diabetes were described by them as a separate disease for the first time by them, recognizing that type 1 is associated with youth and type 2 with being overweight.

It is described in different ancient books by different names. It is also mentioned in Chinese literature and they observed that ants were attracted to the urine of such patients, and they use to treat it with their herbs.

In Rome, it was described as melting down of the flesh and limbs into urine on the observation that such patients use to lose weight and become weak.

It was also known as ‘rich man’s disease, due to the fact that over nourished persons suffer from this disease.

In 230 BCE, the term diabetes or pass through was first used by the Greek Apollonius of Memphis.

The disease was considered rare, with Galen of Rome commenting that he had seen only two cases during his career. He called the disease “diarrhea urinosa”, ‘diarrhea of the urine’

In the 2nd century AD, a Greek physician Aretaeus of Cappadocia called this disease as Diabetes meaning ‘siphon’ or running through. He described the symptoms course of the disease and

discussed the differential diagnosis and hypothesized correlation of diabetes with other diseases in detail. His work remained unknown in the West until the middle of the 16th century when in 1522 the first latin edition was published in Venice.

In 752 AD Wang Jao a distinguished physician of China in his famous book 'Wai Tai Yao' described Diabetes. He wrote that in this disease urine is sweet, and urine should be tested to determine the progress of the disease and effectiveness of the treatment. He pointed that defect in functions of the pancreas is responsible for diabetes and recommended the use of pork pancreas for treatment of the disease.

In 1670 Thomas Willis rediscovered that urine of diabetic patient is sweet. Mellitus meaning honey or sugar was added to diabetes, and then it is known as Diabetes mellitus, clearly different from Diabetes insipidus in which there is increased urination but urine is not sweet.⁴ Insipidus means "without taste" in Latin. Diabetes insipidus is a rare disease and due to lack of Antidiuretic hormone (A.D.H.). It does not involve the same disease mechanism as Diabetic Mellitus.

In 1815, Chevreuil showed that blood sugar behaved chemically as grape sugar i.e. glucose or dextrose.⁹

In 1850, Claude Bernard for the first time noted that increased blood sugar-hyperglycemia is the main feature of Diabetes Mellitus. In his famous 'Piojure diabetes' experiments he demonstrated the definite link between Diabetes Mellitus and Central nervous system.

In 1869, Paul Langerhans described the Islet cells of pancreas; inter acinar cells in the pancreas.¹⁰

In 1888, Hermann Fehling described a perfect method for qualitative test of urine sugar.

In 1889, Von Mering and Minkowski showed by experiments in animals that removal of pancreas i.e. pancreatectomy cause diabetes.¹¹ This confirmed that pancreas is responsible for Diabetes Mellitus.

In 1894, Laguesse after observation for three years 1891 to 1894 he described islet cells of pancreas as glands secreting within the pancreas, he named it 'Islets of Langerhans' after name of Paul Langerhans.¹²

In 1901, Opie detected that in Diabetes Mellitus there are lesions in 'Islets of Langerhans'.

In 1908, Francis Benedict developed the test for sugar estimation in urine. This test is named after him "Benedicts test" is used even today.

In 1921, Frederick G. Banting a surgeon and his student Charles H Best successfully extracted insulin, from chilled extracts of dog pancreas. When chilled extracts of dog pancreas were injected into pancreatectomised diabetic there was fall in blood sugar concentration.¹³

In 1922, 1st January Leonard Thompson –a 14-year-old boy suffering from Diabetes Mellitus was treated with Insulin-which was extracted and purified by Collip.¹⁴

In 1923, Frederick G. Banting and John Macleod were awarded the Nobel prize of Medicine in 1923 for the discovery of insulin, in Toronto, Canada.

In 1940s long acting insulin NPH was developed.

In 1955, Franke and Fuchs introduced oral anti-diabetic drugs.

In 1955, Frederrick Sanger identified structure of Insulin, and discovered the amino acid sequence of insulin which helped in its synthesis.

In 1969, Dorothy Hodgkin discovered the three dimensional structure of insulin.

In 1970, Blood glucose meters-to know blood sugar quickly was discovered, and in the same year Insulin pumps to inject insulin were discovered.

In 1971, Pierre Freychet identified insulin receptors in cells.

In 1983, for the first time biosynthetic insulin was introduced.

In 1986, insulin pen delivery system was introduced to inject insulin with ease.

In 1989 “St. Vincent Declaration” was the result of international effort to improve quality of life & life expectancy of persons suffering from diabetes.

In many countries including our country National Diabetes programme is functioning.¹⁸

In 1993, knowing the grave situation of Diabetes Mellitus, Diabetic control and complications trial (DCCT) was published to aware the public against Diabetes Mellitus. In a study it is estimated that from 2012 to 2015, 1.5 to 5 million people died each year from this disease.¹. Diabetes at least doubles a person’s risk of death⁷. It is estimated that one person in the world dies from Diabetes Mellitus, every 10 seconds and new diabetic cases being identified every ten seconds². The global economic cost of diabetes was estimated to be 612 billion USD. As a mark of awareness programme we celebrate World Diabetic day on 14 November every year. World Diabetic day was created in the year 1991 by International Diabetes Federation (IDF) and World Health Organization in response to growing concerns about the rising health problem posed by Diabetes. World Diabetic day become an official United Nations Day in 2006, with the passage of United Nation Resolution 61/225. Blue circle logo was adopted in 2007 . Blue circle Blue circle signifies the unity of the global diabetes community in response to the diabetes epidemic.

In 1998, United Kingdom prospective Diabetes Study (UKPDS) also published its report on prevention of complication of Diabetes Mellitus.

Inhalable insulin was developed but due to its side effects, it was withdrawn¹⁵. But the investigation was going on and in June 2014, Inhalable insulin “Arezza” of pharmaceuticals company Mankind Corporation was approved by the FDA for general sale¹⁶. This inhaled insulin is more convenient and easy to use.¹⁷

Research is in progress to improve management of Diabetes Mellitus.

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