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The Effectiveness of Self-Care Enhancement Based Intervention Among Type 2 Diabetes Mellitus: A Systematic Review

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ABSTRACT Poor glycemic control and the high prevalence of complications among individuals with type 2 diabetes mellitus (T2DM) remain major public health challenges and are strongly associated with inadequate self-care behaviors. Despite the growing implementation of self-care–based interventions, evidence regarding their effectiveness on glycemic outcomes and self-care activities remains inconsistent. This systematic review aimed to evaluate the effectiveness of self-care enhancement–based interventions in improving glycemic control and self-care behaviors among adults with T2DM. A systematic search was conducted across four electronic databases PubMed, ScienceDirect, ProQuest, and Google Scholar using relevant keywords related to self-care, intervention, and T2DM. Studies published between 2019 and 2024, written in English, available in full text, and employing randomized controlled trial or quasi-experimental designs were included. Article selection followed the PRISMA framework, and methodological quality was assessed using the Joanna Briggs Institute (JBI) critical appraisal tools. Eight eligible studies were included in the final synthesis. The findings demonstrated heterogeneous outcomes across interventions. Most studies (n = 5) reported significant reductions in HbA1c levels accompanied by improvements in self-care activities, including diet management, blood glucose monitoring, and self-efficacy. One study showed a significant reduction in HbA1c without corresponding improvements in self-care behavior, while two studies reported improvements in self-care activities without significant changes in HbA1c. Interventions that incorporated structured, personalized education and ongoing monitoring, supported by family or community involvement, consistently yielded more favorable outcomes. In conclusion, self-care enhancement–based interventions are generally effective in improving glycemic control and self-care behaviors among individuals with T2DM, particularly when delivered through a structured, person-centered approach integrated with social support systems. These findings highlight the importance of comprehensive and context-sensitive intervention designs in diabetes self-management programs.

INDEX TERMS Self-Care Behavior, Self-Care Intervention, Type 2 Diabetes Mellitus, Glycemic Control, Systematic Review.

I. INTRODUCTION

Type 2 diabetes mellitus (T2DM) remains one of the most prevalent chronic non-communicable diseases worldwide and continues to pose a substantial burden on health systems, particularly in low- and middle-income countries [1], [2]. Recent global estimates indicate a persistent increase in the prevalence of T2DM, accompanied by high rates of morbidity, mortality, and disability related to cardiovascular disease, nephropathy, neuropathy, and other long-term complications [3], [4]. Despite advances in pharmacological therapy, a considerable proportion of individuals with T2DM fail to achieve optimal glycemic control, as reflected by persistently elevated glycated hemoglobin (HbA1c) levels [5]. Poor glycemic outcomes are closely linked to inadequate self-care behaviors, including suboptimal dietary management, insufficient physical activity, poor medication adherence, and irregular blood glucose monitoring [6], [7].

Self-care is recognized as a cornerstone of effective diabetes management and is strongly associated with improved glycemic control, reduced complications, and enhanced quality of life [8], [9]. However, evidence consistently shows that many individuals with T2DM demonstrate low adherence to recommended self-care practices due to psychological, physical, and social barriers, such as low self-efficacy, depression, comorbid conditions, and limited social support [10]–[12]. These challenges underscore the need for effective interventions that not only provide education but also enhance patients' motivation, skills, and long-term engagement in self-care activities.

In recent years, state-of-the-art self-care enhancement interventions have evolved from conventional education-based programs to more comprehensive and technology-assisted approaches. These include automated personalized self-care programs, mobile health (mHealth) applications, eHealth family-based education, peer-led

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support models, and community-based diabetes self-management education (DSME) programs [13]–[16]. Such interventions emphasize person-centered care, behavioral training, continuous monitoring, and the integration of family and community support. Several randomized controlled trials have demonstrated that these approaches can improve self-efficacy, self-care behaviors, and, in some cases, significantly reduce HbA1c levels [17]–[19]. Nevertheless, findings across studies remain inconsistent, particularly regarding the magnitude and sustainability of glycemic improvement.

Previous systematic reviews and meta-analyses have reported mixed results concerning the effectiveness of self-care–based interventions on HbA1c reduction and behavioral outcomes [20], [21]. Some reviews suggest modest improvements in glycemic control, while others highlight limited or non-significant effects, often attributed to heterogeneity in intervention design, duration, delivery methods, and participant characteristics. Moreover, many existing reviews focus on specific intervention types or populations, leaving uncertainty regarding which combinations of strategies are most effective in enhancing both self-care behavior and glycemic outcomes.

Based on these inconsistencies, there remains a clear research gap in synthesizing recent high-quality evidence to identify effective self-care enhancement–based interventions and the key components that contribute to their success among adults with T2DM. Therefore, this study aims to systematically review and synthesize evidence from recent randomized and quasi-experimental studies to evaluate the effectiveness of self-care enhancement–based interventions on glycemic control and self-care behaviors in individuals with T2DM.

The contributions of this study are threefold. First, it provides an up-to-date synthesis of recent evidence (2019–2024) on self-care enhancement interventions for T2DM. Second, it categorizes interventions based on their approach (personal, family, and community) and examines their differential effects on HbA1c and self-care outcomes. Third, it identifies key intervention characteristics, such as personalization and social support, that are associated with improved effectiveness, thereby offering practical implications for future diabetes self-management programs.

The remainder of this article is structured as follows. Section II describes the methods used in the systematic review. Section III presents the results of the included studies. Section IV discusses the findings in relation to existing literature and highlights limitations and implications. Finally, Section V concludes the study and outlines recommendations for future research.

II. METHODS

A. STUDY DESIGN

This study employed a systematic review design to synthesize empirical evidence on the effectiveness of self-care enhancement–based interventions among adults with type 2 diabetes mellitus (T2DM). A systematic review approach was selected to ensure a transparent, reproducible, and comprehensive synthesis of available research findings. The review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to minimize selection bias and enhance methodological rigor [22]. The study design was retrospective, as it analyzed previously published primary studies, and did not involve direct recruitment of participants. No randomization was conducted at the review level; however, the majority of included studies applied randomized controlled trial (RCT) designs.

B. DATA SOURCES AND SEARCH STRATEGY

A comprehensive literature search was conducted across four electronic databases: PubMed, ScienceDirect, ProQuest, and Google Scholar. These databases were selected due to their extensive coverage of health, nursing, and clinical research. The search strategy employed a combination of controlled vocabulary and free-text keywords, including “self-care,” “self-care intervention,” “diabetes self-management,” and “type 2 diabetes mellitus.” Boolean operators (“AND,” “OR”) were used to refine the search results.

The search was limited to studies published between January 2019 and December 2024, written in English, and available in full-text format. Reference lists of eligible articles were also manually screened to identify additional relevant studies. All retrieved records were exported into a reference management tool to facilitate screening and removal of duplicates.

C. ELIGIBILITY CRITERIA

Eligibility criteria were determined using the PICO framework (Population, Intervention, Comparison, Outcome). The population consisted of adults aged ≥20 years diagnosed with T2DM for at least two years. Eligible interventions were those explicitly designed to enhance self-care behaviors, including educational, behavioral, technological, family-based, or community-based approaches. Studies were required to include a comparison group receiving usual care or standard treatment.

Primary outcomes included glycemic control, measured by HbA1c levels, while secondary outcomes included self-care behaviors, self-efficacy, and diabetes self-management activities such as diet, physical activity, medication adherence, and blood glucose monitoring. Only randomized controlled trials or quasi-experimental studies with a minimum sample size of 30 participants in the intervention group, an intervention duration of at least 8 weeks, and a minimum of three evaluation points (post-intervention and follow-up assessments) were included. Studies involving participants with severe diabetes complications or significant comorbidities were excluded.

D. STUDY SELECTION PROCESS

Study selection was conducted in four sequential stages following the PRISMA framework: identification, screening, eligibility assessment, and inclusion. During the identification stage, titles and abstracts were screened to exclude clearly irrelevant studies. In the screening stage, duplicate records were removed. Full-text articles were then assessed for eligibility based on the predefined inclusion and exclusion criteria. Discrepancies during

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TABLE 1.
Quality Appraisal

Study design	Author	Items of quality appraisal												
		1	2	3	4	5	6	7	8	9	10	11	12	13
RCT	1	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	2	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	3	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	4	Y	Y	Y	U	U	Y	Y	Y	Y	Y	Y	Y	Y
	5	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	6	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y
	7	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	8	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Y: yes, *N*: no, *U*: unclear, *NA*: not applicable

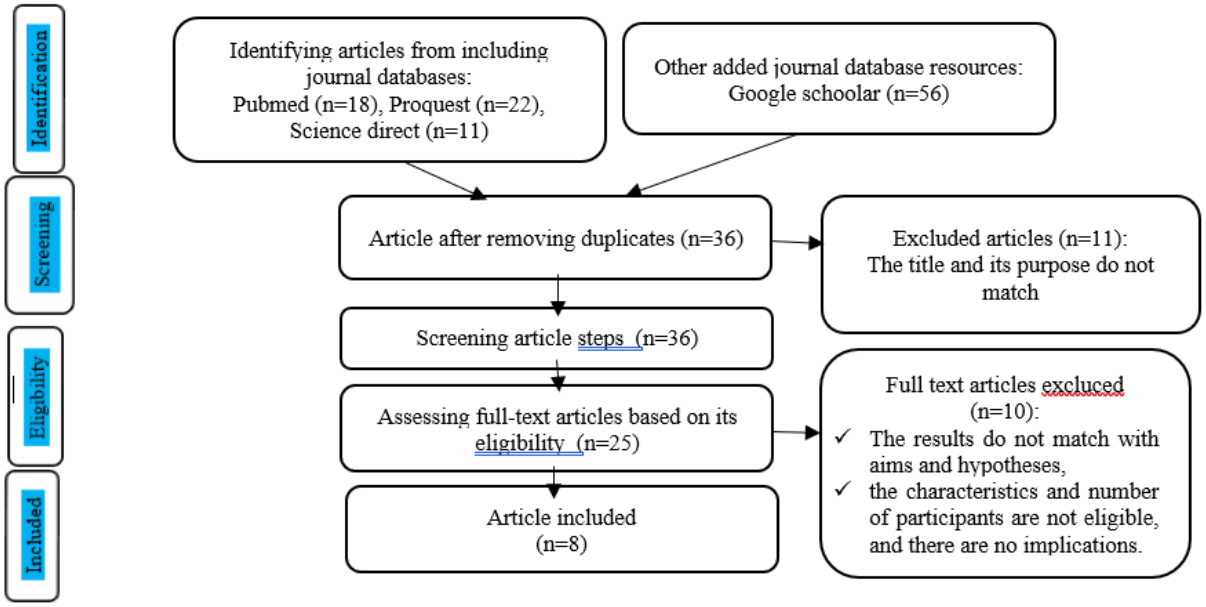

FIGURE 1. Studies Flow Chart

study selection were resolved through discussion between the reviewers to ensure consistency and accuracy. The final set of included studies was documented in a PRISMA flow diagram. To ensure reproducibility, the study selection process was conducted independently by two reviewers using a predefined screening protocol. Titles and abstracts were initially assessed to determine relevance, followed by full-text evaluation to confirm eligibility. Any disagreements between reviewers regarding study inclusion were resolved through consensus to minimize selection bias. The reasons for exclusion at the full-text stage were documented systematically to enhance transparency and allow replication of the selection procedure in future reviews.

E. QUALITY APPRAISAL

Methodological quality of the included studies was independently assessed using the Joanna Briggs Institute (JBI) critical appraisal tools, which are widely used for evaluating experimental and quasi-experimental studies [23]. For randomized controlled trials, a 13-item checklist was applied, while a 9-item checklist was used for quasi-experimental designs. Each item was rated as "Yes," "No," "Unclear," or "Not Applicable." Studies achieving at least 80% compliance with the appraisal criteria were considered methodologically sound and eligible for inclusion. Quality appraisal results were summarized descriptively and did not serve as exclusion criteria but were used to inform interpretation of findings.

F. DATA EXTRACTION

Data extraction was performed using a standardized extraction form to ensure consistency across studies. Extracted variables included author information, publication year, country, study design, sample characteristics, intervention type and duration, comparison conditions, outcome measures, follow-up periods, and key findings related to HbA1c and self-care outcomes. All extracted data were cross-checked for accuracy prior to synthesis.

G. DATA SYNTHESIS AND ANALYSIS

A narrative synthesis approach was employed due to heterogeneity in intervention types, duration, outcome measures, and follow-up periods across studies. Interventions were categorized based on their primary approach: individual-based, family-based, or community-based. Outcome patterns were analyzed to identify

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consistency or variation in intervention effectiveness. Where appropriate, findings were compared based on statistical significance and direction of effect. Meta-analysis was considered but not applied universally due to variability in outcome reporting and measurement tools.

III. RESULTS

TABLE 2
Summary of Study Characteristics and Intervention Outcomes in Type 2 Diabetes Mellitus

Author	Country	Study design	Population	Intervention	Control	Outcome
Park et al. (2024) 18	South korea	RCT	404 T2DM patients were identified that 32 patients were enrolled that classified into two group; intervention (n=19), control (n=13).	✓ Automated Personalized Self-care Program ✓ Duration: 4 weeks (@50 minutes per session, seven days a week) ✓ Strategy: Education: self-care (5 days/ week), Monitoring: exercise, diet, BG, medication intake (5 days/ week) ✓ Evaluation time: 3 months	Receiving usual care	✓ Primary: reducing level of HbA1c (p=0,029) in both group ✓ Secondary: enhancement in self-measured blood glucose testing (p=0,005) and grain intake (p=0,024) in the intervention group.
Feng et al. (2023) 19	China	RCT	225 patients with type 2 diabetes in 2 community that devided into two group: intervention (n=113) and control (n=112).	eHealth family-based health education. Duration: 3 months Strategy: ✓ Using official WeChat to access patient's family (online) ✓ On-site health education (diabetes and its complication, patient perception, self-care activities (in-person) ✓ Evaluation time: after intervention, 1 year after	Usual care (diet control, glucose testing, and auxiliary activities during exercise)	✓ Primary: decreasing level of HbA1c significantly (*P*<.001) in intervention group ✓ Secondary: improving in self-care activities (score): general diet (p<0,001); specific diet (p<.001), exercise (p=0,002), blood sugar testing (p=0,02), and foot care (p<0,001). Increasing score risk perception of diabetes: risk knowledge (p<.001), personal control (p<.001), worry (p=.001), and optimism bias (p=.003). Enhancing score of family support: supportive behaviors (p<.001) and non-supportive behaviors (p=0,03).
Hessler et al. (2022) 20	USA	RCT	734 individuals with T2DM that classified into two group: intervention (n=408), control (n=326).	✓ Self-management support (SMS) through combine Connection to Health (CTH) and Enhanced Engagement Connection to Health (EE-CTH) program ✓ Duration: 3 months ✓ Strategy: face to face training program (structured education, live tutorial with role play) ✓ Evaluation periods: 6 to 12 month post enrollment.	Combine Connection to Health (CTH) alone	Individuals in both programs reported significant improvements in self-management behaviors (sugary drinks (p=0,0019; p<0,0001), missed medications (p=0,0296); (p<0,0001), psychological outcomes (stress (p=0,0355; p<0,0001), health-related distress (p=,0002); (p<0,0001), and social risks (food security (p=0,0079); (p=0,0373), utilities (p=0,0072); (p=0,0362).

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Diriba et al. (2023) 21	Ethiopia	RCT	76 people with T2D and family caregiver that classified into two groups: intervention (n=38), control (n=38).	✓ Family-based diabetes self-management education and support programme ✓ Duration: 4 weeks ✓ Strategy: face to face education ✓ Evaluation periods: T0 (baseline at recruitment), T1 (immediately after intervention completed), T2 (2 months after T1)	Usual care	✓ Perceived support status: There is a significant different between two group in support needed (p<0,001) and support received (p<0,001) at T1 and T2. ✓ Family caregiver' supportive behavior: there is a significant different of supportive behaviour between two group at T1 (p=0,002) and T2 (p<0,001), and non-supportive behavior at T2 (p<0,001).
Presley et al. (2020) 22	USA	RCT	97 T2DM patients that classified into intervention group (n=62), and control group (n=35).	✓ Community-based diabetes self-management education (DSME) plus mobile health (mHealth)– ✓ Duration: 6 months (3 for course, 3 monthls for phone calls ✓ Strategy: direct course, phone calls ✓ Evaluation periods: 6 months afrer intervention	Community-based DSME alone	The result shows reducing value of HbA1C between two group (p=0,004) after 6 months, and also reducing diabetes distress on intervention group after 6 months (p=0,004).
Binesh et al. (2023) 23	Iran	RCT	30 subjects with diabetes type-2 were assigned to two groups of intervention and control (IG=15; CG=15).	✓Occupational Therapy Diabetes Self-Management intervention (OTDSM). ✓Duration: 10 weeks ✓Strategy: group and individual visit ✓Strategy: individual or group training ✓Evaluation periods: 3 months after intervention	individual session and phone calls.	The result shows significant differences between two groups in HbA1C levels, self-management behaviors, self-efficacy, and performance and satisfaction with daily routines after the intervention ($p < 0.05$) at 3 months, but not significant in diabetes distress and depressive symptoms.
Asmat et al. (2024) 24	USA	RCT	612 adults with T2DM and HbA1c ≥ 7% that classified into two group: control (n = 310) and intervention (n = 302)	✓Patient-centered self-management intervention (PACE-SMI) ✓Duration: 8 weeks ✓Strategy: ✓Individualized education, counseling, behavioral training, and home visit ✓Evaluation periods: 3 months	Usual care plus nurse-led	Primary: there is a significant difference between two group in HbA1c level after 3 months ($p = 0.03$). Secondary: There is an increasing level of self-efficacy ($p< 0.0001$) and self-care behaviors between the two groups ($p < 0.0001$).
Ewen et al. (2024) 25	USA	RCT	25 adults with T2DM that classified into two group: intervention (n=12) and control group (n=13).	✓Diabetes Self-Management Education (DSME) and Support (DSMS) ✓Duration: 3 months ✓Strategy: peer-lead and Empowerment-Based ✓Evaluation periods: 3 months	Usual care (DMSE)	Primary: There is a decreasing level of HbA1c in the intervention group (p =0.03), Secondary: enhancing blood glucose monitoring (p= 0,05), and decreasing diabetes distress level (p=0,003), whereas not significant chance in general diet scores (p = .08)

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The article selection procedure is depicted in FIGURE 1, which outlines the systematic process of study identification, screening, eligibility assessment, and final inclusion in accordance with the PRISMA 2020 guidelines. Records identified through database searching were initially screened by reviewing titles and abstracts, followed by the removal of duplicate entries. Subsequently, full-text articles were assessed for eligibility based on predefined inclusion and exclusion criteria. The final set of included studies represents those that met all methodological and relevance requirements, thereby ensuring transparency and reproducibility of the review process, as illustrated in Figure 1.

The methodological quality of the included studies was evaluated using the Joanna Briggs Institute (JBI) critical appraisal tools, and the results are summarized in TABLE 1. Overall, the majority of studies satisfied most of the appraisal criteria, indicating an acceptable level of methodological rigor. Although several studies exhibited minor limitations related to study design or outcome reporting, all included articles met the minimum quality threshold for systematic review inclusion. The quality assessment outcomes presented in Table I support the reliability of the synthesized findings and provide a contextual basis for interpreting the study results.

Based on TABLE 2, the types of intervention are classified into three approaches, namely personal, family, and community. The personal approach is carried out through automated personalized self-care program, self-management support (SMS), occupational therapy diabetes self-management, as well as patient-centered self-management. Meanwhile, family-based approach using eHealth family-based health education, and family-based diabetes self-management education and support program. Community-based approach is also used through community-based diabetes self-management education (DSME) plus mobile health (mHealth).

The periods of Intervention are classified into two categories, including less than 3 months, and between 3 and 6 months. Interventions provided for less than 3 months are mostly conducted on a personal or with their family using simple education and practice methods related to diabetes care (automated personalized self-care program, family-based diabetes self-management education and support program, occupational therapy diabetes self-management, and patient-centered self-management intervention).

Whereas, interventions carried out between 3 to 6 months are types of interventions that using both education and training, that are more intensive, structured, focused on empowerment, as well as using supporting devices (applications on mobile devices) aimed at individuals (Diabetes Self-Management, Education, Self-management support (SMS) through combining of the Connection to Health (CTH) and Enhanced Engagement Connection to Health (EE-CTH) programs), families (eHealth family-based health education), and community (Community-based diabetes self-management education (DSME) plus mobile health (mHealth).

HbA1c levels: All articles (n=8) show a decrease in HbA1c values (HbA1c values less than 5.7%) after given interventions ($p<0.05$ and $p<0.001$). There were differences in the significant level of HbA1c decrease. Some articles demonstrate a decrease in HbA1c ($p<0.05$) [18,22,23,24]. Other studies demonstrated a more significant decrease in HbA1c values ($p<0.001$) [19]. Whereas, several studies reported no significant result in decreasing level of HbA1c after given interventions [20,21,25].

There is a significant difference result in p-value<0.05 and p-value<0.0001 for the categories of self-efficacy, self-care behavior, and diabetes self-care activities (diet, exercise, blood glucose testing). For p-value <0.05 found in self-care activities including: diet [19,23,25], exercise [19], and BG testing, [18]. Whereas, p-value <0.0001 found on studies with categories including self-efficacy [21,22,24], self-care behavior [24], self-care activities: diet [20,24] and BG testing [23]. Based on result of studies, more significant value (p <0.0001) of self-efficacy, self-care behavior, and self-care activities were found in the studies that involved personalized structure, family, peer, and community approaches. This is evidenced by the significant influence between social support and increased self-efficacy, self-care behavior, and self-care events [24,25].

IV. DISCUSSION

A. EFFECTIVENESS OF SELF-CARE ENHANCEMENT INTERVENTIONS ON GLYCEMIC CONTROL

The findings of this systematic review indicate that self-care enhancement–based interventions demonstrate a generally positive effect on glycemic control among individuals with type 2 diabetes mellitus (T2DM). Most of the included studies reported a statistically significant reduction in glycated hemoglobin (HbA1c) levels following intervention implementation. This outcome suggests that structured self-care interventions, particularly those incorporating education, monitoring, and behavioral support, play a critical role in improving metabolic outcomes in individuals with T2DM. Improved glycemic control observed across studies may be attributed to increased patient awareness, improved adherence to dietary recommendations, and more consistent blood glucose monitoring behaviors.

These findings are consistent with previous systematic reviews and randomized controlled trials that emphasize the effectiveness of structured self-management education in diabetes care. Recent studies have demonstrated that interventions emphasizing patient-centered education and continuous engagement significantly reduce HbA1c levels compared to usual care [29], [30]. Furthermore, technology-assisted interventions, such as mobile health applications and digital self-monitoring tools, were found to enhance patient engagement and provide real-time feedback, contributing to improved glycemic outcomes [31]. However, not all included studies reported uniform improvements in HbA1c, indicating variability in intervention effectiveness.

Contrasting results were observed in studies where improvements in self-care behaviors did not translate into significant glycemic changes. This discrepancy may be explained by differences in intervention duration, intensity, or participant baseline glycemic status. Studies with shorter follow-up periods may not capture long-term metabolic changes, as HbA1c reflects glycemic control over approximately three months. Additionally, individuals with long-standing diabetes or multiple comorbidities may

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require more intensive or prolonged interventions to achieve measurable glycemic improvement. These findings align with earlier research suggesting that behavioral changes may precede physiological improvements, particularly in chronic disease management [32].

Despite the promising outcomes, several limitations should be acknowledged. The heterogeneity of intervention designs, outcome measures, and follow-up durations across studies limits direct comparability. Additionally, variations in baseline HbA1c levels and medication regimens may confound intervention effects. Nevertheless, the consistent trend toward improved glycemic control supports the clinical relevance of self-care enhancement interventions as a core component of diabetes management programs.

B. IMPACT OF SELF-CARE INTERVENTIONS ON SELF-CARE BEHAVIORS AND PSYCHOSOCIAL OUTCOMES

Beyond glycemic outcomes, this review highlights the positive influence of self-care enhancement interventions on diabetes-related self-care behaviors. Most included studies reported significant improvements in dietary management, physical activity, blood glucose monitoring, medication adherence, and self-efficacy. These findings underscore the importance of behavioral and psychosocial components in diabetes management, as effective self-care behaviors are fundamental to achieving long-term glycemic stability.

The improvement in self-care behaviors observed in this review is consistent with contemporary literature emphasizing behaviorally oriented and theory-based interventions. Interventions grounded in self-efficacy theory and self-determination frameworks were particularly effective in enhancing patient motivation and confidence in managing diabetes-related tasks [33]. Moreover, family- and community-based interventions demonstrated added benefits by fostering social support, which has been shown to reinforce behavior change and improve treatment adherence [34].

However, variations in behavioral outcomes across studies suggest that not all self-care components respond equally to intervention. For example, dietary and medication adherence showed more consistent improvement compared to physical activity, which may be influenced by environmental, cultural, or physical barriers. This observation aligns with prior studies indicating that lifestyle modifications requiring sustained physical effort are more challenging to maintain than knowledge-based behaviors [35]. Additionally, digital interventions improved self-monitoring behaviors but were less effective in addressing emotional and psychological barriers without complementary human support.

Several methodological limitations may have influenced these findings. Self-care behaviors were primarily assessed using self-reported questionnaires, which are subject to recall and social desirability bias. Differences in measurement instruments across studies also limited direct comparison. Furthermore, most interventions were delivered over relatively short periods, raising concerns regarding the sustainability of behavior change. Despite these limitations, the overall evidence supports the effectiveness of self-care enhancement strategies in improving behavioral outcomes among individuals with T2DM.

The implications of these findings are substantial for clinical practice. Healthcare providers should prioritize comprehensive self-care education that integrates behavioral, psychological, and social dimensions. Interventions should be tailored to individual needs and contextual factors, including cultural beliefs and access to resources. Strengthening self-efficacy and social support mechanisms may further enhance intervention effectiveness and sustainability.

C. IMPLICATIONS FOR PRACTICE, POLICY, AND FUTURE RESEARCH

The findings of this review have important implications for diabetes care delivery, health policy, and future research. The demonstrated effectiveness of self-care enhancement interventions suggests that integrating structured self-care programs into routine diabetes management may improve both clinical and behavioral outcomes. Healthcare systems should consider adopting multidisciplinary, patient-centered approaches that combine education, behavioral support, and continuous monitoring to optimize diabetes care.

From a policy perspective, the incorporation of self-care interventions into national diabetes management guidelines may help standardize care and reduce the burden of diabetes-related complications. Digital health interventions, in particular, offer scalable and cost-effective solutions, especially in resource-limited settings. However, equitable access to technology and digital literacy must be addressed to prevent disparities in intervention benefits [36].

Future research should focus on identifying the most effective components and delivery modes of self-care enhancement interventions. Longitudinal studies with extended follow-up periods are needed to assess the sustainability of behavioral and glycemic improvements. Additionally, future trials should employ standardized outcome measures and robust methodological designs to enhance comparability and evidence synthesis. Greater attention should also be given to subgroup analyses, including age, disease duration, and comorbidity profiles, to tailor interventions more effectively.

Several limitations of this review should be considered. The inclusion of studies with heterogeneous designs and outcome measures limited the feasibility of quantitative synthesis. Publication bias may also be present, as studies reporting positive outcomes are more likely to be published. Despite these limitations, the review provides comprehensive and up-to-date evidence supporting the role of self-care enhancement interventions in T2DM management.

In summary, self-care enhancement interventions represent a valuable strategy for improving glycemic control and self-care behaviors among individuals with T2DM. Their successful implementation requires a structured, patient-centered approach supported by healthcare systems and policy frameworks. Continued research and innovation are essential to optimize intervention effectiveness and ensure long-term benefits for individuals living with diabetes. Overall, this review provides consolidated evidence that self-care enhancement interventions constitute a viable and impactful approach for improving both glycemic control and self-care behaviors in individuals with

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type 2 diabetes mellitus, thereby supporting their broader integration into evidence-based diabetes management strategies.

V. CONCLUSION

This systematic review aimed to evaluate the effectiveness of self-care enhancement–based interventions in improving glycemic control and self-care behaviors among individuals with type 2 diabetes mellitus (T2DM). Based on the synthesis of eight eligible studies published within the last five years, the findings demonstrate that self-care enhancement interventions are generally effective in supporting diabetes management outcomes. Most included studies reported a statistically significant reduction in glycated hemoglobin (HbA1c) levels, with reported decreases ranging approximately from 0.5% to 1.5% following intervention implementation, indicating clinically meaningful improvements in glycemic control. In addition to metabolic outcomes, the majority of studies also showed notable improvements in key self-care behaviors, including dietary management, medication adherence, blood glucose monitoring, and self-efficacy. However, variability in outcomes was observed, as several studies reported improvements in self-care behaviors without corresponding significant reductions in HbA1c, highlighting the influence of intervention duration, intensity, baseline glycemic status, and participant characteristics on clinical effectiveness. Interventions that incorporated structured education, personalized support, continuous monitoring, and family or community involvement consistently demonstrated more favorable and sustained outcomes. These findings underscore the importance of adopting a comprehensive, patient-centered approach when designing and implementing self-care programs for individuals with T2DM. Despite the overall positive evidence, this review is limited by heterogeneity in study designs, outcome measures, and follow-up periods, which constrained direct comparison across studies. Future research should focus on conducting large-scale randomized controlled trials with standardized outcome measurements and longer follow-up durations to assess the sustainability of both behavioral and glycemic improvements. Additionally, further studies are needed to identify the most effective components and delivery modalities of self-care enhancement interventions, particularly in diverse and resource-limited settings. In conclusion, self-care enhancement–based interventions represent a valuable and evidence-based strategy for improving diabetes-related outcomes, and their integration into routine diabetes care has the potential to contribute substantially to better long-term disease management and reduced complication risk.

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DATA AVAILABILITY

All data generated or analyzed during this study are included in this published article.

AUTHOR CONTRIBUTION

All authors contributed substantially to the conception and design of the study. The first author was responsible for literature searching, study selection, data extraction, and drafting the initial manuscript. The second author contributed to methodological design, critical appraisal of the included studies, and data synthesis. The third author provided supervision, validated the analysis, and critically reviewed the manuscript for important intellectual content. All authors participated in revising the manuscript, approved the final version for publication, and agreed to be accountable for all aspects of the work.

DECLARATIONS

ETHICAL APPROVAL

Not applicable, as this study is a systematic review of previously published literature and did not involve direct interaction with human participants or the use of identifiable personal data.

CONSENT FOR PUBLICATION PARTICIPANTS.

Not applicable.

COMPETING INTERESTS

The authors declare that they have no competing interests.

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