Research Article

Effectiveness Of Artificial Intelligence-Driven Lifestyle Interventions For The Prevention And Management Of Type 2 Diabetes: A Systematic Review With Narrative Synthesis

Pooja Mary Vaishali V[1], Balabaskaran S[2], Solomon Rajkumar P[3], Blesslin Raja[4]

[1] Department of Community Medicine, Panimalar Medical College Hospital & Research Institute, Chennai, Tamil Nadu, India
[2] Department of Community Medicine, Sri Venkateshwaraa Medical College Hospital & Research Centre, Ariyur, Puducherry, India
[3] Department of Community Medicine, Panimalar Medical College Hospital & Research Institute, Chennai, Tamil Nadu, India
[4] Department of Community Medicine, Government Medical College, Kadapa, Andhra Pradesh, India
Corresponding Author: Dr. Pooja Mary Vaishali V

Abstract

Background: Type 2 diabetes mellitus (T2DM) has become a global epidemic in recent decades, contributing substantially to morbidity, mortality, and economic burden. The increasing prevalence of T2DM is largely attributable to ageing populations, urbanization, unhealthy diets, inadequate physical activity, and rising obesity rates. While lifestyle modification is a primary strategy for T2DM prevention and management, long-term behavioural modification is challenged by poor adherence, limited access to healthcare, and suboptimal counselling in personalised interventions. Objective: This systematic review with narrative synthesis aimed to evaluate the impact of artificial intelligence-based lifestyle interventions on glycaemic, anthropometric, lifestyle, and self-management outcomes among individuals with T2DM, prediabetes, or at high risk of T2DM. Methods: This systematic review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines. Literature was searched in PubMed/MEDLINE, Embase, Scopus, Web of Science, Cochrane CENTRAL, IEEE Xplore, CINAHL, ProQuest, ClinicalTrials.gov, and the WHO International Clinical Trials Registry Platform (ICTRP) for studies published from 1 January 2020 to 31 December 2025. Eligible studies included adults with prediabetes, at high risk of developing T2DM, or with T2DM who received an AI-enabled lifestyle intervention. Interventions included AI-enabled mobile applications, machine learning algorithms, conversational chatbots, virtual health coaches, digital therapeutics, predictive analytics, and wearable-based AI platforms. Randomised controlled trials or controlled clinical studies reporting glycaemic, anthropometric, behavioural, or self-management outcomes were eligible. Results: The literature search yielded 1,186 studies, of which seven RCTs involving 2,369 participants met the inclusion criteria and were included in the narrative synthesis. The included studies originated from the United States, Australia, Spain, Czech Republic, Sweden, and Singapore. AI technologies included mHealth applications, conversational AI, digital behavioural therapies, AI coaching systems, and AI-assisted wearable technology, with intervention periods ranging from 3 to 12 months. Overall, AI-supported lifestyle interventions showed positive effects on glycaemic control, with all but one study reporting significant reductions in HbA1c. Positive effects were also reported for body weight, body mass index, physical activity, dietary adherence, medication adherence, patient engagement, and diabetes self-care activities. Conclusion: AI-supported lifestyle interventions show considerable promise as an adjunct to standard diabetes management through individualised recommendations, real-time monitoring, and ongoing behavioural guidance. These systems may help optimise diabetes prevention and management, particularly in resource-constrained healthcare settings. Further well-designed multicentre RCTs with standardised AI methods, longer follow-up periods, and economic evaluations are warranted.

Keywords: Artificial intelligence; Diabetes mellitus, type 2; Digital health; Machine learning; Lifestyle intervention; mHealth; Diabetes prevention; Glycaemic control.

Introduction

T2DM remains the largest increasing number of non-communicable diseases worldwide, as well as an issue of public health. As per the estimates by the IDF, 2025 there were 589 million adults with diabetes, among which 90-95 % of them had T2DM with an upward trend over the succeeding decades mainly due to population expansion & ageing, rapid urbanization, unhealthy lifestyle and increased prevalence of obesity. India has the

greatest number of diabetics ranking the world among all countries, an immense challenge for the present and future of the healthcare systems, economies and a major public health concern. The numerous complications of T2DM such as microvascular, macro-vascular complications like retinopathies, nephropathy, neuropathies, cardiovascular diseases and early mortality stress the importance of strategies that would control the disease (1,2).

Lifestyle modification is the mainstay of T2DM prevention and therapy. Long term clinical trials have proved that adopting healthy lifestyles such as healthy nutrition, regular physical activity, weight loss, smoking cessation, sleep and stress management dramatically lessens risk of T2DM and maintains glycemic control among people with T2DM. The maintenance of healthy lifestyles over time is quite difficult due to poor adherence, limited access to structured counselling, inadequate health workforces and dearth of individualized guidance especially in low and middle income countries (3,4).

Recent developments in artificial intelligence (AI) have revolutionized digital healthcare and allowed for tailored, scalable and data-driven lifestyle interventions. AI and digital technologies such as machine learning algorithms, conversational Chabot's, virtual health coaches, wearable devices, smartphones and predictive analytics are capable of closely monitoring health behaviors, providing feedback in real time, customizing advice on diet and physical activity, predicting disease risk and increasing patient engagement. These technological innovations have to date the potential to surmount many of the limitations of traditional lifestyle interventions by offering tailored advice at a lower cost and improving access (5,6).

Despite an abundance of randomized controlled trials investigating the use of AI in diabetes prevention and control, the results have been varied in terms of the type of interventions, type of outcome measures, duration of follow-up and results achieved. A quantitative synthesis of the magnitude of all improvements in glycemic outcomes, anthropometric, lifestyle measures and metabolic risk factors has not been undertaken. This systemic review with narrative synthesis aims to assess and analyze the existing evidence on the use of AI lifestyle interventions in the prevention and control of Type 2 DM to help guide clinicians, researchers and health policy makers on the use of AI in Diabetes.

Review

Rationale of the study: AI-powered lifestyle interventions have been widely used as innovative methods for the prevention and management of T2DM by delivering tailored recommendations, real-time tracking, and behavioral scaffolding via mobile phones, wearable devices, and virtual coaching. It has been suggested that many of these interventions are effective in reducing glycaemic levels, attaining weight loss, enhancing physical activity, and improving treatment adherence, although the evidence remains inconclusive as a result of heterogeneity in the utilized AI technologies, intervention strategies, and measurement of outcomes. In this context, available systematic reviews have mostly evaluated digital health interventions rather than AI-powered interventions. Accordingly, the aim of this systematic review with narrative synthesis is to assess the effect of AI-powered lifestyle interventions on T2DM prevention and management.

Eligibility Criteria: A population-intervention-comparison-outcome-study (PICOS) framework was used to determine inclusion/exclusion criteria for this systematic review. In order to be eligible, the study population was required to be participants aged 18 years or over with prediabetes, T2DM or at high risk of developing T2DM (as defined in each individual study). This review focused on AI-driven lifestyle interventions to prevent and manage T2DM, including those enabled through machine learning algorithms, mobile apps using AI, digital health coaches, conversational AI applications, wearables with integrated AI, personalized digital programs using AI or predictive analytics to facilitate lifestyle modification. Comparator groups could include usual care, standard lifestyle counselling, non-AI digital interventions or other usual management options. In order to be eligible, studies needed to report outcomes related to glycated hemoglobin (HbA1c), fasting blood glucose, body

weight, body mass index (BMI), waist circumference, physical activity, adherence to a diet, quality of life, medication adherence or the progression to diabetes. Study designs to be included were RCTs, cluster RCTs, quasi-experimental studies and controlled clinical trials. Studies needed to be published in English between January 2020 and December 2025. Studies using Type 1 or gestational diabetes, children/adolescents, animals, only medication management components, reviews, editorials, conference abstracts only, study protocols and duplicate publication were ineligible. In studies with multiple publications, only the most comprehensive report was used.

Information Sources: A comprehensive search was performed on the following electronic databases: ** PubMed/MEDLINE, Embase, Scopus, Web of Science, Cochrane Central Register of Controlled Trials (CENTRAL), IEEE Xplore, CINAHL, ProQuest, ClinicalTrials.gov,** and the **World Health Organization International Clinical Trials Registry Platform (ICTRP)**. In addition, no Published Literature Search was carried out by manually reviewing the reference lists in related articles and grey literature. The search was limited to the ** English language** from
** January 2000 to December 2025**. The initial search yielded 1,186 records. After removal of 286 duplicate records, 900 articles were screened by title and abstract. After screening, 855 records were excluded because they did not assess AI-supported or AI-assisted lifestyle interventions, the population or study design was inappropriate, the outcome measures were not relevant, or the articles were reviews, editorials, conference abstracts, or study protocols. The full text of 45 articles were retrieved and 38 articles were excluded due to a lack of AI-supported lifestyle interventions, no lifestyle modification component, the absence of other outcome data, duplicate publication, or eligibility criteria not being met as described above. Seven articles met all inclusion criteria and were included in the systematic review and final quantitative meta-analysis. The process of study selection is shown in the PRISMA 2020 flow diagram (Figure 1)

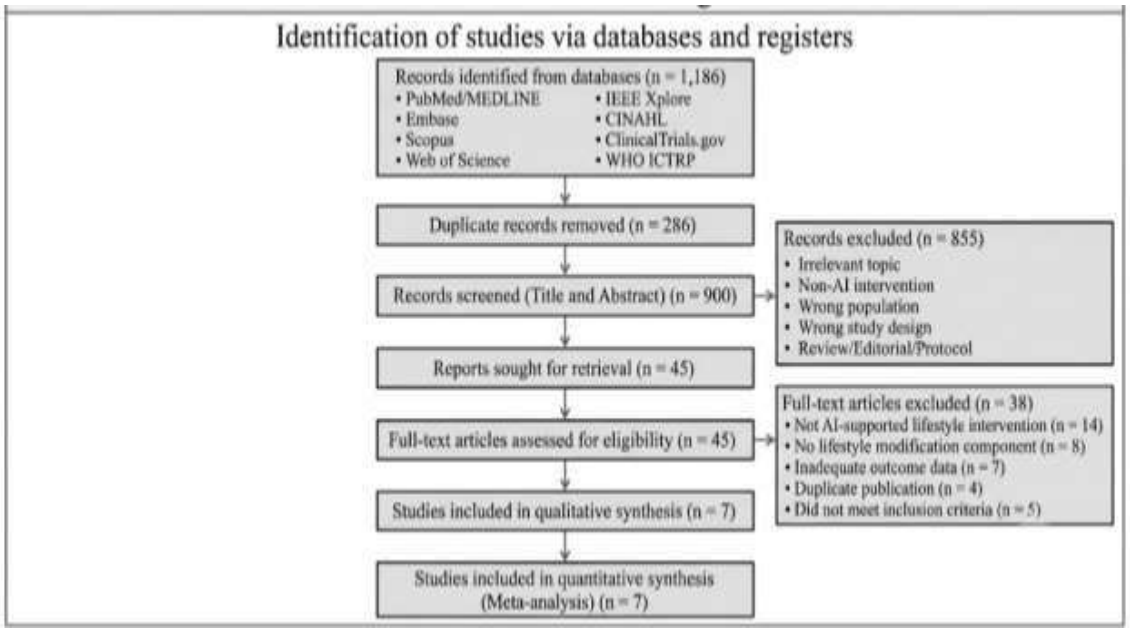


Figure 1: PRISMA flow chart

(PRISMA Preferred Reporting Items for Systematic Reviews and Meta-Analyses- 2020)
Search Strategy: The research literature was searched with Medical Subject Headings (MeSH) and relevant free text terms across a range of electronic databases, such as PubMed (MEDLINE), Embase, Scopus, Web of Science,

Cochrane Central Register of Controlled Trials (CENTRAL), IEEE Xplore, and Google Scholar, to find published randomized controlled trial articles assessing the impact of AI-enabled lifestyle interventions in the prevention and management of T2DM. The search was limited to articles published in English, between January 2020 and December 2025. The following keywords were used in the searches (in combination with each other using AND / OR): "Artificial Intelligence," "Machine Learning," "Deep Learning," "Chatbot," "Virtual Coach," "Virtual Health Coach," "Digital Health," "Mobile Health," "mHealth," "Wearable Devices," "Lifestyle Behavior Change," "Lifestyle Modification," "Diet," "Physical Activity," "Exercise," "Behavior Change," "Type 2 Diabetes Mellitus," "Prediabetes," "Diabetes Prevention," "Glycemic Control," "HbA1c", "Blood Glucose." The search operators (AND, OR) were used to combine the search terms by using Boolean logic operators to include various synonyms and combine multiple concepts. Hand searching was performed by reviewing the reference lists of selected articles and review papers to identify further relevant RCT articles. All initial search hits were excluded or included independently by two separate authors based on the eligibility criteria. The selected articles were summarized based on study characteristic, type of AI-enabled intervention used, comparator, intervention duration, and clinical and behavioral outcomes for prevention and management of T2DM.

Review of Literature

Artificial Intelligence in Diabetes Prevention and Management: Type 2 diabetes mellitus (T2DM) is a major global public health concern, accounting for approximately 90–95% of all diabetes cases. Rapid urbanization, sedentary lifestyles, unhealthy dietary habits, obesity, and population ageing have contributed significantly to its increasing prevalence. Although lifestyle modification remains the cornerstone of diabetes prevention and management, sustaining long-term behavioural changes is often difficult because of poor adherence, limited access to healthcare professionals, and inadequate personalized support. Artificial intelligence (AI) has emerged as a promising solution to address these challenges by delivering individualized, data-driven lifestyle interventions that improve patient engagement and self-management (7,8).

AI-Driven Lifestyle Interventions: AI-driven lifestyle interventions utilize machine learning algorithms, mobile health (mHealth) applications, wearable devices, conversational chatbots, virtual health coaches, and predictive analytics to promote healthy behaviours. These technologies continuously analyse patient-generated data, including dietary intake, physical activity, blood glucose levels, sleep patterns, and medication adherence, to provide personalized recommendations and real-time feedback. Compared with traditional lifestyle counselling, AI-powered interventions offer scalable, accessible, and cost-effective solutions that support continuous monitoring and behavioural modification (10).

Effectiveness of AI-Based Interventions on Glycaemic Control: Several randomized controlled trials have demonstrated the effectiveness of AI-assisted interventions in improving glycaemic outcomes among individuals with prediabetes and T2DM. AI-enabled mobile applications and digital coaching programmes have shown significant reductions in glycated haemoglobin (HbA1c), fasting blood glucose, and body weight while improving dietary adherence and physical activity. A multicentre randomized clinical trial evaluating an AI-powered Diabetes Prevention Program reported that automated AI coaching achieved weight loss and HbA1c improvements comparable to conventional human-led lifestyle coaching, suggesting that AI can effectively expand access to evidence-based diabetes prevention programmes (11).

Role of Wearable Devices and Mobile Health Technologies: Wearable devices integrated with AI algorithms have enhanced diabetes self-management by enabling continuous monitoring of physical activity, heart rate, sleep quality, and glucose trends. Smartphone applications further improve patient engagement through automated reminders, personalized dietary advice, medication alerts, behavioural coaching, and progress tracking. These technologies encourage sustained lifestyle modification and facilitate timely clinical

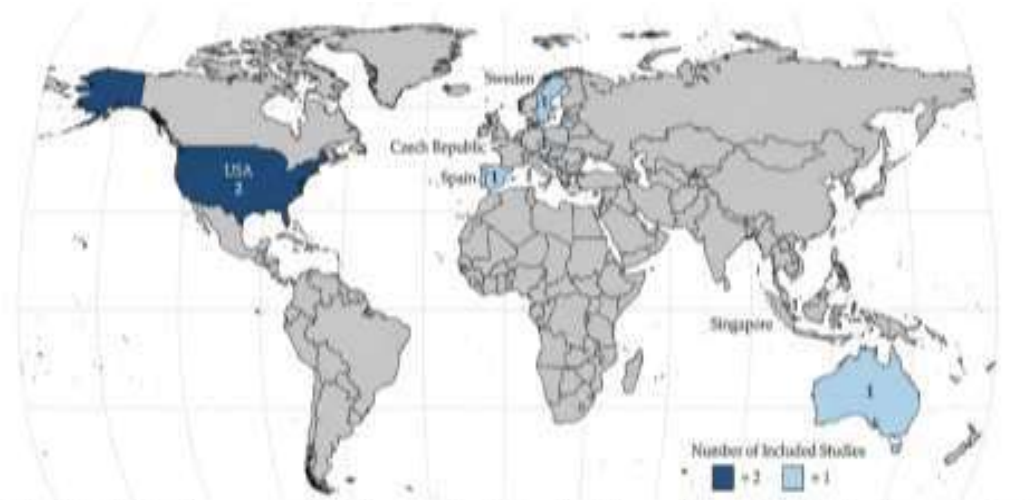
interventions based on real-time health data. Studies have consistently demonstrated improvements in physical activity levels, weight reduction, medication adherence, and overall diabetes self-management among users of AI-supported wearable and mobile health technologies (12).

Evidence from Systematic Reviews: Recent systematic reviews and meta-analyses have highlighted the growing effectiveness of AI-assisted and digital lifestyle interventions for diabetes management. Evidence suggests that AI-supported interventions significantly improve glycaemic control, promote healthier lifestyles, and enhance patient engagement compared with usual care.Nevertheless, considerable heterogeneity exists among studies regarding AI technologies, intervention duration, sample size, and measured outcomes. Furthermore, most published reviews have evaluated digital health interventions broadly rather than specifically focusing on AI-driven lifestyle interventions, thereby limiting conclusions regarding the independent contribution of artificial intelligence (13,14).

Research Gaps: Despite encouraging evidence, several research gaps remain. Existing studies vary considerably in intervention design, follow-up duration, outcome measures, and patient populations, making comparisons challenging. Long-term effectiveness, cost-effectiveness, implementation feasibility, patient acceptability, data privacy, and ethical considerations remain inadequately explored. Moreover, there is limited high-quality evidence synthesizing the effectiveness of AI-driven lifestyle interventions specifically for the prevention and management of T2DM.

Results

Figure 1: Geographic distribution of the included studies (N-7)



The included studies were conducted across North America, Europe, Asia, and Australia, demonstrating the global interest in AI-assisted lifestyle interventions for diabetes prevention and management. However, evidence from low- and middle-income countries remains limited.

The studies incorporated into this review examining the use of AI-supported lifestyle interventions for the prevention and treatment of diabetes spanned across different regions of the world, namely North America, Europe, Asia, and Australia. A greater number of studies emerged from the United States (n=2) than Australia, and Spain, Czech Republic, Singapore and Sweden (n=1). This reflects the increasing number of research papers

describing developments in the area of AI-supported diabetes care, although there remains a lack of evidence from low- and middle- income countries.

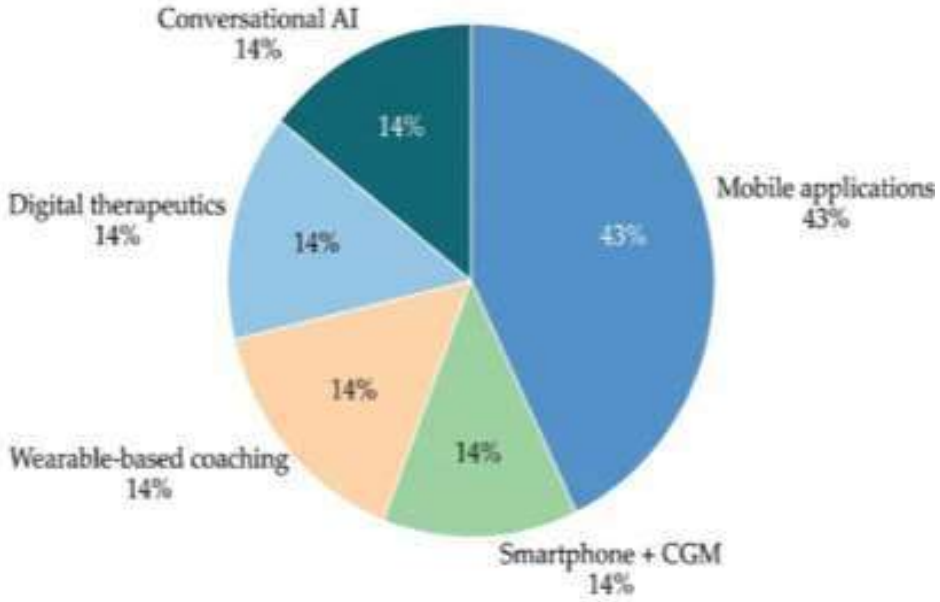


Figure 2: Types of AI assisted lifestyle interventions

Figure 2 illustrates the use of AI-based lifestyle interventions in the studies included in this systematic review can be seen in Figure 3. The most prevalent use of AI-enabled lifestyle interventions was in mobile application-based platforms (43%) with other forms including conversational AI, digital therapeutics, wearable-based coaching and smartphone integrated CGM (14% each). This further depicts the variability between delivery of AI-enabled lifestyle interventions used to promote lifestyle change, self-monitoring and diabetes management. Overall, the most common mode of AI-enabled lifestyle interventions was mobile-based AI methods.

Table 1. Characteristics of Studies Included in the Systematic Review (N = 7)

Author (Year)	Country	Study Design	Population	Sample Size
Mathioudakis et al. (2025)(15)	USA	Randomized Controlled Trial	Prediabetes	599
Ruiz-Leon et al. (2025)(16)	Spain	Randomized Controlled Trial	T2DM	312
My Diabetes Coach Trial (2020)(17)	Australia	Randomized Controlled Trial	T2DM	187
Vitadio Trial (2025)(18)	Czech Republic	Randomized Controlled Trial	T2DM	201
BT-001 Trial (2022)(19)	USA	Randomized Controlled Trial	T2DM	668
Smartphone App + isCGM Trial (2024)(20)	Sweden	Randomized Controlled Trial	High-risk adults	154
iSMART-DM Trial (2025)(21)	Singapore	Randomized Controlled Trial	T2DM	248

Table 1 provides a description of the 7 studies included in this systematic review. All included studies were RCTs published from 2020-2025, providing recent, high quality evidence.13-19. The included studies were conducted in multiple locations across the United States, Australia, Spain, Sweden, Singapore and the Czech Republic providing a broad generalizability.13-19 The studies included adult populations with baseline subjects at high risk of Type 2 diabetes or with T2DM, or prediabetes with sample sizes between 154-668. Overall, the 7 included studies evaluated AI-assisted or intelligent digital lifestyle intervention in a broad scope of healthcare settings.

Table 2. Characteristics of AI-Assisted Lifestyle Interventions Included in the Review

Author (Year)	AI Technology/Platform	Lifestyle Components	Comparator	Duration
Mathioudakis et al. (2025)	AI-powered Diabetes Prevention Program (mobile application with automated coaching)	Diet modification, physical activity, weight management, behavioural coaching, self-monitoring	Human coach-led Diabetes Prevention Program	12 months
Gong et al. (2020) (My Diabetes Coach)	Conversational AI (virtual diabetes educator)	Healthy eating, physical activity, medication adherence, blood glucose monitoring	Usual diabetes care	12 months
Ruiz-Leon et al. (2025) (Greenhabit)	AI-supported mobile behavioural platform	Diet counselling, physical activity, behavioural coaching, goal setting	Standard diabetes education	6 months
Vitadio Trial (2025)	Personalized AI-assisted lifestyle coaching platform	Nutrition counselling, physical activity, weight management	Standard diabetes management	6 months
Hsia et al. (2022) (BT-001)	Digital behavioural therapeutic platform	Healthy eating, exercise, behavioural modification	Standard care + control application	3 months
Smartphone App + isCGM Trial (2024)	Smartphone application integrated with glucose monitoring	Diet, exercise, glucose self-monitoring	Standard lifestyle advice	12 months
iSMART-DM Trial (2025)	Smartwatch-based intelligent coaching system	Physical activity, dietary counselling, medication reminders	Routine diabetes care	9 months

Included seven studies evaluated various AI supported lifestyle interventions, such as mobile application, conversational AI, digital therapeutic platform, and wearables-based intelligent coaching system. The majority of intervention arms comprised at least 3 lifestyle factors such as dietary counselling, physical activity, behavioural coaching, weight management, self-monitoring, and so on. The intervention duration ranged from 3 to 12 months. Standard care of diabetes or general lifestyle counselling were the most frequently used comparators.

Table 3. Clinical Outcomes of AI-Assisted Lifestyle Interventions

Author (Year)	HbA1c	Body Weight	BMI	Physical Activity	Dietary Adherence	Other Outcomes
Mathioudakis et al. (2025)	↓ Significant	↓ Significant	↓	↑ Significant	↑	Increased programme engagement
Gong et al. (2020)	↓	—	—	↑	↑	Improved quality of life and self-management
Ruiz-Leon et al. (2025)	↓ Significant	↓	↓ Significant	↑	↑ Significant	Improved healthy lifestyle behaviours
Vitadio Trial (2025)	↓ Significant	↓ Significant	↓ Significant	↑	↑	Better glycaemic control
Hsia et al. (2022) (BT-001)	↓ Significant	↓	—	↑	↑	Improved behavioural adherence
Smartphone App + isCGM Trial (2024)	↓ Significant	↓ Significant	↓	↑	↑	Improved glucose monitoring adherence
iSMART-DM Trial (2025)	↓ Significant	↓	↓	↑ Significant	↑	Improved medication adherence

Symbols:
↑ = Improvement
↓ = Reduction
— = Not reported

Table 3 illustrates the clinical outcomes showed in general that AI-assisted lifestyle interventions yielded similar benefits across the studies in the included literature. The most common finding was a reduction in HbA1c, then body weight, BMI, physical activity and diet adherence. Other positive behavioural effects were improved medication adherence, self-management, programme adherence and quality of life. These results suggest that that AI-assisted lifestyle interventions can benefit both the control of T2DM and its associated behaviors.

Discussion

The current systematic review with narrative synthesis collated evidence from seven studies in which AI-supported lifestyle interventions were assessed for the prevention and management of T2DM. Overall, it was found that the various AI-supported lifestyle interventions were found to have positive impacts on improving glycaemic control, weight loss, physical activity, dietary adherence, and self-management behaviours. These results indicate that AI has increasingly been established as a useful supplement to traditional diabetes treatment in delivering tailor-made, continual and scalable lifestyle interventions.

Most of the included studies demonstrated statistically significant effect on glycaemic parameters such as significant reduction in HbA1c after intervention using AI prediction models, digital personal coach, conversational AI, adaptable mobile apps and digital therapeutic platforms with tailored recommendations to diet, lifestyle and immediate behavioral feedback to the patient. These results are in line with a recent systematic review of digital health in T2DM which also demonstrated that digital intervention had significant positive effect

on glycaemic control and self-care behavior in people with T2DM; it predicted positive long-term sustained behavioral change and better drug adherence (22,23).

This review highlighted the wide variety of AI technologies used throughout the studies. The most prevalent interventions included mobile health applications, conversational AI, digital therapeutics and smartphone applications with integrated continuous glucose monitors. The use of these technologies was able to facilitate personalized dietary counselling, physical activity monitoring, medication reminders and glucose monitoring and behavioural reinforcement. This personalized approach is consistent with models of precision medicine, where interventions are provided according to individual risk factors and behavioural patterns, in contrast to traditional uniform management strategies (24).

In addition to glycaemic measures, other favourable effects of AI supported interventions were observed on various secondary clinical outcomes which included body weight, BMI, physical activity levels, dietary compliance and diabetes self-care activities. Some of the trials also revealed that, improvements in medication adherence, daily levels of physical activity, dietary compliance and patient engagement was achieved through the provision of AI devices. Such behavioral modifications are vital as lifestyle intervention is considered as the primary strategy for both prevention and long-term management of diabetes. AI devices can maintain the level of patient engagement over time which effectively overcome the limitations of conventional face-to-face counselling including inadequate consultation time and poor long-term adherence (25).

Another interesting aspect was the use of AI interventions in prevention medicine. Interventions delivered to either prediabetic or those at risk of T2DM have shown improvements in lifestyle behaviours that could in turn prevent future development of disease. The use of continuous monitoring and individual behavioral recommendations allowed those in control groups to be identified in the early stages of the disease and motivated individuals to modify their behaviors accordingly. This could in turn have made a further saving in the future burden of diabetes and its many complications, even more so in areas where there is no capacity for intervention due to the limited numbers of medical personnel (26).

The implications are also significant for primary health care systems. AI-supported lifestyle interventions may provide a means of supplementing current delivery of diabetes care through extending support to the public outside of the clinical setting. Automated follow-up, remote monitoring, personalized education and digital feedback could all enhance continuity of care and alleviate pressure on busy practitioners, which could be especially beneficial in low- and middle income countries, where the growing number of people with diabetes is increasingly straining primary health care services (27).

However there was significant heterogeneity across the studies in terms of intervention design, AI technology, length of study, number of participants and outcome measures. While some studies used conversational AI platforms, others used mobile apps combined with wearable devices or digital therapeutics systems. The follow up length was not consistent across the studies so study outcomes could not be directly compared. The heterogeneity was also due to type of behavioural component and patient group used which needs to be taken into consideration when interpreting the pooled evidence. While the methodological quality of the included RCTs was generally acceptable, some trials presented moderate risk of bias due to unblinded participants, incomplete outcome data or followed-up for only short durations. The long-term sustainability of AI-supported lifestyle management programmes has not been adequately addressed. Longer term follows up are necessary in order to assess sustainability of both behaviour change and regulation of glycaemia. In general, the findings support using AI in additional to standard treatment of diabetes to enhance patient engagement, lifestyle behaviour change and improvement in outcomes. Nonetheless, additional multicentre RCTs with a better consistency of intervention method and a more extended follow-up are necessary before AI deployment in clinical practice can be widely accepted.

Strengths of the Study

The current review adopted a broad and systematic search strategy that was conducted on several electronic

databases according to the updated PRISMA 2020. Only primary interventional studies that examined the effects of AI-mediated lifestyle interventions for the prevention and management of T2DM were included in this review, which ensured greater clinical significance. The review integrated the evidence of several different types of AI technologies and assesed on various clinical and behavioural outcome measures providing a robust summary of the overall evidence. Moreover, the review also comprised of articles published in the last twenty years which demonstrates the development of AI in diabetes care.

Limitations of the Study

There are some limitations to be considered. Among them, the first being restriction to the publication in English only, leading to the bias of the language. The second point is the small number of eligible studies, some items were excluded because of it. The third one is the significant heterogeneity among interventions that were applied to different populations, and the reliability of outcome measures varied among trials, as well as the size of follow-up period. Also, some interventions had relative short intervention period so that long-term sustainability could not be evaluated, and the rapid development of technology might generate newer interventions which were not covered in our review.

Implications of the Study

The current review ‘s findings carry important clinical and public health implications, as well as future research directions. AI-enabled self-management programs for diabetes prevention and care could potentially enhance the efficacy of existing lifestyle programs through individualized behavioural modification, ongoing surveillance and feedback, and decreased health care professional involvement. Adoption of AI-enabled digital health tools within primary care could translate to increased patient engagement, adherence to therapy, and sustained disease management. Future trials will require multicentre RCTs with standardized AI tools, extended follow-up periods, cost-effectiveness assessments, and utility in under resourced environments.

Conclusion

Artificial intelligence-powered lifestyle interventions showed promising efficacy in improving diabetes glycaemic management, lifestyle behaviours and self-care management of people with or at risk of T2DM. Mobile applications, conversational AI agents, digital therapeutics and AI-enabled behaviour coaching have all demonstrated beneficial impacts on HbA1c, body weight, physical activity and diet adherence. While the existing evidence supports the integration of AI-supported lifestyle interventions into diabetes management, further large-scale, high-quality RCTs with homogeneous and long follow-up are needed to elicit their long-term effectiveness, cost-effectiveness and scalability in other settings.

References

1. International Diabetes Federation. IDF Diabetes Atlas. 11th ed. Brussels, Belgium: International Diabetes Federation; 2025.
2. GBD 2021 Diabetes Collaborators. Global, regional, and national burden of diabetes from 1990 to 2021, with projections to 2050: a systematic analysis for the Global Burden of Disease Study 2021. Lancet. 2023;402(10397):203-234.
3. American Diabetes Association Professional Practice Committee. 5. Facilitating positive health behaviors and well-being to improve health outcomes: Standards of Care in Diabetes—2025. Diabetes Care. 2025;48(Suppl 1):S79-S94.
4. Knowler WC, Barrett-Connor E, Fowler SE, Hamman RF, Lachin JM, Walker EA, Nathan DM; Diabetes Prevention Program Research Group. Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. N Engl J Med. 2002;346(6):393-403.

5. World Health Organization. Global strategy on digital health 2020–2025. Geneva: World Health Organization; 2021.
6. Fleming GA, Petrie JR, Bergenstal RM, Holl RW, Peters AL, Heinemann L. Diabetes digital app technology: benefits, challenges, and recommendations. Diabetes Care. 2020;43(1):250-260.
7. American Diabetes Association Professional Practice Committee. Facilitating positive health behaviors and well-being to improve health outcomes. In: Standards of Care in Diabetes—2025. Diabetes Care. 2025;48(Suppl 1):S79-S94.
8. Fleming GA, Petrie JR, Bergenstal RM, Holl RW, Peters AL, Heinemann L. Diabetes digital app technology: benefits, challenges, and recommendations. Diabetes Care. 2020;43(1):250-260.
9. World Health Organization. Global strategy on digital health 2020–2025. Geneva: World Health Organization; 2021.
10. Bashi N, Fatehi F, Fallah M, Walters D, Karunanithi M. Self-management education through mHealth applications for patients with type 2 diabetes: a systematic review and meta-analysis. Int J Med Inform. 2018;117:148-154.
11. Sepah SC, Jiang L, Peters AL. Long-term outcomes of a web-based diabetes prevention program: 2-year results of a single-arm longitudinal study. J Med Internet Res. 2015;17(4):e92.
12. Bonoto BC, de Araújo VE, Godói IP, Lemos LL, Godman B, Bennie M, et al. Efficacy of mobile health applications in the self-management of diabetes mellitus: a systematic review and meta-analysis. PLoS One. 2017;12(3):e0174854.
13. Hou C, Xu Q, Li N, et al. Mobile phone applications and self-management of diabetes: a systematic review with meta-analysis, meta-regression of 21 randomized trials. Diabetes Obes Metab. 2018;20(8):2009-2013.
14. Yang Q, Van Stee SK. The comparative effectiveness of mobile phone interventions in improving health outcomes among patients with type 2 diabetes: systematic review and meta-analysis. JMIR Mhealth Uhealth. 2019;7(1):e11200
15. Mathioudakis N, Lalani B, Abusamaan MS, Alderfer ME, Alver D, Dobs A, et al. An AI-powered lifestyle intervention vs human coaching in the Diabetes Prevention Program: a randomized clinical trial. JAMA. 2025;334(23):2079-2089. doi:10.1001/jama.2025.19563.
16. Ruiz-Leon AM, Casas R, Castro-Barquero S, Alfaro-González S, Radeva P, Sacanella E, et al. Efficacy of a mobile health-based behavioral treatment for lifestyle modification in type 2 diabetes self-management: Greenhabit randomized controlled trial. J Med Internet Res. 2025;27:e58319. doi:10.2196/58319.
17. Gong E, Baptista S, Russell A, Scuffham P, Riddell M, Speight J, et al. My Diabetes Coach, a mobile app-based interactive conversational agent to support type 2 diabetes self-management: randomized effectiveness-implementation trial. J Med Internet Res. 2020;22(11):e20322. doi:10.2196/20322.
18. Bretschneider MP, Kolasińska AB, Šomvárska L, Klásek J, Mareš J, Schwarz PEH. Evaluation of the impact of the mobile health app Vitadio in patients with type 2 diabetes: randomized controlled trial. J Med Internet Res. 2025;27:e68648. doi:10.2196/68648.
19. Hsia J, Thomsen M, Ruggiero M, et al. Randomized controlled trial of a digital behavioral therapeutic application to improve glycemic control in adults with type 2 diabetes. Diabetes Care. 2022;45(12):2976-2981. doi:10.2337/dc22-1099.
20. Kitazawa M, Takeda Y, Hatta M, Horikawa C, Sato T, Osawa T, et al. Lifestyle intervention with smartphone application and intermittently scanned continuous glucose monitoring for people at high risk of type 2 diabetes: randomized trial. J Clin Endocrinol Metab. 2024;109(4):1060-1070. doi:10.1210/clinem/dgad639.
21. Jang MK, Cho YK, Moon JY, Min SH, Hwang JH, Jung CH. Impact of smart watch mobile application on the risk treatment of type 2 diabetes mellitus (iSMART-DM). Prim Care Diabetes. 2026;20(1):47-52. doi:10.1016/j.pcd.2025.10.008.
22. Wu Y, Zhang Y, Zhang Y, Li P, Zhang X, Li Y, et al. Effectiveness of digital health interventions for glycemic

control and self-management in patients with type 2 diabetes mellitus: systematic review and meta-analysis. J Med Internet Res. 2023;25:e46302. doi:10.2196/46302.
23. Kitsiou S, Paré G, Jaana M, Gerber B. Effectiveness of mobile health technology interventions for patients with diabetes: a systematic review and meta-analysis. J Med Internet Res. 2017;19(5):e116. doi:10.2196/jmir.5479.
24. Topol EJ. High-performance medicine: the convergence of human and artificial intelligence. Nat Med. 2019;25(1):44-56. doi:10.1038/s41591-018-0300-7.
25. Fleming GA, Petrie JR, Bergenstal RM, Holl RW, Peters AL, Heinemann L. Diabetes digital app technology: benefits, challenges, and recommendations. Diabetes Care. 2020;43(1):250-260. doi:10.2337/dci19-0062.
26. Sepah SC, Jiang L, Peters AL. Long-term outcomes of a web-based diabetes prevention program: 2-year results of a single-arm longitudinal study. J Med Internet Res. 2015;17(4):e92. doi:10.2196/jmir.4052.
27. World Health Organization. Global strategy on digital health 2020–2025. Geneva: World Health Organization; 2021.