WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

A REVIEW ON :DIABETES MELLITUS; PATHOPHYSIOLOGY, COMPLICATIONS, AND THERAPEUTIC ADVANCES

Dr. MIYASA MOIDU C K[1], MARIYAMMATH SHUHAIBA SHIRIN[2]

MALIK DEENAR COLLEGE OF PHARMACY, SEETHANGOLI, P/O BELA, 671321

ABSTRACT :

Diabetes mellitus is a persistent metabolic disorder characterized by high blood glucose concentrations due to defective insulin secretion, defective insulin action, or both. It continues to grow into a worldwide health crisis that produces significant morbidity and mortality. This review addresses the re-examination our current understanding of the pathophysiology of diabetes, pan-systemic complication, therapy, including the update on medications and technology since 2015. We emphasize the use of SGLT2 inhibitors, GLP-1 receptor agonists and continuous glucose monitoring in addition to lifestyle changes, and offer some directions on future of treatment.

1. Introduction

Chronic hyperglycemia is a hallmark of a set of metabolic diseases collectively referred to as diabetes mellitus (DM). The two main types (type 1 diabetes mellitus (T1DM) and type 2 diabetes mellitus (T2DM)) differ in etiology, but both lead to complications that remain chronic. T1DM is the autoimmune destruction of pancreatic beta-cells, while T2DM is caused by insulin resistance and relative insulin deficiency (the body doesn't use insulin properly or produce adequate amounts). The International Diabetes Federation estimated that 537 million people had diabetes in 2021, with projections indicating 783 million people will have diabetes in 2045 [1].

2. Pathophysiology of Diabetes Mellitus

Beta-cell dysfunction is a symptom of the autoimmune condition known as type 1 diabetes mellitus (T1DM). The pathophysiology of Type 2 diabetes mellitus (T2DM) is characterized by insulin resistance in peripheral tissues, primarily the liver, muscle and adipose tissue, along with progressive beta-cell failure. Long-standing hyperglycemia also activates pathophysiological pathways (e.g., oxidative stress, polyol and hexosamine pathways and advanced glycation end-products (AGE) formation), all of which contribute to cellular dysfunction and disease. [2].

3. Complications of Diabetes

Uncontrolled diabetes can lead to microvascular (retinopathy, nephropathy, neuropathy) and macrovascular (cardiovascular disease, stroke, and peripheral artery disease) complications, with diabetic nephropathy being the number 1 cause of end-stage renal disease worldwide. Furthermore, the risk of cardiovascular events is two to four times higher for people with diabetes than for people without the disease [3,4].

4. Recent Advances in Therapy

The therapeutic landscape has changed fundamentally since 2015, thanks to the introduction of two drug classes, SGLT2 inhibitors and GLP-1 receptor agonists that have revolutionized the management of diabetes.

- SGLT2 Inhibitors: This group of drugs works primarily by inhibiting glucose reabsorption in the kidney, thus lowering blood glucose, and causing weight loss. They are clinically important because in addition to lowering blood glucose, SGLT2 inhibitors provide cardiovascular and renal protective effects irrespective of having a positive glycemic effect [5].
- GLP-1 receptor agonists: These medications improve glucose-dependent insulin secretion while lowering appetite. These drugs have also demonstrated positive outcomes, in terms of reduction in major adverse cardiovascular (cardio) events (MACE) amongst high-risk patients [6].

It is evident that both drug classes are likely to be referenced in international guidelines, especially in patients with T2DM and established cardiovascular or renal disease.

5. Lifestyle and Preventive Measures

The key to managing diabetes is changing one's lifestyle. T2DM can be effectively prevented and treated with dietary, activity, and weight loss improvements. In individuals at high risk for diabetes, lifestyle modifications can postpone the beginning of the disease, according to the Diabetes Prevention Program Outcomes Study (DPPOS) and other studies [7]. Even with these successful lifestyle changes, medical nutrition therapy and patient education support long-lasting change in the behaviors of patients with diabetes or prediabetes.

6. Future Directions

Diabetes management is changing due to advances in technology. For example, continuous glucose monitoring (CGM) systems and new closed-loop "artificial pancreas" devices have demonstrated significant improvements in glycemic control and reductions in hypoglycemia in people with T1DM and insulin-treated T2DM [8]. Active research is underway exploring precision medicine, immunotherapy for T1DM, and beta-cell regrowth or regeneration. Ongoing research includes advances in precision medicine, the study of immunotherapy for T1DM and beta-cell regeneration [9], and digital health platforms that apply decision support by leveraging AI and machine learning at a level not previously possible [10].Amidst these advances, the combination of digital health tools provide further opportunities to monitor and manage this chronic, lifelong disease.

7. Conclusion

Diabetes mellitus remains a significant global health problem. However, advances in its pathophysiology and new treatments have changed management and outcomes of the disease trajectory. A comprehensive approach consisting of lifestyle interventions, drug therapy, and the increasing role of technology could lead to more individual and effective personalized care for diabetes.

REFERENCES

1. Saeedi P, Petersohn I, Salpea P, et al. Global and regional diabetes prevalence estimates for 2019 and projections for 2030 and 2045: Results from the International Diabetes Federation Diabetes Atlas. *Diabetes Res Clin Pract*. 2019;157:107843.
2. Ceriello A, De Nigris V, Prattichizzo F. Why is hyperglycaemia worsening COVID-19 and its prognosis? *Diabetes Obes Metab*. 2020;22(10):1951–2.
3. Zheng Y, Ley SH, Hu FB. Global aetiology and epidemiology of type 2 diabetes mellitus and its complications. *Nat Rev Endocrinol*. 2018;14(2):88–98.
4. Rawshani A, Rawshani A, Franzén S, et al. Risk factors, mortality, and cardiovascular outcomes in patients with type 2 diabetes. *N Engl J Med*. 2018;379(7):633–44.
5. Wiviott SD, Raz I, Bonaca MP, et al. Dapagliflozin and cardiovascular outcomes in type 2 diabetes. *N Engl J Med*. 2019;380(4):347–57.
6. Marso SP, Daniels GH, Brown-Frandsen K, et al. Liraglutide and cardiovascular outcomes in type 2 diabetes. *N Engl J Med*. 2016;375(4):311–22.
7. Knowler WC, Fowler SE, Hamman RF, et al. 10-year follow-up of diabetes incidence and weight loss in the Diabetes Prevention Program Outcomes Study. *Lancet*. 2009;374(9702):1677–86.
8. Heinemann L, Freckmann G. CGM versus FGM; or, continuous glucose monitoring is not flash glucose monitoring. *J Diabetes Sci Technol*. 2015;9(5):947–50.
9. Von Herrath M, Bain SC, Bode BW, et al. Anti-interleukin-21 antibody and liraglutide for type 1 diabetes. N Engl J Med. 2021;384(20):1919–29.
10. Contreras I, Vehi J. Artificial Intelligence for Diabetes Management and Decision Support: Literature Review. Journal of Medical Internet Research. 2018 May 30;20(5):e10775.