Artificial intelligence revolutionizing type 2 diabetes mellitus self management (DSM): A digital breakthrough

Mohammad Hadif[1], Kashaf Fatima[2], Maryam NasrumminAllah[3]

Dear Madam, Diabetes Mellitus (DM) is a chronic metabolic disorder characterised by persistently elevated plasma glucose levels and is one of the leading causes of chronic health problems globally.[1] International Diabetes Federation (IDF) reports that 537 million people live with DM, With projections of 643 million by 2030 and 783 million by 2045.[2] Pakistan ranks among the top 10 countries with the highest Diabetes cases, with Type 2 Diabetes Mellitus (T2DM) caused by endogenous resistance of the body cells to insulin leading to chronic hyperglycaemia being a significant public health issue due to increased deaths, especially among the 40-60 age group.[1] Given the sharp increase in cases, it is pertinent to understand the factors contributing to its increased incidence, such as genetics, dietary habits of complex protein intake, birth weight, sedentary lifestyle, lack of physical activity, high-calorie intake, cigarette smoking, and obesity[1]. Thus, early identification is crucial for preventing disability and death in high-risk individuals. This involves patient education, screening, and ongoing medical care to prevent acute complications like ketoacidosis and reduce long-term risks which impact practically every organ in the body, including retinopathy, nephropathy, neuropathy, diabetic foot, stroke, and cardiovascular complications[3]. Diabetes management necessitates commitment to a variety of self-care practices that are frequently quite taxing for patients: meal planning, carb counting, exercise, blood glucose monitoring, and daily activity adjustment. Therefore, Diabetes self-Management (DSM) has always been challenging to both patients and Health care professionals.

But over the past decade, the diabetes management paradigm has been significantly transformed by the integration of new technologies, with AI playing a crucial role in recognizing Diabetes Self-Management (DSM) apps as essential therapeutic aids for patients[4]. Diabetes management apps offer documentation and analysis of various parameters like blood glucose, eating habits, physical activity, and medical therapy[4,5]. These apps also track disease progression and facilitate communication between patients and caregivers[4,5]. Compared to patients in the control group, patients who got coaching and decision support via the Well Doc app showed higher reductions in haemoglobin A1c (HbA1c) levels[5]. The FareWell app was used in cohort research that found adults with type 2 diabetes to have the same effect, and those users reported feeling more confident about controlling their condition[5]. To prevent Diabetes Mellitus Type 2, a recent study by Esrat Jahan et al. Shows the potential advantages of smartphone applications by lowering obesity[6]. Furthermore, multiple meta-analyses on randomised controlled trials (RCTs) show that mobile app interventions, particularly for type 2 diabetes patients, can significantly lower HBA1C levels without causing any major adverse effects.[5]. The National Diabetes Prevention Program discovered that lifestyle changes such as healthy eating and physical activity can reduce type 2 diabetes risk by up to 58%[4,5]

Pakistan is a developing country with almost 26% of people living with diabetes[2] having access to limited resources. It is important to prevent the disease through methods which are easily accessible to all privileged & underprivileged, as almost 82% of the world's population has access to smartphones[7]. Therefore, we can possibly reduce the burden of diabetic patients in health care by encouraging the use of smartphone apps in high-risk populations; this way, in future, we might even see better results showing a reduction in glycated Haemoglobin. We believe a greater audience can get the maximum benefit from the smartphone apps if we were to incorporate AI for individual customisation by using wireless scales, caloric intake targets, setting realistic goals, diet plans according to personal preferences and lastly, by encouraging diabetic screening.

[1]3rd Year MBBS Student, Dow International Medical College, Karachi, Pakistan; [2,3]5th Year MBBS Student, Dow International Medical College, Karachi, Pakistan.
Correspondence: Mohammad Hadif. **Email:** Hadif1960@gmail.com
ORCID ID:0009-0006-9687-5742

Submission complete: 20-06-2024 **First Revision received:** 16-08-2024
Acceptance: 14-12-2024 **Last Revision received:** 13-12-2024

DOI: https://doi.org/10.47391/JPMA.20746

Disclaimer: None.

Conflict of Interest: None.

Source of Funding: None.

References

1. Lovic D, Piperidou A, Zografou I, Grassos H, Pittaras A, Manolis A. The Growing Epidemic of Diabetes Mellitus. Curr Vasc Pharmacol 2020;18:104-9. doi: 10.2174/1570161117666190405165911
2. The Diabetes Centre (TDC). Facts and Figures. [Online] 2021 [Cited 2025 February 17]. Available from URL: https://thediabetescentre.org/facts-figures#:~:text=There% 20are%20approximately %20537%20million,there%20will%20be%20783%20million.
3. Ruze R, Liu T, Zou X, Song J, Chen Y, Xu R, et al. Obesity and type 2 diabetes mellitus: connections in epidemiology, pathogenesis, and treatments. Front Endocrinol (Lausanne) 2023;14:1161521. doi: 10.3389/fendo.2023.1161521
4. Contreras I, Vehi J. Artificial Intelligence for Diabetes Management and Decision Support: Literature Review. J Med Internet Res 2018;20:e10775. doi: 10.2196/10775
5. Tu YZ, Chang YT, Chiou HY, Lai K. The Effects of Continuous Usage of a Diabetes Management App on Glycemic Control in Real-world Clinical Practice: Retrospective Analysis. J Med Internet Res 2021;23:e23227. doi: 10.2196/23227
6. Jahan E, Almansour R, Ijaz K, Baptista S, Giordan LB, Ronto R, et al. Smartphone Applications to Prevent Type 2 Diabetes: A Systematic Review and Meta-Analysis. Am J Prev Med 2024;66:1060-7. doi: 10.1016/j.amepre.2024.01.008
7. Moschonis G, Siopis G, Jung J, Eweka E, Willems R, Kwasnicka D, et al. Effectiveness, reach, uptake, and feasibility of digital health interventions for adults with type 2 diabetes: a systematic review and meta-analysis of randomised controlled trials. Lancet Digit Health 2023;5:e125-43. doi: 10.1016/S2589-7500(22)00233-3

AUTHORS' CONTRIBUTIONS:
MH: Topic, content search, data analysis, interpretation and final approval.
KF: Writing, appropriately investigated and resolved the work.
MN: Drafting and critical revision.