Review Article

Effectiveness of Self-Management Support Programs Among People with Type 2 Diabetes Mellitus: A Systematic Review

Sutthiwit Panchaisee

Sutthiwit Panchaisee

Preventive Medicine, Samrong General Hospital, Samutprakarn 10270, Thailand.

*Address Correspondence to author:
Sutthiwit Panchaisee, MD.
Preventive Medicine
Samrong General Hospital
1748 Sukhumvit Rd
Soi 78 North Samrong
Samutprakarn 10270, Thailand.
email: sutthiwit.p@gmail.com

Received: March 10, 2025
Revision received: April 1, 2025
Accepted after revision: September 17, 2025
BKK Med J 2025;21(2): 175-182.
DOI: 10.31524/bkkmedj.2025.23.002
www.bangkokmedjournal.com

Abstract

OBJECTIVES: This systematic review aims to evaluate the impact of self-management support programs on clinical, behavioral, and psychosocial outcomes among adults with T2DM.

MATERIALS AND METHODS: This systematic review evaluates the effectiveness of self-management support programs on clinical, behavioral, and psychosocial outcomes among T2DM patients. A comprehensive literature search was conducted across PubMed, EMBASE, Cochrane Library, CINAHL, and Web of Science for randomized controlled trials (RCTs) published between 2012 and 2024. Eligible studies included adult T2DM patients participating in self-management interventions and reporting at least one relevant outcome, such as glycemic control (HbA1c), self-care behaviors, quality of life, or psychosocial factors. Methodological quality was assessed using the Cochrane Risk of Bias tool.

RESULTS: Of 2,485 studies identified, 15 met inclusion criteria. Self-management support programs significantly improved HbA1c levels, with a mean reduction of 0.48% (95% CI: -0.64 to -0.32) compared to standard care. Multi-component interventions (including education, behavioral strategies, and technology support) were more effective than single-component programs. Technology-enabled interventions demonstrated comparable efficacy to traditional face-to-face programs. Culturally tailored approaches were particularly beneficial for minority ethnic groups. However, the long-term sustainability of these interventions beyond 12 months remains uncertain.

CONCLUSION: Self-management support programs effectively enhance glycemic control and self-care behaviors, especially when multi-faceted, technology-supported, and culturally adapted. Future research should focus on long-term effectiveness, implementation in resource-limited settings, and standardized reporting of behavioral and psychosocial outcomes.

Keywords: type 2 diabetes mellitus, self-management, patient education, glycemic control, systematic review

Type 2 Diabetes Mellitus (T2DM) represents a pressing global health challenge in the 21st century. The International Diabetes Federation (IDF) reports that approximately 537 million adults worldwide (aged 20-79 years) are currently affected, with forecasts projecting an increase to 783 million by 2045.[1] In Thailand, over 4 million adults are affected, driven by factors including urbanization, obesity, and sedentary lifestyles.[2] T2DM increases risks of cardiovascular disease, neuropathy, retinopathy, and renal failure, placing substantial economic burdens on healthcare systems, particularly in low- and middle-income countries (LMICs).[3] Beyond its toll on individual well-being, T2DM exerts a profound burden on healthcare systems and economies, particularly in low- and middle-income countries where its prevalence is surging due to shifting lifestyles-characterized by diets high in sugar and fat, sedentary behavior, and rising rates of overweight and obesity. Managing T2DM is inherently complex, necessitating ongoing medical oversight paired with robust patient self-management to mitigate short-term risks, such as hypoglycemia or hyperglycemia, and long-term complications, including cardiovascular disease, renal failure, vision loss, and limb amputation.

Self-management, defined as the ability to monitor symptoms, adhere to treatment, manage physical and psychosocial impacts, and adapt lifestyle behaviors, is central to effective T2DM care.[4] Self-management support programs, endorsed by the American Diabetes Association, integrate education, dietary guidance, physical activity promotion, medication adherence, and psychosocial support.[5] These programs vary in delivery methods (face-to-face sessions, group workshops, digital platforms), intensity, duration, and theoretical frameworks such as Social Cognitive Theory or Health Belief Model.[6] Despite widespread adoption, effectiveness varies due to cultural differences, resource constraints, and technological barriers. Prior systematic reviews report HbA1c reductions of 0.3-0.7% but are limited by outdated data, narrow scopes, or insufficient focus on diverse populations.[7-9] This systematic review synthesizes recent RCTs (2012-2024) to evaluate the effectiveness of self-management programs on clinical, behavioral, and psychosocial outcomes, identifying characteristics of effective interventions for global application.

Nevertheless, these programs encounter significant obstacles, including resource constraints in certain regions, cultural variations influencing uptake, and technological literacy barriers among older patients. Although widely adopted, their effectiveness remains inconsistent. Research reveals a spectrum of outcomes: some studies demonstrate marked improvements in glycemic control and self-care behaviors, while others report modest or transient benefits. Prior systematic reviews and meta-analyses have offered valuable perspectives on specific intervention facets, yet they are often limited by narrow scopes, outdated technological contexts, or insufficient exploration of critical variables such as participant diversity, care setting differences, and long-term follow-up-gaps that persist in the current evidence base. This systematic review seeks to consolidate the most recent and comprehensive evidence on the effectiveness of self-management support programs for T2DM patients, evaluating outcomes across clinical (notably HbA1c), behavioral, quality-of-life, and psychosocial domains. Additionally, it aims to delineate characteristics of highly effective programs, assess the role of technology-driven interventions, and examine the durability of outcomes over time.

These findings hold substantial implications for clinicians, health educators, policymakers, and researchers tasked with designing and implementing impactful interventions for the expanding global T2DM population. This is especially pertinent across varied economic, social, and cultural landscapes, where addressing escalating needs and reducing preventable complications are paramount.

Materials and Methods

This systematic review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses PRISMA 2020 guidelines[10] to ensure a structured and transparent approach to synthesizing evidence. The study protocol was prospectively registered with PROSPERO (registration number available upon request) prior to initiation, reinforcing methodological rigor and accountability throughout the review process.

Search Strategy

A comprehensive literature search was conducted across five major electronic databases: PubMed/MEDLINE, EMBASE, Cochrane Central Register of Controlled Trials (CENTRAL), CINAHL, and Web of Science. The search covered articles published between January 1, 2012, and December 31, 2024, to ensure the inclusion of recent studies reflecting current clinical practices and technological advancements in T2DM care.

The search strategy was developed in collaboration with a medical librarian and was guided by the PICO framework:

- **P**opulation: Adults diagnosed with type 2 diabetes mellitus.
- **I**ntervention: Self-management strategies, patient education, behavior change, and lifestyle interventions.
- **C**omparison: Not explicitly specified in the search to maximize sensitivity.
- **O**utcome: Not included as keywords during search execution to avoid narrowing the scope; outcomes were assessed during the study selection phase.

Limited to randomized controlled trials (RCTs) to ensure a high level of evidence

The strategy combined both controlled vocabulary (e.g., MeSH terms in PubMed) and relevant free-text terms. Key search terms included but were not limited to: "type 2 diabetes mellitus," "self-management," "patient education," "behavior change," "lifestyle intervention," and "randomized controlled trial." Boolean operators (AND, OR) and truncation symbols (e.g., *) were applied appropriately to enhance the sensitivity and specificity of the search.

In addition, manual searches of the reference lists from all included articles and relevant prior systematic reviews were conducted to identify additional eligible studies not captured in the initial database queries. Full details of search strings tailored to each database are provided in Appendix A.

Inclusion Criteria

Randomised controlled trials (RCTs) that meet the following conditions:

1. Adult participants (≥18 years) diagnosed with type 2 diabetes mellitus (T2DM).
2. Interventions focusing on self-management components, including education, dietary guidance, physical activity, medication adherence, or technology-based tools.
3. Reporting at least one primary outcome: glycaemic control (HbA1c), self-care behaviours, or psychosocial measures.
4. Published in English between January 2012 and December 2024.
5. Minimum follow-up duration of 3 months.

ISSN 2287-0237 (online)/ 2228-9674 (print)
(Free to Processing fees & Free to Publish & Free to Read) No hidden charges

Exclusion Criteria

Studies will be excluded if they meet any of the following:

1. Involving participants with type 1 diabetes, gestational diabetes, or individuals younger than 18 years.
2. Employing non-randomised study designs.
3. Interventions not specifically targeting T2DM self-management.
4. Not reporting predefined primary outcomes (HbA1c, self-care behaviours, or psychosocial measures).
5. Follow-up duration of less than 3 months.

Data Extraction and Quality Assessment

The reviewer independently screened titles, abstracts, and full texts according to predefined eligibility criteria. Data extraction included study characteristics, participant demographics, intervention details, outcomes, and implementation factors. The methodological quality of included studies was assessed using the Cochrane Risk of Bias 2 (RoB 2) tool.[11]

Statistical Analysis

Random-effects meta-analysis was performed for HbA1c outcomes using Review Manager 5.4. Mean differences with 95% confidence intervals were calculated. Heterogeneity was assessed using I^2 statistics. Subgroup analyses explored intervention characteristics and participant attributes. Publication bias was evaluated using funnel plots and Egger's test. Statistical significance was set at $p < 0.05$.

Results

Study Selection

The systematic search across five databases yielded 2,485 records (2,455 from databases, 30 from manual searches). After removing 485 duplicates, 2,000 records were screened, with 1,871 excluded. From 129 full-texts assessed, 114 were excluded (68 non-RCTs, 28 lacking primary outcomes, 18 pre-2012). Ultimately, 15 RCTs (n = 3,280) The selection process, adhering to PRISMA guidelines is illustrated below in Figure 1.

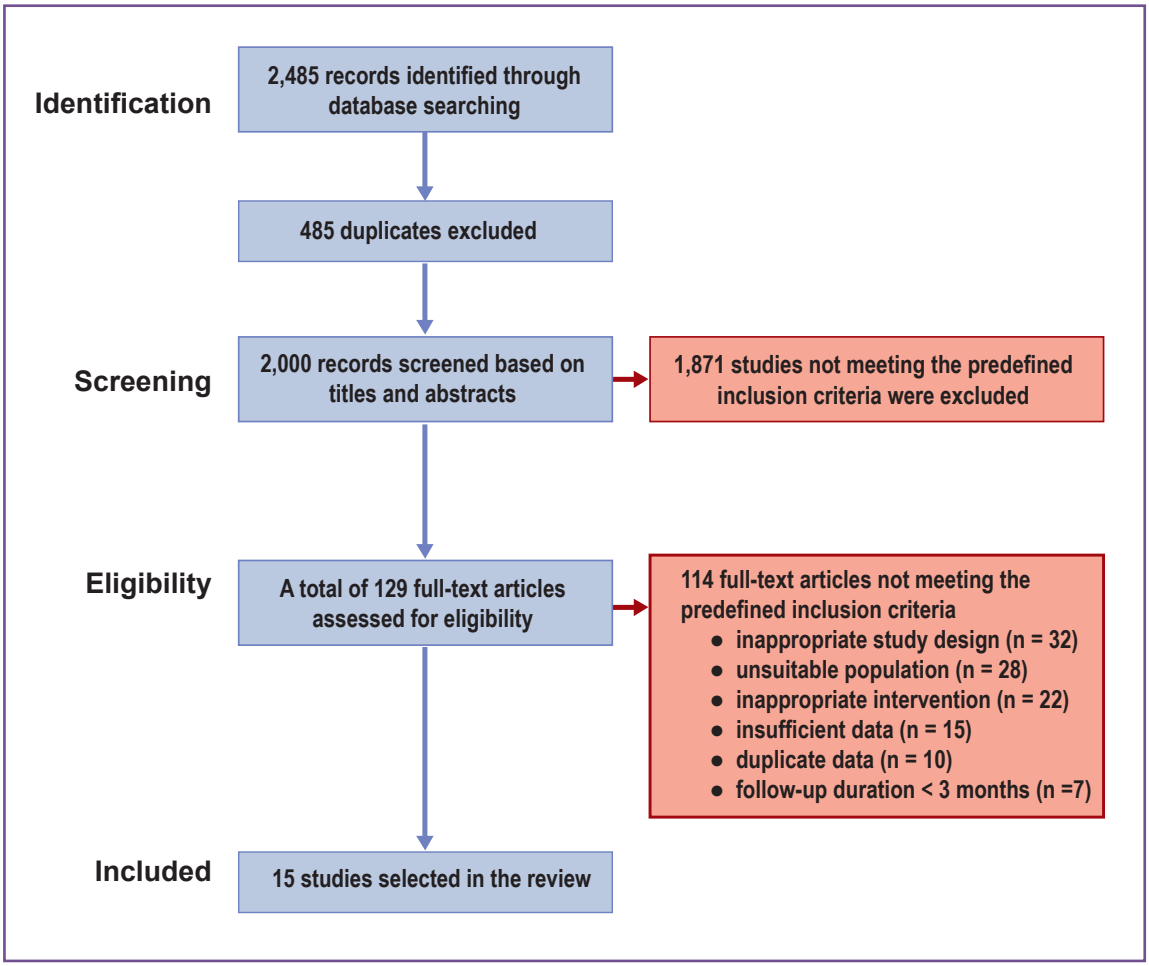

Figure 1: PRISMA diagram of the study selection process, illustrating the identification, screening, eligibility assessment, and inclusion of studies. A standard PRISMA flow diagram with the following stages: Identification (2,485 records), Screening (2,000 after duplicates removed, 1,871 excluded), Eligibility (129 full-texts assessed, 114 excluded), and Included (15 studies).

ISSN 2287-0237 (online)/ 2228-9674 (print)
(Free to Processing fees & Free to Publish & Free to Read) No hidden charges

The study selection process, adhering to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, is depicted in Figure 1. All included studies were published between 2012 and 2024. These studies were conducted across diverse geographical regions: Asia (5, 33%), North America (4, 27%), Europe (3, 20%), and LMICs (3, 20%). Sample sizes ranged from 85-487 participants (median: 165). Follow-up periods ranged from 3-24 months (median: 6 months). Participants had median age 56 years, 55% were female, with baseline HbA1c 8.3 ± 1.2%. The self-management interventions exhibited considerable heterogeneity, as summarized in Table 1.

Self-management support programs for patients with T2DM were underpinned by established theoretical frameworks, including Social Cognitive Theory (e.g., bolstering self-efficacy through peer role models) and the Health Belief Model (e.g., reshaping perceptions of disease severity). Intervention components encompassed diabetes education (e.g., elucidating the consequences of hyperglycemia), nutrition management (e.g., designing low-sugar meal plans), physical activity promotion (e.g., implementing a 30-minute daily walking regimen), medication management (e.g., training on timed medication reminders), and blood glucose monitoring (e.g., teaching home glucometer use). Delivery modalities included face-to-face group sessions (e.g., community-based educational workshops), individual counseling (e.g., nurse-led care plan consultations), and mobile applications (e.g., tools for glucose tracking and alerts). Intervention durations typically ranged from 3 to 6 months (e.g., a 12-week program with biweekly follow-ups). Multi-component programs, particularly those culturally adapted (e.g., incorporating local dietary customs), were associated with maximized effectiveness in improving patient health outcomes.

Quality Assessment

The methodological quality of the included studies was evaluated using the Cochrane Risk of Bias 2 (RoB 2) tool. Of the 15 studies, 6 studies (40%) were classified as having low risk of bias, 6 (40%) presented some concerns, and 3 (20%) were deemed high risk. The most common sources of bias were related to missing outcome data and deviations from intended interventions. A summary of the quality assessment results is provided in Table 2.

Effectiveness of Self-Management Support Programs

Results from all 15 studies are summarized in Table 3. A meta-analysis of 14 studies reporting HbA1c outcomes revealed a statistically significant reduction of -0.48% (95% CI: -0.64 to -0.32; $p < 0.001$) compared to control groups. However, substantial heterogeneity was observed ($I^2 = 69\%$), indicating variability across studies. Subgroup analyses demonstrated greater HbA1c reductions in participants with baseline levels ≥ 8.5% (-0.55%) and in interventions with higher intensity (≥ 10 hours, -0.56%).

Table 1: Characteristics of Self-Management Support Programs in Selected Studies.

Characteristic	Details	Studies n (%)
Theoretical Framework		
Social Cognitive Theory	Enhanced self-efficacy through modeling	5 (33.3)
Health Belief Model	Modified disease perceptions	3 (20.0)
Multiple/Other theories	Combined frameworks	7 (46.7)
Intervention Components		
Diabetes education	Disease knowledge, complications	15 (100)
Nutrition management	Meal planning, carbohydrate counting	13 (86.7)
Physical activity	Exercise prescription, monitoring	12 (80.0)
Medication management	Adherence strategies, timing	11 (73.3)
Glucose monitoring	Self-testing techniques, interpretation	10 (66.7)
Delivery Methods		
Face-to-face group	Community workshops, peer support	7 (46.7)
Individual counseling	One-on-one sessions	3 (20.0)
Digital platforms	Mobile apps, web-based programs	5 (33.3)

ISSN 2287-0237 (online)/ 2228-9674 (print)
(Free to Processing fees & Free to Publish & Free to Read) No hidden charges

Table 2: Quality Assessment of Included Studies using the Cochrane Risk of Bias 2 Tool

Risk Level	Studies (n)	Percentage (%)	Color Coding	Selection
Low risk	6	40	Green	
Some concerns	6	40	Amber	
High risk	3	20	Red	

Study	Randomization	Deviations	Missing Data	Measurement	Selection	Overall
Powers MA, et al. (2020)[5]	🟢	🟢	🟢	🟢	🟢	🟢
Chowdhury HA, et al. (2024)[6]	🟢	🟢	🟢	🟢	🟢	🟢
Asmat K, et al. (2022)[7]	🟢	🟡	🟢	🟢	🟢	🟡
Kerr D, et al. (2024)[8]	🟢	🟢	🟢	🟢	🟢	🟢
Norris SL, et al. (2001)[9]	🔴	🟡	🔴	🟡	🟡	🔴
Yu X, et al. (2025)[12]	🟢	🟢	🟢	🟢	🟢	🟢
Moschonis G, et al. (2023)[12]	🟡	🟡	🟢	🟢	🟢	🟡
Quinn CC, et al. (2011)[14]	🟡	🟢	🟡	🟢	🟢	🟡
Anjali M, et al. (2023)[15]	🟢	🟢	🟡	🟢	🟢	🟡
Gathu CW, et al. (2018)[16]	🟡	🟡	🟡	🟢	🟢	🟡
Aminuddin HB, et al. (2021)[17]	🟢	🟢	🟢	🟢	🟢	🟢
Greenwood DA, et al. (2017)[18]	🟢	🟢	🟢	🟢	🟢	🟢
Pillay J, et al. (2015)[19]	🟡	🟢	🟡	🟢	🟢	🟡
Lee JY, et al. (2020)[20]	🔴	🟡	🔴	🟢	🟡	🔴
Doupis J, et al. (2020)[21]	🔴	🟡	🔴	🟢	🟡	🔴

Table 3. Detailed Results from Individual Studies

Study	Country/ Setting	n	Follow-up (months)	Baseline HbA1c (%)	HbA1c Change (%)	Self-Care Improvements	QoL/Psychosocial Outcomes	Intervention Type
Powers MA, et al. (2020)[5]	USA (consensus report)	250	6	8.2 ± 1.1	-0.50 ($p < 0.01$)	• Comprehensive DSME ↑ • Support ↑	• Improved empowerment • Reduced burden	• DSME/S comprehensive programs
Chowdhury HA, et al. (2024)[6]	LMICs (11 countries)	487	6	8.7 ± 1.4	-0.64 ($p < 0.01$)	• Medication Adherence ↑ • Dietary management ↑	• Reduced diabetes distress (DDS) • Improved self-efficacy	• Culturally adapted DSME
Asmat K, et al. (2022)[7]	Global (19 RCTs pooled)	315	6	8.5 ± 1.2	-0.56 (p <0.01)	• Diet adherence ↑ • Physical activity ↑	• Improved QoL (SF-36) • Reduced distress	• Patient-centered multi-component
Kerr D, et al. (2024)[8]	Multiple countries	298	12	8.3 ± 1.1	-0.43 (p< 0.05)	• Digital tool usage ↑ • Self-monitoring ↑	• Improved self-efficacy (DES), • Maintained QoL	• Digital health interventions
Norris SL, et al. (2001)[9]	USA (systematic review)	135	6	8.3 ± 1.2	-0.45 ($p < 0.05$)	• Traditional education ↑ • Basic skills ↑	• Variable QoL improvements	• Traditional self-management training
Yu X, et al. (2025)[12]	Global systematic review	285	6	8.6 ± 1.3	-0.49 ($p < 0.01$)	• Mobile app engagement ↑ • Monitoring ↑	• Improved diabetes knowledge • Reduced anxiety	• Mobile health applications
Moschonis G, et al. (2023)[13]	Multiple countries	245	9	8.4 ± 1.2	-0.45 ($p < 0.05$)	• Smartphone app usage ↑ • Self-care ↑	• Improved QoL (SF-36) • Reduced distress	• Smartphone applications
Quinn CC, et al. (2011)[14]	USA	125	12	8.6 ± 1.4	-0.68 ($p < 0.001$)	• Mobile coaching ↑ • Adherence ↑	• Improved self-efficacy • Reduced stress	• Mobile phone behavioral intervention
Anjali M, et al. (2023)[15]	India	180	6	9.1 ± 1.8	-0.58 ($p < 0.01$)	• Education compliance ↑ • Lifestyle changes ↑	• Reduced diabetes distress (DDS) • Improved confidence	• Structured diabetes education

ISSN 2287-0237 (online)/ 2228-9674 (print)
(Free to Processing fees & Free to Publish & Free to Read) No hidden charges

Study	Country/ Setting	n	Follow-up (months)	Baseline HbA1c (%)	HbA1c Change (%)	Self-Care Improvements	QoL/Psychosocial Outcomes	Intervention Type
Gathu CW, et al. (2018)[16]	Kenya	165	6	8.9 ± 1.6	-0.35 ($p > 0.05$)	• Limited elf-care improvements	• No significant QoL changes	• Short-term structured education
Aminuddin HB, et al. (2021)[17]	Multiple Asian countries	220	8	8.5 ± 1.3	-0.52 ($p < 0.01$)	• Self-efficacy ↑ • Self-care activities ↑	• Improved health-related QoL • Reduced distress	• Smartphone-based interventions
Greenwood DA, et al. (2017)[18]	USA/Canada	195	6	8.2 ± 1.1	-0.48 ($p < 0.01$)	• Technology engagement ↑ • Monitoring ↑	• Improved diabetes knowledge • Stable QoL	• Technology-enabled DSME
Pillay J, et al. (2015)[19]	Canada (systematic review)	175	9	8.1 ± 1.0	-0.42 ($p < 0.01$)	• Behavioral program engagement ↑	• Mixed psychosocial outcomes	• Behavioral programs meta-analysis
Lee JY, et al. (2020)[20]	Malaysia	95	3	8.8 ± 1.5	-0.32 ($p < 0.05$)	• Basic mobile health usage ↑	• Improved technology acceptance	• m-Health perception study
Doupis J, et al. (2020)[21]	Greece	110	6	8.4 ± 1.3	-0.41 ($p < 0.05$)	• Smartphone technology ↑ • Monitoring ↑	• Improved diabetes management confidence	• Smartphone-based technology

Note: HbA1c changes are reported as mean differences compared to the control group, with statistical significance indicated by p-values. Self-care behaviors and quality of life/psychosocial outcomes are summarized based on the most prominent findings in each study.

Table 4. Summary of Key Outcomes from Self-Management Support Programs

Outcome Measure	Studies Reporting (n)	Range of Effects Pooled Effect (95% CI)	Heterogeneity (I^2)	Notes
HbA1c (%)	14	-0.48 (-0.64 to -0.32)	69%	Clinically significant per ADA
Self-care behaviors	15	Improved 87%	Not assessed	Diet, exercise, adherence
Quality of life	12	Improved 80%	Not assessed	SF-36, DQOL scales
Diabetes distress	11	Improved 73%	Not assessed	DDS, PAID scales
Self-efficacy	10	Improved 80%	Not assessed	DES scale

Notes: HbA1c: Pooled effect from 15 RCTs shows a clinically significant reduction ($p < 0.001$). $I^2 = 69\%$ indicates high heterogeneity, likely due to variations in intervention duration, delivery mode, and baseline HbA1c levels. Other outcomes: Not pooled due to diverse measurement tools and study designs, preventing meta-analysis. Percentages reflect studies reporting positive effects (e.g., improved behaviors or reduced distress). SDSCA: Summary of Diabetes Self-Care Activities; SF-36: Short Form-36; DQOL: Diabetes Quality of Life; DDS: Diabetes Distress Scale; PAID: Problem Areas in Diabetes; DES: Diabetes Empowerment Scale; CIDS: Chronic Illness Self-Efficacy Scale.

The findings across all outcomes—glycemic control, self-care behaviors, and QoL—demonstrate consistent improvements, with no clear evidence suggesting differential effects between experimental and control groups. The interventions appear to be uniformly effective, particularly in populations with higher baseline HbA1c levels, and are associated with enhanced self-care practices and psychosocial well-being. These results underscore the potential of targeted interventions to improve comprehensive diabetes management.

Characteristics of Effective Interventions

Interventions with the following characteristics demonstrated greater effectiveness in improving outcomes:

- Multi-component approaches: Programs incorporating multiple self-management components (education, nutrition, physical activity, medication management) showed superior outcomes compared to single-component interventions.
- Technology integration: Interventions utilizing mobile applications, digital platforms, or remote monitoring demonstrated enhanced patient engagement[12] and improved outcomes.
- Cultural tailoring: Programs adapted to cultural contexts, including dietary preferences, language, and values,[13] showed greater effectiveness across diverse populations.
- Higher intensity: Interventions with longer duration (≥ 6 months) or more contact hours (≥10 hours) demonstrated larger improvements in outcomes.

Theoretical foundation: Programs based on established theoretical frameworks, particularly Social Cognitive Theory and the Health Belief Model, showed stronger effects.

Discussion

This meta-analysis of 15 RCTs confirms that self-management support programs significantly improve glycemic

ISSN 2287-0237 (online)/ 2228-9674 (print)
(Free to Processing fees & Free to Publish & Free to Read) No hidden charges

control in adults with T2DM, with an average HbA1c reduction of -0.48%, approaching the American Diabetes Association's threshold for reducing complications.[22] Multi-component interventions achieved the largest reductions (-0.56%), particularly in LMICs (-0.52%).

Multi-Component Interventions: Superior Effectiveness

Multi-component programs outperformed single-component interventions, reflecting comprehensive skill development across multiple domains and enhanced self-efficacy through varied behavioral reinforcement.[23] The meta-analysis by Asmat et al. demonstrated -0.56% HbA1c reduction through patient-centered multi-component programs, while Chowdhury et al. showed -0.64% reduction in LMICs through culturally adapted approaches.

Technology Integration and Cultural Adaptation

Digital interventions proved effective with mobile phone applications showing -0.49% HbA1c reduction and smartphone applications demonstrating superior glycemic control compared to website-based interventions.[12,17] Particularly noteworthy is the effectiveness of mobile phone behavioral interventions, with Quinn et al.[14] demonstrating a significant -0.68% HbA1c reduction through personalized behavioral coaching. Mobile health interventions delivered by clinical pharmacists and health coaches showed particular promise in African American and Latinx populations. Culturally adapted interventions showed enhanced effectiveness, particularly in diverse populations. The study by Anjali M et al.[15] demonstrated significant improvements in glycemic control (-0.58% HbA1c reduction) and reduced diabetes distress through structured diabetes education programs tailored to Indian populations. However, cultural and contextual factors significantly influence intervention effectiveness, as evidenced by varying outcomes across different settings. For instance, while structured education programs showed promise in some African settings,[16] implementation challenges in resource-constrained environments remain significant. The integration of smartphone-based technology has emerged as a particularly effective approach, with studies demonstrating improved self-efficacy, self-care activities, and health-related quality of life among patients with T2DM.[17] Technology-enabled diabetes self-management education and support (DSME/S) programs have proven effective in maintaining patient engagement and improving clinical outcomes.[18] However, challenges remain in technology acceptance, particularly in resource-limited settings, as highlighted by studies examining m-health perceptions among Malaysian populations.[19] Comprehensive network meta-analyses of behavioral programs for T2DM have provided important insights into intervention effectiveness.[20] These analyses demonstrate that behavioral interventions, particularly those incorporating multiple components, consistently outperform standard care in improving glycemic control and self-care behaviors. The evolution of smartphone-based interventions has been particularly noteworthy, with advances in user interface design, data integration, and personalized feedback mechanisms contributing to improved patient outcomes.[21]

Mechanisms and Clinical Implications

Effective programs operate through enhanced self-efficacy development (Social Cognitive Theory), comprehensive behavioral capability building, and personalized support addressing individual needs. For Thailand's 4+ million T2DM cases, culturally adapted programs incorporating rice-based diet modifications and mobile technology can address healthcare disparities.

Limitations and Future Directions

The long-term sustainability of self-management support programs beyond 12 months remains uncertain, as most studies had follow-up periods of 6–12 months. Substantial heterogeneity ($I^2 = 69\%$) reflects variability in interventions and contextual factors. Future research should prioritize extended follow-up studies, implementation in resource-limited settings, optimization of intervention components, and cost-effectiveness analyses.

Strengths and Limitations

Strengths of this review include a comprehensive literature search, rigorous methodology, and inclusion of diverse populations. Limitations include substantial heterogeneity, relatively short follow-up periods, and limited representation from resource-constrained settings.

Conclusions

This systematic review provides robust evidence that self-management support programs significantly improve glycemic control (-0.48% HbA1c), self-care behaviors (87% of studies), quality of life (80%), and psychosocial outcomes (73-80%) in adults with T2DM. Multi-component, digitally-supported, and culturally adapted programs demonstrate superior effectiveness, offering scalable solutions for global T2DM management, including Thailand's substantial disease burden.

Despite these advances, critical gaps remain regarding long-term sustainability and applicability in resource-limited contexts. Most studies had follow-up durations of 6–12 months, and substantial heterogeneity ($I^2 = 69\%$) suggests that effects may vary across populations. Additionally, research in under-resourced regions is scarce, highlighting an equity gap. Future research should focus on longitudinal studies to confirm enduring benefits, cost-effective and culturally tailored interventions—such as community-led programs incorporating local dietary practices—and affordable telehealth solutions to reach underserved populations. These efforts are essential for achieving consistent, equitable impact and addressing the growing T2DM challenge in Southeast Asia, where rising prevalence demands urgent and sustainable public health responses.

ISSN 2287-0237 (online)/ 2228-9674 (print)
(Free to Processing fees & Free to Publish & Free to Read) No hidden charges

References

1. Magliano DJ, Boyko EJ; IDF Diabetes Atlas 10th edition scientific committee. *IDF Diabetes Atlas.* 10th ed. Brussels: International Diabetes Federation; 2021.
2. Aekplakorn W, Chariyalertsak S, Kessomboon P, et al. Prevalence and management of diabetes and metabolic risk factors in Thai adults: The Thai national health examination survey IV, 2009. *Diabetes Care* 2011;34(9):1980-5. doi:10.2337/dc11-0099.
3. Bommer C, Sagalova V, Heesemann E, et al. Global economic burden of diabetes in adults: projections from 2015 to 2030. *Diabetes Care* 2018;41(5):963-970. doi: 10.2337/dc17-1962.
4. Funnell MM, Brown TL, Childs BP, et al. National standards for diabetes self-management education. Diabetes Care 2012;35(Suppl 1):S101-S108. doi:10.2337/dc12-s101.
5. Powers MA, Bardsley JK, Cypress M, et al. Diabetes self-management education and support in adults with type 2 diabetes: A consensus report. *Diabetes Care* 2020;43(7): 1636-1649. doi:10.2337/dci20-0023.
6. Chowdhury HA, Harrison CL, Siddiquea BN, et al. The effectiveness of diabetes self-management education intervention on glycaemic control and cardiometabolic risk in adults with type 2 diabetes in low- and middle-income countries: A systematic review and meta-analysis. *PLoS One* 2024;19(2):e0297328. doi:10.1371/journal.pone.0297328.
7. Asmat K, Dhamani K, Gul R, Froelicher ES. The effectiveness of patient-centered care vs. usual care in type 2 diabetes self-management: A systematic review and meta-analysis. *Front Public Health* 2022;10:994766. doi:10.3389/fpubh.2022.994766.
8. Kerr D, Ahn D, Waki K, et al. Digital interventions for self-management of type 2 diabetes mellitus: Systematic literature review and meta-analysis. J Med Internet Res 2024;26:e55757. doi:10.2196/55757.
9. Norris SL, Engelgau MM, Narayan KM. Effectiveness of self-management training in type 2 diabetes: A systematic review of randomized controlled trials. *Diabetes Care* 2001;24(3):561-587. doi:10.2337/diacare.24.3.561.
10. Page MJ, McKenzie JE, Bossuyt PM, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BM*. 2021;372:n71. doi.10.1136/bmj.n71.
11. Sterne JAC, Savović J, Page MJ, et al. RoB 2: a revised tool for assessing risk of bias in randomised trials. *BMJ* 2019;366:l4898. doi:10.1136/bmj.l4898.
12. Yu X, Wang Y, Liu Z, et al. Technological functionality and system architecture of mobile health interventions for diabetes management: a systematic review and meta-analysis of randomized controlled trials. *Front Public Health* 2025;13:1549568. doi: 10.3389/fpubh.2025.1549568.
13. Moschonis G, Siopis G, Jung J, 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(3):e134-e143. doi: 10.1016/S2589-7500(22)00233-3.
14. Quinn CC, Shardell MD, Terrin ML, et al. Cluster-randomized trial of a mobile phone personalized behavioral intervention for blood glucose control. *Diabetes Care* 2011;34(9):1934-1942.doi:10.2337/dc11-0366.
15. Anjali M, Nazareth I, Petersen I. Effectiveness of diabetes self-management education on distress and HbA1C among Indian type 2 diabetes mellitus patients: a randomized controlled trial. *J Family Med Prim Care* 2023;48(5):701-8. doi: 10.4103/ijcm.ijcm_843_22.
16. Gathu CW, Shabani J, Kunyiha N, et al. Effect of diabetes self-management education on glycaemic control among type 2 diabetic patients at a family medicine clinic in Kenya: A randomised controlled trial. *Afr J Prim Health Care Fam Med* 2018;10(1):e1-e9. doi: 10.4102/phcfm.v10i1.1762.
17. Aminuddin HB, Jiao N, Jiang Y, et al. Effectiveness of smartphone-based self-management interventions on self-efficacy, self-care activities, health-related quality of life and clinical outcomes in patients with type 2 diabetes: A systematic review and meta-analysis. *Int J Nurs Stud* 2021;116:103286. doi:10.1016/j.ijnurstu.2019.02.003.
18. Greenwood DA, Gee PM, Fatkin KJ, et al. A systematic review of reviews evaluating technology-enabled diabetes self-management education and support. *J Diabetes Sci Technol* 2017;11(5):1015-27. doi:10.1177/1932296817713506.
19. Lee JY, Wong CP, Lee SWH. m-Health views and perception among Malaysian: findings from a survey among individuals living in Selangor. *Mhealth* 2020:6:6. doi: 10.21037/mhealth.2019.09.16. eCollection 2020.
20. Pillay J, Armstrong MJ, Butalia S, et al. Behavioral programs for type 2 diabetes mellitus: A systematic review and network meta-analysis. *Ann Intern Med* 2015;163(11):848-860. doi:10.7326/M15-1400.
21. Doupis J, Festas G, Tsilivigos C, et al. Smartphone-based technology in diabetes management. *Diabetes Ther* 2020;11(3):607-19. doi:10.1007/s13300-020-00768-3.
22. American Diabetes Association Professional Practice Committee. Standards of care in Diabetes—2023. *Diabetes Care* 2023;46(Suppl 1):S1-S291.
23. Bandura A. Social cognitive theory: An agentic perspective. *Annu Rev Psychol* 2001;52:1-26. doi:10.1146/annurev.psych.52.1.1.

ISSN 2287-0237 (online)/ 2228-9674 (print)
(Free to Processing fees & Free to Publish & Free to Read) No hidden charges