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mHealth Apps for Promoting Diabetes Self-Management Behaviors: A Mini-Review of Recent High-Quality Systematic Reviews

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ABSTRACT

Introduction: Mobile health (mHealth) applications have emerged as promising tools to support diabetes self-management, yet their overall effectiveness remains to be systematically evaluated.
Objective: This review evaluates the effectiveness of mobile health (mHealth) apps in promoting diabetes self-management behaviors by synthesizing findings from high-quality systematic reviews published in the last five years.
Method: A comprehensive search was conducted across Scopus, PubMed, Cochrane Library, EBSCO Host, and ProQuest. Six systematic reviews met the inclusion criteria, with a mean AMSTAR quality score of 10.33 out of 11. Reviews were analyzed for clinical outcomes, user engagement, and adherence.
Result: Findings indicate that mHealth apps significantly improve glycemic control, evidenced by reductions in HbA1c levels. Additional benefits include increased user engagement, better adherence, behavioral improvements, and psychosocial outcomes such as reduced anxiety and improved quality of life. However, heterogeneity across studies, challenges related to digital literacy, and concerns about data privacy limit generalizability.
Conclusion: mHealth apps show strong potential to enhance diabetes self-management through clinical and psychosocial benefits. Future work must address barriers such as digital literacy, data security, and variability in intervention quality to support sustained adoption and effectiveness.

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INTRODUCTION

The self-management of diabetes refers to the ongoing process by which diabeticians take an active role in managing their condition to achieve optimal health outcomes (1). This process encompasses monitoring blood glucose levels, adhering to prescribed medications, making informed dietary choices, and engaging in regular physical activity (2). Effective self-management is very crucial since it can significantly reduce the risk of diabetes-related complications (3), such as cardiovascular disease, neuropathy, and retinopathy (4). Studies have shown that individuals who effectively manage their diabetes experience improved quality of life (5), reduced healthcare costs, and lower rates of hospitalization (6).

Mobile health applications (mHealth apps) are digital tools designed to support health and wellness through the use of mobile devices such as smartphones and PC tablets (7,8). mHealth encompasses a broad range of functionalities, from the simple health tracking to complicated clinical decision support systems (9). In terms of the diabetes self-management, the use of mHealth apps has been associated with several benefits (10). A number of clinical studies and systematic reviews have explored the effectiveness of the apps in diabetes management (11). These studies generally report positive outcomes, such as improved glycemic control, improved patient engagement, and better adherence to the treatment plans (12). For instance, a systematic review of mHealth apps found that users of these apps had significant reductions in HbA1c levels compared to the non-users (13).

However, the findings across all the studies above are not entirely consistent, with some reporting no significant differences in clinical outcomes (14). Additionally, research trends indicate a growing interest in the integration of AI and machine learning (ML) technologies in mHealth apps to enhance predictive capabilities and personalized recommendations (15). Despite these advancements, there remain gaps in understanding the long-term sustainability and broader impacts of these technologies on diverse patient populations (16,17). This mini-review addresses these gaps by synthesizing only recent high-quality systematic reviews, providing a focused and updated evaluation of mHealth app effectiveness in diabetes self-management across clinical, behavioral, and psychosocial domains.

METHOD

Search Strategy

To ensure a comprehensive review of the effectiveness of mHealth apps in diabetes self-management, searches were conducted across five major databases—Scopus, PubMed, Cochrane Library, EBSCO Host, and ProQuest—chosen for their extensive coverage of medical, technological, behavioral, and interdisciplinary health research relevant to digital health interventions. A combination of Medical Subject Headings (MeSH) terms and Boolean operators was employed to refine the search (e.g., (“mobile health” OR “mHealth” OR “mobile application”) AND (“diabetes” OR “diabetes mellitus”) AND (“systematic review” OR “meta-analysis”)). The inclusion criteria were limited to systematic reviews and meta-analyses published in peer-reviewed journals from 2020 to 2024. This five-year window was chosen to capture the most recent advances in mHealth technologies and their applications in diabetes care, particularly given the rapid pace of digital health innovation and adoption during and after the COVID-19 pandemic.

Study Selection

The selection process began with an initial screening of titles and abstracts to identify potentially relevant reviews, followed by full-text assessment based on predefined inclusion criteria. As this is a single-author review, all screening and selection procedures were conducted independently by the author. To promote consistency and reduce subjective bias, a self-auditing approach was used: each decision was documented, and potentially ambiguous inclusion cases were revisited after an interval to confirm or revise the decision based on the eligibility criteria. This strategy ensured transparency and replicability in the study selection process despite the single-author design.

Data Extraction and Analysis

A standardized data extraction form was developed to systematically collect relevant information from each included review. Key variables extracted included: author(s), publication year, study objectives, methodology, sample characteristics, primary findings, and conclusions. As this was a single-author review, data extraction was not

performed independently by multiple reviewers. To ensure rigor and minimize bias, the author applied a repeated cross-checking procedure: each extracted data point was verified against the original source in two rounds conducted at separate times. Notes were recorded for any ambiguities and revisited during synthesis to ensure consistency and transparency. Given the heterogeneity in methodologies, populations, and outcomes across the included reviews, a narrative synthesis approach was used to identify and organize key patterns and themes.

Quality Assessment

To assess the methodological quality of the included systematic reviews, the AMSTAR tool (A Measurement Tool to Assess Systematic Reviews) was applied. AMSTAR is a validated and widely used instrument for evaluating the rigor and transparency of systematic reviews, making it especially appropriate for evidence syntheses involving multiple sources. Its use in this study helped ensure that only methodologically sound reviews contributed to the analysis. As this was a single-author review, AMSTAR scoring was conducted solely by the author. To enhance objectivity, each of the 11 criteria was assessed in two independent rounds, spaced several days apart. Any discrepancies between rounds were resolved by re-evaluating the review in question using the official AMSTAR explanatory guidance to ensure consistent interpretation of criteria. No third-party adjudication was involved; instead, a self-auditing procedure ensured transparency and internal consistency throughout the quality assessment process.

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RESULTS

An extensive literature search was carried out over three months (from December 2023 to February 2024) across various databases to assess the effectiveness of mHealth apps in the diabetes self-management. This initial search yielded a total of 309 research articles. The contributions from each database were as follows: PubMed provided 11 articles, Scopus contributed the largest number with 118 articles, the Cochrane Library yielded 53 articles, EBSCO contributed 26 articles, and ProQuest added 101 articles to the pool. Following the removal of 51 duplicate records, 258 articles were screened based on titles and abstracts. This screening process resulted in the exclusion of 232 articles that did not meet the eligible criteria. The remaining 26 papers underwent a full-text review to assess eligibility, during which 20 articles were further excluded based on specific criteria: 9 were not focused on mobile-app interventions, 8 did not conform to systematic literature review (SLR) designs, and 3 did not focus on self-management as the primary study objective (Figure 1).

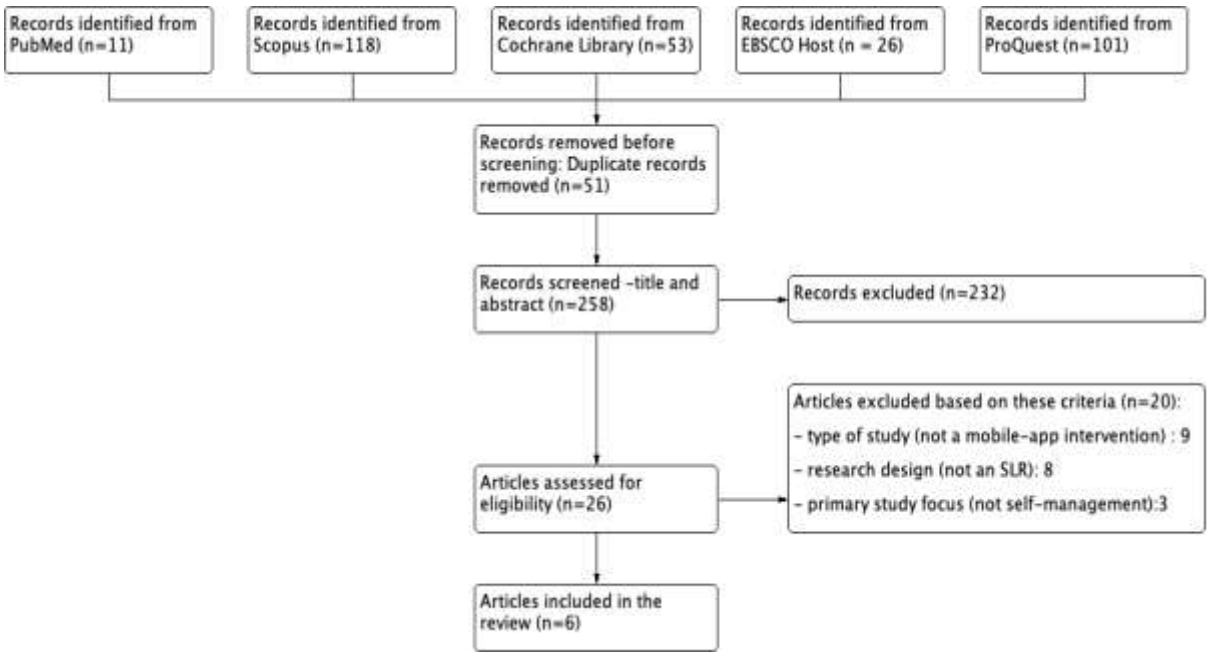

Figure 1. The PRISMA flowchart of this study

Study Characteristics

The six included systematic reviews were published between 2020 and 2023 and represent diverse geographical contexts, including North America, Europe, and Asia (Table 1). Populations studied ranged from adults with Type 1 and Type 2 diabetes to pregnant women with gestational diabetes mellitus (GDM). Sample sizes varied widely—from approximately 100 participants to several thousand—supporting the robustness of the synthesized findings. Each review evaluated a variety of mHealth tools, often incorporating features like lifestyle tracking, personalized feedback, and remote monitoring. For instance, Garg et al. (2020) focused on GDM-specific apps such as Pregnant+ and GDm Health, emphasizing their potential to improve compliance and personalized care. Kruse et al. (2023) reported that mHealth SMS combined with telemedicine coaching significantly improved clinical metrics like HbA1c, BMI, and disease awareness. Similarly, Safiee et al. (2022) highlighted usability and motivational benefits, though they noted challenges with privacy and technical barriers. Wang et al. (2022) found increased compliance and reduced NICU admissions but minimal effects on HbA1c. Nkhoma et al. (2021) showed improvements in medication adherence and clinical outcomes, while Mao et al. (2020) emphasized enhanced clinical results, particularly when mHealth was paired with professional healthcare management.

All the findings from Table 1 below support a consistent theme: mHealth apps can positively influence clinical outcomes, user engagement, and self-management behaviors, though implementation challenges remain. While formal statistical heterogeneity was not assessed due to the narrative nature of this mini-review, substantial variability was observed across reviews in terms of intervention types, target populations, and measured outcomes. This conceptual and methodological heterogeneity informed the decision to use a narrative synthesis approach.

Table 1. Demographic characteristics of the included studies

Authors	Study Objectives	Methodology	Key Findings	Conclusion
Garg et al. (2020)	To investigate the awareness and use of smartphone applications for the management of GDM among pregnant women.	The study followed a systematic review approach using a 5-stage framework which included research question identification, identification of articles, article selection, data collection, and result reporting.	The review highlighted the use of mobile apps like Pregnant+, MobiGuide, and GDm health for GDM management.	The study findings underscore the potential of mobile health interventions as valuable tools in managing GDM and improving health outcomes for pregnant women.
Kruse et al. (2023)	To objectively analyze recent research to assess the effectiveness of mHealth interventions for managing diabetes in older patients, and to analyze patient satisfaction, quality, and barriers to adoption of mHealth.	The interventions were assessed for their impact on health outcomes like BMI, weight loss, diet, exercise, HbA1C, disease awareness, blood pressure, cholesterol, medication adherence, and foot care.	The study found that mHealth SMS coupled with telemedicine for coaching was the most effective intervention, showing significant improvements in a variety of health metrics including weight loss, BMI, diet, exercise, HbA1C, disease awareness, blood pressure, cholesterol, medication adherence, and foot care.	mHealth interventions, particularly mHealth SMS coupled with telemedicine for coaching, help in behavior modification, improving various health metrics, and enhancing patient satisfaction.
Safiee et al. (2022)	To identify the views of health professionals (HPs) and women with GDM regarding the use of eHealth for GDM self-management, and to	This systematic literature review followed the PRISMA approach, with searches conducted in databases such as MEDLINE, CINAHL, Embase, ACM, and IEEE. The review included 26 papers	The review identified four main themes: benefits of using technology, engagement with people via technology, usability of technology, and	The study concluded that eHealth technologies offer significant benefits for the self-management of GDM, particularly in terms of convenience,

	investigate the usability and user satisfaction levels when using these technologies.	published between January 2008 and September 2021.	discouragement factors for the use of technology.	motivation, and self-management practices.
Wang et al. (2022)	To examine the effects of smartphone-based lifestyle interventions on compliance, HbA1c, maternal outcomes, infant outcomes, psychological status, satisfaction, and cost-effectiveness among women with GDM.	This systematic review and meta-analysis included 10 randomized controlled trials (RCTs) involving 1626 participants. The studies were selected from databases such as PubMed, Embase, Web of Science, CINAHL, and Cochrane Library, covering articles published from January 2007 to March 2022.	The review found that smartphone-based lifestyle interventions significantly improved compliance (SMD = 7.36, 95% CI = 4.05 to 10.68, P < 0.0001) and reduced the incidences of NICU admission (RR = 0.64, 95% CI = 0.47 to 0.86, P = 0.003).	These interventions are promising tools for supporting GDM management, although further high-quality RCTs are necessary to explore their long-term effects and cost-effectiveness. Addressing the challenges related to usability, technical issues, and privacy concerns is essential for optimizing these systems.
Nkhoma et al. (2021)	To conduct a systematic review and meta-analysis of interventional studies to investigate the impact of diabetes self-management education and support (DSMES) apps on adherence in patients with type 2 diabetes mellitus (T2D).	This systematic review and meta-analysis included six randomized controlled trials (RCTs) involving 696 participants with an average age of 57.6 years.	The study found that DSMES apps significantly improved medication adherence (SMD=0.393, 95% CI 0.17 to 0.61), HbA1c (MD=-0.314, 95% CI -0.477 to -0.151), and BMI (MD=-0.28, 95% CI -0.545 to -0.015) at three months compared to usual care.	The study concluded that DSMES apps have significant small to moderate effects on medication adherence, HbA1c, and BMI for patients with T2D compared to usual care.
Mao et. al (2020)	To evaluate the impact of mobile health (mHealth) interventions on the management of diabetes and hypertension in countries with different economic levels.	The study employed a systematic review and meta-analysis approach, including 51 randomized controlled trials (RCTs) with 13,054 participants. The data was sourced from PubMed, ResearchGate, Embase, and Cochrane databases, covering articles published from January 2008 to June 2019.	The meta-analysis revealed that mHealth interventions significantly improved clinical outcomes compared to conventional care. Specific improvements were noted in HbA1c (WMD = -0.39), fasting blood glucose (WMD = -0.52), systolic blood pressure (WMD = -2.99), and diastolic blood pressure (WMD = -1.14).	The combination of mHealth with professional healthcare management is particularly beneficial, suggesting that human intelligence plays a critical role in enhancing the effectiveness of mHealth interventions.

Quality Assessment

The effectiveness of mHealth apps in managing diabetes has been demonstrated through significant improvements in clinical outcomes, particularly reductions in HbA1c levels. For example, a review by Garg et al. (2020), which was assessed as having moderate methodological quality based on an AMSTAR score of 7, reported improvements in glycemic control among users of apps like Pregnant+, MobiGuide, and GDm Health for GDM

management. Similarly, Kruse et al. (2023) and Mao et al. (2020)—both high-quality reviews—found that mHealth interventions significantly improved HbA1c levels, BMI, and other health metrics, especially when integrated with telemedicine or professional support services.

Table 2. AMSTAR Assessment of Systematic Reviews with Global Rating and Mean Score

Criteria	Garg et al.	Kruse et al.	Safiee et al.	Wang et al.	Nkhoma et al.	Mao et al.
Protocol registered	0	1	1	1	1	1
Literature Search Duplicate	0	1	1	1	1	1
Comprehensive Literature Search	1	1	1	1	1	1
Status of Publication	0	1	1	1	1	1
List of Studies Included/Excluded	1	1	1	1	1	1
Characteristics of Included Studies	1	1	1	1	1	1
Scientific Quality Assessed	1	1	1	1	1	1
Quality Used in Conclusion Formulation	1	1	1	1	1	1
Appropriate Methods to Combine Findings	0	1	1	1	1	1
Assessment of Publication Bias	1	1	1	1	1	1
Conflict of Interest	1	1	1	1	1	1
Total Score	**7**	**11**	**11**	**11**	**11**	**11**
Mean Score						**10.33**

Effectiveness of mHealth Apps in Diabetes Self-Management: Clinical Outcomes

The effectiveness of mHealth apps in diabetes management is evident through measurable improvements in clinical outcomes, most notably reductions in HbA1c, a critical marker of glycemic control. A review by Garg et al. (2020), assessed as having moderate methodological quality, reported qualitative evidence of improved HbA1c control in users of GDM-focused apps such as Pregnant+, MobiGuide, and GDm Health (18). While specific effect sizes were not pooled, the review emphasized user-reported improvements and increased compliance. Kruse et al. (2023) provided more detailed outcomes, reporting statistically significant reductions in HbA1c and improvements in weight, BMI, and disease awareness when mHealth SMS interventions were combined with telemedicine coaching (19). Safiee et al. (2022) did not pool HbA1c data but synthesized user-reported improvements in glucose control and convenience for GDM self-management (20). However, Wang et al. (2022) included 10 RCTs in a meta-analysis, finding no significant effect on HbA1c (Mean Difference [MD] = -0.19; 95% CI: -0.52 to 0.14; P = 0.26), but did report significant improvements in treatment compliance and a 36% reduction in NICU admissions (Relative Risk [RR] = 0.64; 95% CI: 0.47 to 0.86; P = 0.003) (21). Additionally, Mao et al. (2020) synthesized results from 51 RCTs, reporting significant reductions in HbA1c (Weighted Mean Difference [WMD] = -0.39), fasting blood glucose (WMD = -0.52), and systolic/diastolic blood pressure (WMD = -2.99 and -1.14, respectively) across both high- and low-income settings (22), while provided pooled results from six RCTs, showing significant reductions in HbA1c (MD = -0.31; 95% CI: -0.48 to -0.15), along with improved medication adherence and BMI (11).

Although no cross-review meta-analysis or direct effect size comparison was conducted in this mini-review due to methodological heterogeneity, the inclusion of reported pooled statistics where available allows for an appreciation of the magnitude of clinical benefits associated with mHealth app use. Together, these findings support the conclusion that mHealth apps, especially when integrated with coaching or healthcare professional oversight, can produce clinically meaningful improvements in diabetes outcomes.

Patients Engagement and Adherence

Patient engagement and adherence are critical components in evaluating the effectiveness of mHealth apps for diabetes management. Across the included reviews, these outcomes were assessed through metrics such as app usage frequency, treatment plan adherence, and adoption of self-care behaviors. Several consistent themes emerged across studies. For example, Real-time feedback and data monitoring were frequently cited as key facilitators of engagement. Both Garg et al. (2020) and Wang et al. (2022) emphasized the role of real-time feedback in encouraging consistent app use and compliance, particularly in gestational diabetes and lifestyle interventions, respectively (18).

Wang et al. reported a significant improvement in treatment compliance (SMD = 7.36; 95% CI: 4.05 to 10.68; P < 0.0001), although medication adherence to broader clinical recommendations was more variable. Meanwhile, personalization and coaching also played a critical role. Kruse et al. (2023) and Safiee et al. (2022) highlighted that features such as individualized messaging, telemedicine support, and tailored goal-setting contributed to improved engagement, motivation, and long-term adherence (19). Apps that incorporated behavior change techniques and human interaction were more likely to sustain user participation over time. Additionally, usability and interface design emerged as another key determinant. Simplified navigation, intuitive layouts, and the inclusion of peer support features were positively associated with user satisfaction and adherence in Safiee et al. (2022) and Garg et al. (2020) (18). Together, these findings indicate that mHealth app features such as real-time monitoring, personalization, and user-friendly design may enhance both patient engagement and adherence to diabetes self-management strategies.

Behavioural and Psychosocial Outcomes

mHealth apps have shown considerable influence on behavioral and psychosocial outcomes in diabetes management, particularly in promoting self-efficacy, improving quality of life, and enhancing patient empowerment. For example, Garg et al. (2020) and Kruse et al. (2023) reported that these apps support the development of self-management skills and build patient confidence, leading to improved health behaviors and a greater sense of control over diabetes (18, 19). Behavioral changes such as healthier eating habits, increased physical activity, and regular glucose monitoring were consistently observed across studies. Meanwhile, Safiee et al. (2022) highlighted that features such as personalization, goal-setting, and peer support mechanisms helped motivate users to adopt and maintain lifestyle modifications (20). Psychosocial benefits reported across reviews included reduced anxiety and stress, improved mood, and enhanced emotional support, especially when apps offered interactive components like community forums or messaging tools. Comparatively, interventions that integrated human support (e.g., telemedicine coaching, peer support, or healthcare provider interaction) appeared to yield more substantial psychosocial improvements than app-only interventions. For instance, reviews by Kruse et al. (2023) and Safiee et al. (2022) found stronger effects on empowerment and mood when real-time guidance or social connection was available (19, 20). In contrast, app-only interventions lacking interactive features were more limited in psychosocial impact, primarily offering benefits in behavior tracking rather than emotional support.

Despite these benefits, several challenges were identified. Digital literacy barriers may hinder adoption among older adults, low-income users, or individuals with limited education, potentially exacerbating health disparities. Some users may struggle to navigate app interfaces or interpret data, reducing sustained engagement. Privacy concerns related to the handling of personal health data can also limit trust in mHealth solutions. Lastly, cost-related barriers, including smartphones, data plans, and subscription fees, remain particularly problematic in underserved populations. These findings highlight the need for inclusive, user-centered mHealth design—featuring simple interfaces, transparent privacy practices, and integration with human support systems—to optimize psychosocial outcomes and long-term engagement.

DISCUSSION

All six included systematic reviews examining mHealth apps for diabetes self-management report meaningful improvements in clinical, behavioral, and psychosocial outcomes. Interventions incorporating features like real-time data feedback, personalized coaching, and telemedicine were consistently associated with improvements in glycemic control, as evidenced by reductions in HbA1c levels in studies such as Garg et al. (2020), Kruse et al. (2023), and Mao et al. (2020) (18), (19), (22). These findings highlight the potential of mHealth apps to complement traditional diabetes care by empowering patients with greater control and convenience. Compared with earlier reviews, such as Cui et al. (2016) and Bene et al. (2019)—which noted inconsistent evidence regarding clinical outcomes—this mini-review improves upon prior work in several key ways (23, 24). First, it restricts inclusion to systematic reviews published within the past five years, ensuring that the evidence base reflects recent advances in app technology, AI integration, and telemedicine capabilities. Second, it applies a quality filter using the AMSTAR tool, which was not consistently used in earlier reviews, allowing the synthesis to focus on high-quality, methodologically robust studies. Third, it provides a more integrated evaluation across clinical, behavioral, and psychosocial outcomes, whereas earlier reviews often focused narrowly on glycemic control or technical feasibility.

Additionally, Kitsiou et al. (2017) had emphasized the need for more rigorous and recent evaluations of mHealth interventions in diabetes care—a gap this review begins to address by focusing on contemporary, high-scoring systematic reviews (25).When compared with earlier literature, such as reviews by Cui et al. (2016) and Bene et al. (2019), which noted inconsistent evidence regarding clinical outcomes, the current mini-review provides more recent and methodologically robust studies that help clarify prior uncertainties (23), (24). Likewise, Kitsiou et al. (2017) called for more rigorous and up-to-date evidence, which this review begins to address (25). However, it is important to interpret these findings with caution. Only six systematic reviews met the inclusion criteria, limiting the generalizability of conclusions. Additionally, many included reviews relied on narrative synthesis rather than pooled meta-analytic estimates, which constrains the strength of inference regarding effect sizes. Thus, while the evidence points toward promising outcomes, more high-quality meta-analyses and broader sampling of diverse populations are needed to establish definitive conclusions.

The implications for diabetes management and healthcare practice are substantial. mHealth interventions enable more frequent and accurate monitoring of blood glucose levels, contributing to improved glycemic control, as observed across multiple studies. For example, Garg et al. (2020) demonstrated that the Pregnant+ app automated glucose tracking for patients with gestational diabetes mellitus, thereby improving ease of use and compliance (18). Similarly, Kruse et al. (2023) found that integrating mHealth apps with telemedicine services provided patients with personalized, real-time coaching that enhanced clinical outcomes and patient empowerment (19). These practical benefits align with key domains of the RE-AIM framework—particularly in terms of Reach (wider access via mobile devices), Effectiveness (improved outcomes), and Implementation (feasibility of integration into care workflows). Applying such frameworks can help healthcare systems evaluate not only the clinical efficacy of mHealth tools but also their scalability and sustainability in real-world settings (26).

In addition to clinical benefits, mHealth apps have shown notable improvements in user engagement and adherence. Studies consistently reported high levels of engagement, which may be attributed to the convenience and personalization offered by these digital tools. For example, Safiee et al. (2022) found that personalization features and peer support mechanisms potentially facilitated higher user satisfaction and adherence to diabetes self-management protocols (18). These findings align with the Technology Acceptance Model, which suggests that perceived ease of use and usefulness are important factors influencing user engagement.

The behavioral and psychosocial outcomes associated with mHealth apps are equally noteworthy. Improvements in self-efficacy, quality of life, and patient empowerment were common themes across the reviewed studies. For instance, Garg et al. (2020) and Kruse et al. (2023) reported that mHealth interventions may contribute to increased confidence in managing diabetes, which is associated with healthier dietary habits and increased physical activity (18), (19). These behavioral changes are likely important for sustaining long-term diabetes control and improving overall health outcomes. Psychosocial benefits such as reduced anxiety, improved mood, and increased social support were also reported, particularly in apps with integrated communication or community features. However, challenges like limited digital literacy, privacy concerns, and affordability were also noted and may hinder widespread adoption. These issues suggest the need for more inclusive and secure mHealth designs (27,28). Comparative studies from the past five years support these trends. For example, Kim et al. (2020) concluded that personalized feedback in mHealth apps may improve engagement and adherence in chronic disease management (29). Other studies has also noted that mHealth apps can potentially bridge communication gaps between patients and providers, facilitating better monitoring and care continuity (30–33).

This review has several limitations that warrant consideration. First, there was significant heterogeneity across the included systematic reviews in terms of study design, participant populations, intervention types, and outcome measures. This variability limited the ability to conduct direct comparisons or synthesize quantitative data and may introduce interpretive bias. Future research should standardize outcome metrics and intervention reporting to facilitate cross-study comparison and meta-analysis. Second, many primary studies included within the systematic reviews relied on self-reported data, which are susceptible to recall bias and social desirability bias, potentially affecting the reliability of reported outcomes. Incorporating objective health metrics (e.g., device-recorded data) in future trials could strengthen the evidence base. Third, only studies published in English were included, which may have led to language bias and the exclusion of relevant research conducted in non-English-speaking countries. Future reviews should consider multilingual searches or collaboration with international scholars to expand language

coverage. Fourth, many of the original studies synthesized in the reviews featured relatively short follow-up durations, making it difficult to assess the long-term sustainability and impact of mHealth interventions on diabetes outcomes. Longitudinal studies with follow-up periods of 12 months or more are needed to assess enduring behavioral and clinical changes. Lastly, the included apps varied widely in their features, functionality, and user interfaces—ranging from basic tracking tools to complex platforms integrated with AI or telemedicine. Future evaluations should include subgroup analyses to isolate the effects of specific app components and better understand which features drive outcomes in particular user populations.

CONCLUSION

This mini-review highlights the substantial potential of mHealth apps to improve diabetes self-management by demonstrating benefits across clinical, behavioral, and psychosocial domains. The evidence supports the role of these technologies in enhancing glycemic control, promoting user engagement, and improving quality of life. However, challenges such as digital literacy barriers, data privacy concerns, and variability in app features must be addressed to ensure equitable and sustainable use. Future research should prioritize long-term evaluations of mHealth interventions, with particular attention to their effectiveness across diverse populations and healthcare settings. Additionally, studies should explore strategies to improve accessibility and usability, especially for underserved groups, to fully realize the promise of digital health tools in diabetes care. To support scalable and equitable adoption, policymakers should also consider frameworks that incentivize integration of validated mHealth tools into routine diabetes care and reimbursement models.

AUTHOR'S CONTRIBUTION STATEMENT

The sole author, MT Ghozali, was responsible for the conceptualization, methodology, investigation, formal analysis, data curation, writing – original draft, writing – review and editing, visualization, supervision, and project administration of this study. The author attests that they meet the criteria for authorship and approves the final version of the manuscript.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest relevant to the content of this study.

DECLARATION OF GENERATIVE AI AND AI-ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

During the preparation of this manuscript, the authors used DeepL (for translation assistance) and Grammarly (for grammar and language refinement) to support the writing process. The authors critically reviewed, edited, and approved the final version of the manuscript. The intellectual content, scientific interpretation, and conclusions are entirely the work of the authors.

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