INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH IN HEALTH SCIENCE
An International Open Access, Peer-reviewed, Refereed Journal

Type 1 Diabetes Mellitus: An Overview

R. Thamizselvi

[1]Associate Professor, Department of Child Health Nursing, Vivekanandha Nursing College, Gopalankadai, Iyyankuttipalayam, Puducherry 605009

Abstract:
Type 1 diabetes mellitus is a lifelong autoimmune disorder in which the body's immune system selectively destroys the insulin-producing β-cells of the pancreas, resulting in absolute insulin deficiency. The disease most often begins in childhood or adolescence, although it can appear at any stage of life. Its development is influenced by genetic predisposition and environmental factors that initiate an abnormal immune response. Individuals commonly present with symptoms of hyperglycemia such as excessive thirst, frequent urination, weight loss, and fatigue, and some may initially develop diabetic ketoacidosis. Management depends on continuous insulin replacement, regular glucose monitoring, dietary regulation, and structured education. Recent advances in technology, including continuous glucose monitoring and automated insulin delivery systems, have transformed care and improved metabolic control. Despite these improvements, people with Type 1 diabetes remain at risk for acute and chronic complications. Early detection, sustained glycemic control, and comprehensive support are essential to reduce morbidity and enhance long-term quality of life.

Keywords: Type 1 diabetes mellitus, Immune system

INTRODUCTION:

Diabetes mellitus comprises a group of metabolic disorders characterized by persistent hyperglycemia due to defects in insulin secretion, insulin action, or both. Among its forms, Type 1 diabetes mellitus is unique in its autoimmune origin and absolute dependence on exogenous insulin (ADA, 2023). T1DM accounts for approximately 5–10% of all diabetes cases but remains the most common form in children and adolescents worldwide (Craig et al., 2018). Atkinson et al. (2014) describe T1DM as a prototypical autoimmune disease in which genetically susceptible individuals develop immune responses against pancreatic β-cells. The rising global incidence of T1DM highlights the need for improved understanding of its etiology, early recognition, and long-term management strategies.

TYPE 1 DIABETES MELLITUS

Type 1 diabetes develops when autoreactive T-lymphocytes target and destroy insulin-producing β-cells in the pancreatic islets (Knip & Siljander, 2016). Genetic factors, particularly human leukocyte antigen (HLA) class II genes, play a central role in susceptibility (Zajec et al., 2022). Environmental influences, including viral infections and early-life exposures, are believed to trigger immune activation in predisposed individuals (Del Chierico et al., 2022).

The progressive loss of β-cell mass leads to absolute insulin deficiency and chronic hyperglycemia. Clinically, individuals present with polyuria, polydipsia, polyphagia, weight loss, and fatigue (Mayo Clinic, 2023). In many cases, diabetic ketoacidosis may be the initial manifestation, particularly in children and adolescents (Craig et al., 2018). Diagnosis is based on elevated plasma glucose or HbA1c levels, supported by the presence of pancreatic autoantibodies such as anti-GAD and IA-2 antibodies (Lucier & Weinstock, 2024).

Management of T1DM requires lifelong insulin replacement therapy through multiple daily injections or continuous subcutaneous insulin infusion (ADA, 2023). Technological advancements, including continuous glucose monitoring and hybrid closed-loop systems, have significantly improved glycemic control and reduced hypoglycemic episodes (Powers, 2020). Despite these advances, individuals remain at risk for long-term complications such as retinopathy, nephropathy, neuropathy, and cardiovascular disease, primarily associated with prolonged hyperglycemia (Chiang et al., 2014).

CONCLUSION:

Type 1 diabetes mellitus is a lifelong autoimmune condition with substantial clinical and psychosocial consequences. The disease results from immune-mediated β-cell destruction, leading to absolute insulin deficiency and dependence on lifelong insulin therapy (Atkinson et al., 2014). Early diagnosis, intensive glycemic control, and continuous education are central to preventing acute and chronic complications (ADA, 2023). Advances in monitoring technologies and emerging immunomodulatory therapies provide promising avenues for improved outcomes (Powers, 2020). Strengthening awareness, access to care, and research efforts is essential to reduce disease burden and enhance the quality of life for individuals living with T1DM.

BIBLIOGRAPHY:

1. American Diabetes Association. (2023). Standards of care in diabetes—2023. Diabetes Care, 46(Supplement 1), S1–S350. https://doi.org/10.2337/dc23-SINT
2. Atkinson, M. A., Eisenbarth, G. S., & Michels, A. W. (2014). Type 1 diabetes. The Lancet, 383(9911), 69–82. https://doi.org/10.1016/S0140-6736(13)60591-7
3. Chiang, J. L., Kirkman, M. S., Laffel, L. M. B., & Peters, A. L. (2014). Type 1 diabetes through the life span: A position statement of the American Diabetes Association. Diabetes Care, 37(7), 2034–2054. https://doi.org/10.2337/dc14-1140

4. Craig, M. E., Jefferies, C., Dabelea, D., Balde, N., Seth, A., & Donaghue, K. C. (2018). Definition, epidemiology, and classification of diabetes in children and adolescents. Pediatric Diabetes, 19(Suppl. 27), 7–19. https://doi.org/10.1111/pedi.12773
5. Del Chierico, F., Abbatini, F., Russo, A., Quagliariello, A., Reddel, S., Capucilli, P., … Putignani, L. (2022). Gut microbiota markers in the early detection of type 1 diabetes. International Journal of Molecular Sciences, 23(23), 14650. https://doi.org/10.3390/ijms232314650
6. Knip, M., & Siljander, H. (2016). Autoimmune mechanisms in type 1 diabetes. Autoimmunity Reviews, 15(6), 533–550. https://doi.org/10.1016/j.autrev.2016.01.013
7. Lucier, J., & Weinstock, R. S. (2024). Type 1 diabetes. In StatPearls. StatPearls Publishing. https://www.ncbi.nlm.nih.gov/books/NBK507713/
8. Powers, A. C. (2020). Type 1 diabetes mellitus: Progress and opportunities. Journal of Clinical Investigation, 130(6), 2742–2751. https://doi.org/10.1172/JCI142242
9. Zajec, A., Trebušak Podkrajšek, K., & Šket, R. (2022). Pathogenesis of type 1 diabetes. Genes, 13(4), 706. https://doi.org/10.3390/genes13040706
10. World Health Organization. (2019). Classification of diabetes mellitus. World Health Organization. https://apps.who.int/iris/handle/10665/325182

Cite this Article: R. Thamizselvi (2025). Type 1 Diabetes Mellitus: An Overview, *International Journal of Innovative Research in Health Science*, 1(6), 6-8. https://doi.org/10.63349/ijirhs.202436