



<https://doi.org/10.47430/ujmr.2493.046>

Received: 23<sup>rd</sup> March, 2024

Accepted: 29<sup>th</sup> June, 2024



## “Diabetes Mellitus”, the Then and Now

Safiya Isma'il, M. Y. Iiyasu, A. F. Umar

Department of Biological Science, Abubakar Tafawa Balewa University, Bauchi State, Nigeria

\*Correspondence author: [safiyaismailningi@gmail.com](mailto:safiyaismailningi@gmail.com),

### Abstract

*Diabetes mellitus is a type of metabolic illness characterized by protein, lipid, and glucose metabolism difficulties. It is distinguished by chronic hyperglycemia, which defects in either insulin action or secretion can cause. Diabetes mellitus has been recognized since ancient times, and despite medical advances, it remains an incurable chronic illness. Our historical article presents major events in the evolution of diabetes mellitus from ancient times to the present day. Articles, as well as book chapters were used in citing. The key events in the development of diabetes mellitus from ancient times to the present were explored. An understanding of the key moments leading up to the identification of diabetes mellitus was provided in this study. Events from the Ebers Papyrus, the nineteenth and early twentieth centuries, and the discovery of diabetes are covered in this article. It can be deduced that scientists tried to discover the presence and existence of these illnesses. The discovery of insulin has played a significant role in the history of diabetes mellitus.*

**Keywords:** *diabetes mellitus, hyperglycemia, metabolic diseases, insulin.*

### INTRODUCTION

Diabetes mellitus (DM) is an ever-growing heterogenic disorder altering the metabolic abilities of the body, primarily characterized by persistently high glucose levels (hyperglycemia) resulting from defects in insulin secretion attenuating every bodily function (American Diabetes Association, 2010; W. H. O, 2019; Kaur *et al.*, 2022; Jagadeesan *et al.*, 2022). It is among the most common non-communicable diseases in emerging and developed nations (Butt *et al.*, 2022), and it has a number of effects on the genitourinary system (Rani Goyal *et al.*, 2021). According to Ahmad *et al.* (2020), Diabetes Mellitus (DM) has become a significant public health issue worldwide and has emerged as a significant socio-economic burden for developing nations.

Long-term harm, dysfunction, and failure of many organs, particularly the eyes, genitourinary system, nerves, heart, and blood vessels, are linked to the chronic hyperglycemia of diabetes (WHO, 2013).

Diabetes mellitus comes in two primary forms: type 1 (insulin-dependent) and type 2 (non-insulin-dependent). Type 1 diabetes arises from

the autoimmune breakdown of the pancreatic islets'  $\beta$ -cells, whereas type 2 diabetes is brought on by reduced insulin output and resistance to the hormone's effects. (American Diabetes Association, Acharya, 2015). Type 2 diabetes is brought on by a problem with how the body manages and utilizes sugar. Nevertheless, other forms of diabetes exist, which are Gestational Diabetes Mellitus (GDM) and other specific forms of diabetes, which include Genetic defects of the  $\beta$ -cell and genetic defects in insulin action.

The illness has a lengthy history that dates back to ancient times. However, the disease continued to be very confusing to doctors throughout that time due to a lack of diagnostic tools, insufficient anatomy and pathophysiology knowledge, and other factors.

### ANTIQUITY (EARLY PERIODS)

Around 230 BC, Apollonius of Memphis coined the term "diabetes," which means "to pass through" in Greek. He and his peers recommended bloodletting and dehydration as ineffective treatments since they thought diabetes was a renal disease. (PapaspYROs 1964). A condition known as "too great emptying of the urine" is mentioned among other illnesses

and their treatments in the Ebers Papyrus, written around 1500 BC, found in an Egyptian tomb in 1862 AD and translated by Egyptologist George Ebers in 1874. According to [Ahmed 2002](#), the 1550 BC Ebers papyrus, named for Egyptologist Geary Ebers, was discovered in a cemetery in the Thebes district of southern Egypt in 1862. The papyrus includes descriptions of a number of illnesses, including polyuric condition, which is most likely diabetes. This could be a reference to diabetes mellitus. To treat this illness, ancient Egyptian physicians advised using wheat grains, fruit, and sweet beer. ([Papaspyros 1964](#); [Poretsky, 2017](#)).

Indian doctors developed what is known as the first clinical test for diabetes. They observed that diabetics' urine attracted ants and flies. The condition was called "madhumeha" or "honey urine." Indian doctors also noticed that "madhumeha" patients experienced extreme thirst and poor breath (perhaps owing to ketosis). Ancient doctors could not distinguish between polyuria caused by what we now call diabetes mellitus and polyuria caused by other conditions, although the polyuria associated with diabetes was well understood at the time. [Papaspyros \(1964\)](#), following that, Sushruta and Charaka, two Indian doctors who lived in the fifth century AD, were the first to distinguish between the two types of diabetes mellitus by observing that thin people with the disease developed it at a younger age than heavier people with the disease, who developed it later and lived longer after diagnosis ([Lakhtakia, 2013](#)). Li Hsuan of China noted in the seventh century AD that people with diabetes were more likely to have lung infections and boils. He recommended that the patients abstain from wine and sex as a diabetic treatment.

Avicenna, or Ibn-Sina (980-1037 AD), a court-appointed medical expert to Baghdad's Caliphs, wrote a major medical work (the "Canon Avicennae") that provided a detailed explanation of diabetes. Avicenna described the clinical symptoms, such as sweet urine and increased hunger, as well as the adverse consequences, which included diabetic gangrene and sexual dysfunction. ([Medvei, 1993](#)).

### THE RENAISSANCE AND LATER

A portion of what is known about diabetes today comes from discoveries made in Europe in the sixteenth and eighteenth centuries. After

letting diabetes patients' urine evaporate, Paracelsus—also known as Aureolus Theophrastus Bombastus von Hohenheim, a Swiss physician who lived from 1494 to 1541—saw a white residue. Since he mistakenly believed that the residue in the kidneys was salt, he blamed salt deposition for the patients' increased thirst and urine production ([Medvei 1993](#)). The first mention of a link between the pancreas and diabetes was made by Thomas Cawley in 1788, following his observation in 1670 that diabetic patients' urine tasted sweet. Willis also noted that patients who suffered pancreatic damage also got diabetes ([Medvei 1993](#)).

British scientist Matthew Dobson (1713-1794) published "Experiments and Observations on the Urine in Diabetics" in 1776, and it was via this work that he became the first to show that sugar was the cause of the sweet taste in the urine of people with diabetes. He also noticed that the serum in these individuals tasted sweet, which led him to conclude that they had hyperglycemia. Dobson proposed that diabetes was a general illness rather than one specific to the kidneys ([Medvei 1993](#)).

### NINETEENTH AND EARLY TWENTIETH CENTURY: DISCOVERY OF INSULIN

The nineteenth century saw the rise to prominence of modern scientific disciplines, including experimental physiology and biochemistry in biological investigations, which laid the foundation for our current understanding of "diabetes mellitus."

Eugene Chevreul proved in Paris in 1815 that the urine of people with diabetes contained glucose. ([Poretsky, 2017](#)). Claude Bernard (1813-1878), a physiology professor at Sorbonne University, was one of nineteenth-century Europe's most well-known and productive experimental physiologists. Because of his wide range of interests, Louis Pasteur termed Bernard "Physiology itself". Bernard developed an experimental approach for ligating the pancreatic ducts as part of his studies on the physiology of the gastrointestinal tract. The pancreas thereafter began to deteriorate ([Wrenshall et al. 1962](#)). This approach was tremendously effective in subsequent

experiments to identify a pancreatic component controlling glucose levels (Poretsky 2017). Bernard not only invented pancreatic duct ligation, but he also discovered how the liver released sugar into the bloodstream and stored glycogen. He thought that the cause of diabetes was an overproduction of this hormone. Bernard's hypothesis that diabetes is caused by excessive sugar secretion was widely accepted. Researchers were striving to identify the underlying cause of diabetes, while doctors were expanding their understanding of diabetes mellitus as a systemic disorder with a variety of symptoms and complications (Poretsky 2017).

William Prout (1785-1850) was the first to report a diabetic coma, and Wilhelm Petters discovered that diabetic patients' urine included acetone in 1857. Acetonemia, according to Adolf Kussmaul (1822-1902), is the cause of diabetic coma. Henry Noyes wrote in 1869 about retinopathy in a severe diabetic patient. M. Troiser diagnosed "bronze diabetes" in hemochromatosis patients in 1871 (Medvei 1993). To distinguish it from diabetes insipidus, John Rollo (1749-1809) added the name "mellitus" (derived from the Greek word for honey) to the word "diabetes". (Poretsky 2017). In 1797, Rollo developed a high-protein, low-carbohydrate diet for diabetic patients that contained blood pudding, rancid meats, and a milk-lime water mixture. (Schullan, 1965). It has been claimed that he gave diabetic patients anorexic drugs such as antimony, digitalis, and opium to make them feel hungrier.

Diabetes was largely treated with starvation diets in the years preceding the discovery of insulin. Frederick Allen (1879-1964), a prominent American diabetologist, believed that limiting the amount of food taken by diabetic patients would help them manage their condition because they could not use their meals as well as healthy people. Dietary restriction therapy was rigorous, and patients with type 1 diabetes who had it frequently died from starvation. On the other hand, it is easy to see why low-calorie diets are generally beneficial for patients with type 2 diabetes. (Bliss, 1982; Medvei, 1993).

The discovery of insulin by Frederick Banting and Charles Best ended the search for the substance whose insufficiency had been suggested as the cause of diabetes development. However, many other significant advancements occurred before this milestone. (Poretsky, 2017). Although the importance of pancreatic islets in diabetes etiology was known in the late 1800s, it took 30 years to discover, isolate, and clinically employ insulin. (Pratt, 1954).

The main challenge was estimating blood glucose using Bernard's method, which required 50-100 ml per test. (Ahmed, 2002). Ernest Scott (USA) was close to isolating insulin ten years before Banting and Best in 1910. (Pratt, 1954). His published thesis on the effects of pancreatic extracts on depancreatized dogs yielded valuable insights. Scott identified a chemical involved in glucose metabolism. Stomach enzymes and oxidation easily degrade this chemical; thus, it should be extracted using suitable procedures for clinical usage. Professor A. Carlson, Scott's hostile supervisor, disappointed him. He failed due to his inability to appropriately measure blood glucose levels. In 1921, Frederick Grant Banting (1891-1941) and Charles Herbert Best (1899-1965) of Toronto, Canada, made a groundbreaking discovery by isolating insulin. The study was conducted in John Macleod's physiological laboratory at the University of Toronto in Canada. Macleod's laboratory was well-equipped for studying carbohydrate metabolism.

Working in Strasbourg in 1889, Oscar Minkowski (1858-1931) and Joseph von Mering (1849-1908) observed that dogs with their pancreas removed suffered acute thirst, profuse pee, weight loss, and increased appetite. When Minkowski tested these dogs' pee, he discovered glucose, which supported his hunch that diabetes was to blame for their symptoms. To achieve exocrine atrophy in the dogs used for the experiments, the pancreas of the degenerate dog was excised approximately ten weeks after the pancreatic ducts were first clamped. (Banting et al., 1922). The atrophied pancreatic glands were crushed in a chilly mortar and then frozen in salt water. After that, the bulk was crushed and put into 100 milliliters of physiological salt. Subsequently,

they gave a depancreatized dog 5 mL of this extract intravenously. (Banting et al., 1922). Its blood sugar has significantly decreased in less than two hours. (Barron, 1920). James Collip, a talented chemist who joined the team at the end of 1921, improved the extraction and purification process. The team in its first named the compound they obtained, and MacLeod insulin later took that name. (Von, 1989).

They experimented again and again with other diabetic dogs, with comparable outcomes. They also experimented with fetal calf pancreas, administering it subcutaneously and rectally.

Bernard Naunyn (1839-1925), a notable diabetes expert at the time who was also interested in carbohydrate metabolism, warmly supported Minkowski's results.

Gustave-Edouard Laguesse (1861-1927), a French scientist, proposed in 1893 that the material necessary for blood glucose regulation could arise from the small islands of pancreatic tissue discovered by Paul Langerhans in 1869. Rudolf Virchow trained the renowned German pathologist Paul Langerhans (1847-1888), who was also his student. In his doctoral thesis, he described small clusters of pancreatic cells that were not emptied by pancreatic ducts. Belgian doctor Jean de Mayer used the term "insulin" in 1909 to describe the alleged substance produced by the Langerhans islets.

The discovery of insulin sparked a significant deal of excitement. The media covered numerous cases of miraculous healings. Patients who had previously been deemed doomed had a second chance at life. Before insulin was discovered, very few diabetic women got pregnant, and those who did often (over 40%) died from ketoacidosis. (Kassender, 1958).

Similarly, these mothers' children perished. After insulin was introduced, there was a steady increase in the number of pregnant diabetic patients, and there was a significant decrease in maternal mortality (albeit fetal loss persisted to be high). (Kassender, 1958). Perinatal mortality had decreased to 25% by the 1950s and then to 10%-15% a decade later. However, the essential

significance of managing diabetes, and specifically the effect of the average blood glucose level on fetal development and pregnancy outcome, was not realized until the early 1970s. (Kassender, 1958).

Insulin purification processes improved over time, leading to the development of new insulin formulations. (MacCracken, 1997). Ernesto Roma, a Portuguese doctor who arrived in Boston shortly after insulin became accessible, was among those who witnessed insulin's initial clinical application. When he returned to Portugal, he founded the Portuguese Association for the Protection of Poor Diabetics, the world's first organization for people with diabetes.

Banting began working with young medical student Charles Best on May 16, 1921, which gradually led them to the discovery of insulin with co-researchers. The testing of insulin in people came next. Thus, on January 11, 1922, 14-year-old Leonard Thompson received insulin treatment at Toronto Hospital for his diabetes. (Von 1989; Pratt, 1954). Banting's extract failed, resulting in an abscess. The patient had a significant response to Collip's extract, notwithstanding his refusal to reveal the extraction process to Banting and Best. Purified insulin was being produced on an industrial scale by this time. In 1936, protamine insulins (isophane and protamine zinc) were introduced, replacing the previous soluble insulin. The charity provided free insulin to low-income individuals. Following two years of discussion, delegates from regional societies in the United States met on April 2, 1940, to form the National Diabetes Association. The group was renamed the American Diabetes Association because no such organization existed in Canada then.

## SUMMARY

Diabetes mellitus has been observed throughout historical times. Since ancient times, diabetes mellitus has been recognized, and despite advancements in treatment, it is still an incurable chronic illness. Events from the Ebers Papyrus, the nineteenth and early twentieth centuries, and the discovery of diabetes covered in this article are summarized in [Table 1](#)

Table 1: Diabetes Timeline Order

S/N	EVENT	OBSERVATIONS	REFERENCE
1	Around 230 BC	Apollonius of Memphis coined the term "diabetes," which means "to pass through" in Greek.	(Papaspyros 1964)
2	Fifth century AD, Sushruta and Charaka, two Indians	First, to distinguish between the two types of diabetes mellitus	(Lakhtakia, 2013)
3	Seventh century AD, Li Hsuan of China	People with diabetes were more likely to have lung infections and boils.	(Karamanou, 2016)
4	Avicenna, or Ibn-Sina (980-1037 AD)	Wrote a major medical work (the "Canon Avicennae") that explained diabetes.	(Karamanou, 2016)
5	1494 to 1541 Aureolus Theophrastus Bombastus von Hohenheim, a Swiss physician	Found diabetes patients' urine to contain a white residue after evaporation.	(Poretsky, 2017)
6	1788, Thomas Cawley	First mention of a link between the pancreas and diabetes.	(Poretsky, 2017)
7	(1713-1794) British scientist Matthew Dobson	Published "Experiments and Observations on the Urine in Diabetics" in 1776	(Poretsky, 2017)
8	1815, Eugene Chevreul in Paris	Proved urine of people with diabetes contained glucose	(Poretsky, 2017)
9	William Prout (1785-1850)	First to report a diabetic coma	(Poretsky, 2017)
10	Wilhelm Petters in 1857	Discovered that diabetic patients' urine included acetone.	(Poretsky, 2017)
11	Frederick Allen (1879-1964)	Believed that limiting the amount of food taken by diabetic patients would help them manage their condition.	(Poretsky, 2017)
12	In 1921, Frederick Grant Banting and Charles Herbert Best	Made a groundbreaking discovery by isolating insulin.	(Karamanou, 2016)
13	1922, 14-year-old Leonard Thompson	Received insulin treatment at Toronto Hospital for his diabetes.	(Poretsky, 2017)
14	2-Apr-1940	National Diabetes Association was formed. The group was renamed the American Diabetes Association.	(Poretsky, 2017)

## CONCLUSION

The history of diabetes has been traced back to Eber papyrus. It can be deduced that scientists tried to discover the presence and existence of these illnesses. The discovery of insulin has played a significant role in the history of diabetes mellitus and is also considered a key advance in the progress of modern science. Insulin is a hormone that secretes  $\beta$ -cells plasma levels of glucose. This review will give an insight into the major events that occurred in the of diabetes.

## REFERENCE

Acharya, D., Bogati, B., Shrestha, G., & Gyawali, P. (2015). Diabetes mellitus and Urinary Tract Infection: Spectrum of Uropathogens and their Antibiotic

Sensitivity. *Journal of Manmohan Memorial Institute of Health Sciences*, 1(4), 24-28. [Crossref]

Ahmed, A.M. (2002). Short Review History of Diabetes Mellitus. *Saudi Medical Journal*. Vol. 23 (4): 373-378.

Ahmad, S., Hussain, A., Khan, M. S. A., Shakireen, N., & Ali, I. (2020). Diabetes mellitus and urinary tract infection: Causative uropathogens, their antibiotic susceptibility pattern and the effects of glycemic status. *Pakistan Journal of Medical Sciences*, 36(7). [Crossref].

American Diabetes Association. (2010). Diagnosis and Classification of Diabetes Mellitus. *Diabetes Care*, 33(Supplement\_1), S62-S69. [Crossref]

Banting F.G, Best C.H, Collip J.B, Cambell W.R, Fletcher A.A, Macleod J.J.R, Noble E.C. The Effect Produced on Diabetes by

- Extractions of Pancreas. *Transact Ass Amer Physicians* 1922; 37: 337.
- Banting F.G, Best C.H, Macleod J.J.R. The internal secretion of the pancreas. *Am J Physiol* 1922; 59: 479.
- Barron M. The relation of the Islets of Langerhans to Diabetes. *Surg GynecolObstet* 1920; 31: 437-448.
- Bliss M. A long prelude. In: Bliss M, editor. *The discovery of insulin*. Chicago: The University of Chicago Press; 1982. p. 33-9. [[Crossref](#)]
- Butt, M. D., Ong, S. C., Wahab, M. U., Rasool, M. F., Saleem, F., Hashmi, A., Sajjad, A., Chaudhry, F. A., & Babar, Z.-U.-D. (2022). Cost of Illness Analysis of Type 2 Diabetes Mellitus: The Findings from a Lower-Middle Income Country. *International Journal of Environmental Research and Public Health*, 19(19), 12611. [[Crossref](#)]
- Diabetes mellitus. Report of a WHO Expert Committee. Geneva: World Health Organization; 1965.
- Diabetes mellitus: report of a WHO Study Group. Technical Report Series 727. Geneva: World Health Organization; 1985.
- Jagadeesan, S., Tripathi, B., Patel, P., & Muthathal, S. (2022). Urinary tract infection and Diabetes Mellitus—Etioclinical profile and antibiogram: A North Indian perspective. *Journal of Family Medicine and Primary Care*, 11(5), 1902. [[Crossref](#)]
- Karamanou M, Protogerou A, Tsoucalas G, Androutsos G, Poulakou-Rebelakou E. Milestones in the history of diabetes mellitus: the main contributors. *World J Diabetes*. 2016;7:1-7. [[Crossref](#)]
- Kassender P. Asymptomatic gastric retention (gastroparesis diabeticorum). *Ann Intern Med* 1958; 48: 797- 812. [[Crossref](#)]
- Kaur, P., Sachan, R. S. K., Karnwal, A., Devgon, I. (2022). A Review on Clinical Manifestation and Treatment Regimens of UTI in Diabetic Patients. *Iranian Journal of Medical Microbiology*, 16(2), 98-115. [[Crossref](#)].
- MacCracken J. From ants to analogues. Puzzles and promises in diabetes management. *Postgrad Med*. 1997;4:138-50. [[Crossref](#)]
- Medvei VC. Mediaeval scene. In: Medvei VC, editor. *The history of clinical endocrinology: a comprehensive account of endocrinology from earliest times to the present day*. New York: Parthenon Publishing; 1993. p. 46-9.
- Medvei V.C. The 16th century and the renaissance. In: Medvei VC, editor. *The history of clinical endocrinology: a comprehensive account of endocrinology from earliest times to the present day*. New York: Parthenon Publishing; 1993. p. 55-6.
- Medvei V.C. The 18th century and the beginning of the 19th century. In: Medvei VC, editor. *The history of clinical endocrinology: a comprehensive account of endocrinology from earliest Times to the present day*. New York: Parthenon Publishing; 1993. p. 97.
- Medvei VC. Story of insulin. In: Medvei VC, editor. *The history of clinical endocrinology: a comprehensive account of endocrinology from earliest times to the present day*. New York: Parthenon Publishing; 1993. p. 249-51.
- Rani Goyal, S., E Chand, A., & Singh Naruka, H. (2021). Prevalence of uropathogens among diabetic patients and their antibiogram at government medical college, Kota. *IP International Journal of Medical Microbiology and Tropical Diseases*, 7(1), 24-27. [[Crossref](#)].
- Ritu Lakhtakia. (2013). The History of Diabetes Mellitus. *Sultan Qaboos University Medical Journal*, August 2013, Vol. 13, Issue. 3, pp. 368-37. [[Crossref](#)]
- Schullian D.M. John Rollo's patient. *Journal of Histology Medicine*. 1965;2:163-4. [[Crossref](#)]
- Pratt J.H. A reappraisal of researchers leading to the discovery of insulin. *Journal of History of Medicine* 1954; 9: 281-289. [[Crossref](#)]
- Papaspyros N.S. The history of diabetes. In: Verlag GT, editor. *The history of diabetes mellitus*. Stuttgart: Thieme; 1964. p. 4.
- Poretzky, L. (Ed.). (2017). *Principles of Diabetes Mellitus*. Springer International Publishing. Pp 4 Cham [[Crossref](#)].
- Von Engelhardt D, editor. *Diabetes: Its medical and cultural history*. Berlin: Springer-Verlag, 1989: 306-319, 350-358, 411-426.
- WHO Expert Committee on Diabetes Mellitus. Second Report. Technical report Series 646. Geneva, World Health Organization; 1980.
- Wrenshall G.A. Hatenyi G., Feasby W.R. The story of insulin. London, (United Kingdom): The Bodley Head Ltd; 1962. p. 39-52.

World Health Organization. (2019).  
*Classification of diabetes mellitus.*  
World Health Organization. [[Crossref](#)].  
World Health Organisation (WHO). South  
Eastern Asia Region: Nepal statistics

summary (2002present). Updated 2011;  
cited 2013. Available from:  
[www.who.int](http://www.who.int).