

The Effectiveness of Diabetes Self-Management Education (DSME) Interventions on Glycemic Control, Self-Efficacy, and Quality of Life: A Systematic Review

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DOI: <https://doi.org/10.51244/IJRSI.2026.1315PH00177>

Received: 06 September 2026; Accepted: 11 September 2026; Published: 23 September 2026

ABSTRACT

Background: Diabetes Self-Management Education (DSME) is pivotal for patient empowerment and glycemic control. However, synthesized evidence evaluating diverse delivery modalities in low- and middle-income contexts remains dispersed.

Objectives: To systematically evaluate the effectiveness of DSME interventions on primary clinical outcomes (glycemic control/HbA1c, anthropometric parameters) and secondary psychosocial outcomes (self-efficacy, self-care adherence, and Health-Related Quality of Life [HRQoL]) across adult Type 2 Diabetes Mellitus (T2DM) populations.

Methods: A systematic review was conducted adhering to PRISMA 2020 guidelines. Comprehensive searches across PubMed, Scopus, CINAHL, and Google Scholar (2013–2025) identified empirical primary studies evaluating DSME. Quality and risk of bias were assessed using Cochrane RoB 2, ROBINS-I, and JBI appraisal tools. Due to substantial clinical and methodological heterogeneity, a structured narrative synthesis guided by the Synthesis Without Meta-analysis (SWiM) framework was executed.

Results: Twelve studies comprising randomized controlled trials (n=2), quasi-experimental designs (n=4), pre-experimental studies (n=2), pilot/case studies (n=3), and cross-sectional studies (n=1) were included (n=431 total participants across Indonesia [n=11] and Mali [n=1]). DSME interventions significantly improved glycemic control, with a 12-month peer-led RCT demonstrating a 1.05% HbA1c reduction (vs. 0.15% control, $p < 0.05$) alongside significant reductions in BMI (-1.65 kg/m^2) and waist circumference (-3.34 cm). DSME consistently improved dietary compliance (increasing adherence from 18.7% to 81.3%, $p = 0.006$), self-efficacy ($p = 0.001$), and self-care behaviors ($p = 0.000$). Furthermore, DSME exhibited a strong positive association with high HRQoL (OR = 7.2, $p = 0.002$). Digital SMS, printed booklets, and structured community frameworks ('PASTI SEMBUH') proved highly effective.

Conclusions: DSME is a robust, highly adaptable intervention that drives clinical and behavioral improvements. Healthcare systems should prioritize structured, culturally tailored DSME integration into routine outpatient care.

Keywords: Diabetes Self-Management Education (DSME), self-management practices, diabetes, systematic review, glycemic control, self-efficacy, self-care behaviors, quality of life, healthcare intervention, patient empowerment.

INTRODUCTION

Diabetes mellitus (DM) represents a global public health crisis characterized by chronic hyperglycemia resulting from defects in insulin secretion, insulin action, or both (Anggraeni et al., 2023). Left unmanaged, persistent hyperglycemia leads to severe macrovascular and microvascular damage, impacting the heart, blood vessels, eyes, kidneys, and nerves (WHO, 2022). Global prevalence estimates indicate that 415 million adults were living with diabetes in 2015, a figure projected to rise to 642 million by 2040 (IDF, 2020). In 2019, countries such as

China, India, the United States, Pakistan, Brazil, Mexico, and Indonesia each surpassed 10 million cases (WHO, 2022).

In resource-constrained settings such as Indonesia, the burden is further compounded by adverse lifestyle trends. The Indonesian Basic Health Research (Riskesdas 2018) highlighted alarming national rates of overweight (13.6%), obesity (21.8%), central obesity (31%), and male tobacco use (62.%) (WHO, 2022). Effective chronic disease management requires patients to undertake daily behavioral adjustments, including dietary regulation, physical activity, blood glucose self-monitoring, medication adherence, and foot care (Aminah et al., 2022; Aulia, 2023). However, achieving sustained adherence remains a major clinical hurdle, leaving many patients with sub-optimal glycemic control (Debussche et al., 2018; Etlidawati et al., 2024).

Rationale and Justification

Diabetes Self-Management Education (DSME) is a structured process focused on imparting knowledge, cognitive-behavioral skills, and coping mechanisms necessary for effective self-care (Aminah et al., 2022; Kumar, 2003). While previous reviews have evaluated generic self-care applications or isolated intervention components, there is a distinct necessity to synthesize empirical evidence evaluating comprehensive DSME delivery modalities—ranging from digital SMS platforms and printed educational booklets to peer-led community models and specialized educational frameworks (e.g., 'PASTI SEMBUH') (Kadir & Herawati, 2025; Ridwan et al., 2018).

This systematic review addresses key literature gaps by synthesizing findings across diverse study designs, quantifying both primary clinical parameters (glycemic control and anthropometric indices) and secondary psychosocial outcomes (self-efficacy, self-care adherence, dietary compliance, and HRQoL).

Review Objectives

The specific objectives of this systematic review are to:

- Evaluate the clinical effectiveness of DSME interventions on glycemic control (HbA1c and fasting blood sugar levels) and anthropometric parameters (BMI and waist circumference) in adults with Type 2 Diabetes Mellitus.
- Assess the impact of DSME on secondary behavioral and psychosocial outcomes, including self-efficacy, dietary compliance, self-care practices, and Health-Related Quality of Life (HRQoL).
- Compare the operational feasibility and relative efficacy of diverse DSME delivery formats, including digital SMS, printed booklets, peer education, and structured clinical educational models.

PICOS Framework

The systematic review parameters were defined according to a rigorous PICOS framework (Puspasari et al., 2023):

Table 1: PICOS Framework

PICOS Element	Inclusion Criteria Specification
Population (P)	Adults (aged ≥ 18 years) clinically diagnosed with Type 2 Diabetes Mellitus (T2DM). Excluded pediatric populations and non-diabetic cohorts.
Intervention (I)	Structured Diabetes Self-Management Education (DSME) or Diabetes Self-Management Education and Support (DSMES) delivered via any medium (peer-led, digital/SMS, printed media, or structured educational programs).

Comparator (C)	Standard routine clinical care, non-exposed control groups, or baseline pre-intervention control values.
Outcomes (O)	Primary: Glycemic control (HbA1c %, blood glucose levels), BMI (kg/m ²), waist circumference (cm). Secondary: Self-efficacy, self-care behavior scores, dietary compliance %, and Quality of Life (HRQoL).
Study Design (S)	Empirical primary research studies including Randomized Controlled Trials (RCTs), quasi-experimental studies, pre-experimental studies, pilot/case studies, and cross-sectional studies.

METHODOLOGY

Search Strategy and Information Sources

A systematic search was executed across four electronic databases—PubMed, Scopus, CINAHL, and Google Scholar—for studies published between January 2013 and December 2025 (WHO, 2022). The search strategy combined Medical Subject Headings (MeSH) and free-text keywords using Boolean operators (AND, OR): Search Syntax: (("Diabetes" OR "Diabetic" OR "Type 2 diabetes mellitus") AND ("Self-care" OR "Self-management" OR "Lifestyle modification" OR "Patient education" OR "Self-monitoring" OR "Technology-based intervention") AND ("Glycemic control" OR "Quality of life" OR "Complications" OR "Healthcare utilization"))

Eligibility Criteria

Studies were included if they evaluated DSME or DSMES interventions in T2DM patients and reported empirical data on glycemic control, self-care adherence, self-efficacy, or HRQoL. Studies were excluded if they were duplicate publications, systematic reviews lacking original data, study protocols without reported results, or studies evaluating non-diabetes complementary therapies (e.g., yoga, aromatherapy, or acupressure for hypertension/insomnia).

Study Selection and PRISMA Flow

Study selection followed the PRISMA 2020 guidelines (Page et al., 2021). As detailed in Figure 1, the preliminary database search yielded 2,496 initial records (Google Scholar: 1,897; Scopus: 376; CINAHL: 134; PubMed: 89). Following duplicate removal (n = 1,659) and preliminary filtering (n = 369), 468 unique records underwent title screening. Subsequent title exclusion (n = 149) left 319 records for abstract review, where 172 records were removed. Full-text evaluation of 147 articles excluded study protocols (n = 47) and review papers lacking original data (n = 88), yielding 12 eligible primary studies for final synthesis.

Risk of Bias Assessment Framework

Methodological quality was critically appraised by two independent reviewers using design-appropriate assessment tools:

a. Cochrane Risk of Bias 2 (RoB 2) Tool: Applied to randomized controlled trials across five domains (randomization, intervention deviations, missing data, outcome measurement, reported result selection) (Werfalli et al., 2020).

b. ROBINS-I Tool: Applied to non-randomized quasi-experimental and observational studies.

JBI Critical Appraisal Tool: Applied to pilot and case study designs.

Data Synthesis & Methodological Justification

Quantitative meta-analysis was precluded due to severe clinical and methodological heterogeneity across included studies, encompassing disparate study designs (RCTs, quasi-experimental, single-patient case studies), highly variable sample sizes ($n = 1$ to $n = 151$), diverse intervention delivery media (SMS, booklets, peer education), and varied outcome metrics (Debussche et al., 2018; Rahmadani & Jihad, 2023; Ridwan et al., 2018). Consequently, a Structured Narrative Synthesis guided by the Synthesis Without Meta-analysis (SWiM) framework was executed, grouping findings into four thematic synthesis domains.

RESULTS

PRISMA 2020 Flow Audit Summary

The complete PRISMA 2020 flow audit is summarized in Table 2 below, establishing a transparent and reproducible record accounting for all retrieved, screened, and synthesized literature.

Table 2: PRISMA Flow Summary

PRISMA Stage	Record Count (n)	Exclusion / Selection Rationale
Identification	2,496 total records	Google Scholar: 1,897 Scopus: 376 CINAHL: 134 PubMed: 89
Pre-Screening Removal	2,028 records removed	Duplicates removed: 1,659 Removed for non-eligibility: 369
Title Screening	468 records screened	149 records excluded due to irrelevance to DSME/T2DM
Abstract Screening	319 records screened	172 records excluded for failing eligibility criteria
Full-Text Assessment	147 reports assessed	135 reports excluded: Study protocols ($n=47$), Review articles lacking empirical data ($n=88$)
Final Included Studies	12 studies included	Synthesized across qualitative and narrative domains

Characteristics of Included Studies

The 12 synthesized studies evaluated a total of 431 diabetic patients across Mali ($n = 1$) and Indonesia ($n = 11$). Table 3 provides a comprehensive summary matrix of study characteristics, intervention parameters, and key statistical findings.

Table 3: Characteristics of Included Studies

Study & Country	Design & Sample Size	DSME Format	Primary Outcomes	Key Statistical Findings	Risk of Bias
Debussche et al. (2018) Mali	RCT $n = 151$	Peer-led DSME (12 months)	HbA1c, BMI, Waist circumference	HbA1c -1.05% vs. -0.15% control ($p<0.05$); BMI -1.65 kg/m ² ; Waist -3.34 cm.	Low Risk
Ridwan et al. (2018) Indonesia	Pilot Study $n = 6$	SMS-based DSME	Diabetes Knowledge	Significant knowledge score increase post-intervention ($p < 0.05$).	Some Concerns

Murtaqib et al. (2019) Indonesia	Quasi-Exp. n = 30	Structured DSME & support	Self-Efficacy	Significant post-test self-efficacy score increase (p = 0.001).	Low Risk
Utama et al. (2021) Indonesia	RCT n = 55	Educational DSME sessions	Self-Management, Quality of Life	Significant improvement in self-management (p=0.000) and QoL (p=0.000).	Low Risk
Handayani & Nusdin (2021) Indonesia	Pre-Exp. n = 23	Structured DSME program	Quality of Life (QoL)	Wilcoxon test showed significant QoL improvement (p = 0.001).	Some Concerns
Ratnasari et al. (2022) Indonesia	Quasi-Exp. n = 60	DSMES diet/health (6 months)	Dietary intake, Weight, Glycemic control	Increased veg/fruit/milk intake (p<0.05); HbA1c improved (p<0.05); Weight unchanged.	Low Risk
Aminah et al. (2022) Indonesia	Pre-Exp. n = 16	DSME via printed booklet	Dietary Compliance	Dietary compliance increased from 18.7% to 81.3% post-DSME (p = 0.006).	Some Concerns
Rahmadani & Jihad (2023) Indonesia	Case Study n = 1 patient	DSME (2 sessions + 7-day eval)	Self-Management score	Self-management score increased by 10 points (58 to 68; moderate level).	High Risk
Aulia (2023) Indonesia	Quasi-Exp. n = 30	DSME program	Self-care behavior, Blood sugar	Significant improvement in self-care behavior (p=0.000) & blood glucose (p=0.039).	Low Risk
Etlidawati et al. (2024) Indonesia	Quasi-Exp. n = 32	DSME via printed booklet	Self-care behavior scores	75% intervention vs. 56% control good self-care (p=0.00); mean score improved (p=0.01).	Low Risk
Probosiwi & Siswidiarsari (2024) Indonesia	Cross-Sect. n = 50	Evaluated DSME exposure	Dietary management, HRQoL	DSME significantly linked to HRQoL (p=0.002, OR=7.2); 64% good dietary management.	Low Risk
Kadir & Herawati (2025) Indonesia	Case Study n = 7	'PASTI SEMBUH' education method	Diabetes Knowledge	Knowledge improved significantly (p=0.02); 85.7% low knowledge shifted to moderate/high.	High Risk

Narrative Synthesis by Domain

Domain 1: Glycemic Control and Anthropometric Outcomes

Evidence across synthesized studies consistently underscores DSME's clinical effectiveness in lowering blood glucose and improving body composition. The landmark 12-month RCT by Debussche et al. (2018) in Mali demonstrated a mean HbA1c reduction of 1.05% in the peer-led DSME group compared to 0.15% in standard care controls (p < 0.05). Furthermore, the intervention group achieved clinically meaningful anthropometric

gains, reducing BMI by 1.65 kg/m² and waist circumference by 3.34 cm (Debussche et al., 2018). These findings were corroborated by Indonesian quasi-experimental studies: Ratnasari et al. (2022) reported significant improvements in glycemic control over 6 months ($p < 0.05$), and Aulia (2023) observed significant post-intervention fasting blood glucose reductions ($p = 0.039$).

Domain 2: Behavioral Compliance and Self-Efficacy

DSME interventions exerted a profound positive impact on patient self-efficacy and self-care compliance. Murtaqib et al. (2019) demonstrated a highly significant increase in self-efficacy scores following structured DSME ($p = 0.001$). In terms of dietary compliance, Aminah et al. (2022) observed that printed booklet DSME shifted dietary adherence from 18.7% pre-intervention to 81.3% post-intervention ($p = 0.006$). Ratnasari et al. (2022) detailed qualitative nutritional improvements, showing significant increases in daily vegetable, fruit, and dairy intake alongside reduced tuber/starch consumption ($p < 0.05$). Additionally, Etlidawati et al. (2024) reported that 75% of patients receiving booklet-based DSME achieved good self-care practice scores compared to 56% in controls ($p = 0.000$).

Domain 3: Health-Related Quality of Life (HRQoL)

Four studies specifically evaluated HRQoL outcomes. Utama et al. (2021) and Handayani & Nusdin (2021) reported statistically significant post-DSME enhancements in overall QoL scores ($p = 0.000$ and $p = 0.001$, respectively). Probosiwi & Siswidiarsari (2024) established a powerful statistical association between DSME exposure and superior HRQoL ($p = 0.002$, Odds Ratio [OR] = 7.2), demonstrating that patients undergoing DSME were over seven times more likely to report high vitality, physical functioning, and social well-being.

Domain 4: Efficacy of Delivery Media and Educational Models

Synthesized literature confirms that DSME can be successfully operationalized across diverse delivery formats:

- **Mobile SMS Technology:** Ridwan et al. (2018) established the community feasibility and efficacy of SMS-delivered DSME, showing significant knowledge retention ($p < 0.05$).
- **Printed Educational Booklets:** Aminah et al. (2022) and Etlidawati et al. (2024) proved that low-cost printed booklets provide accessible, asynchronous reinforcement that drives sustained dietary adherence.
- **Tailored Culturally Specific Methods:** Kadir & Herawati (2025) demonstrated that the 'PASTI SEMBUH' educational method significantly increased patient knowledge ($p = 0.02$), converting 85.7% of low-knowledge patients into moderate/high knowledge categories.

DISCUSSION

Principal Findings & Clinical Context

This systematic review synthesizes compelling empirical evidence demonstrating that structured DSME significantly improves glycemic control, anthropometric profiles, self-efficacy, self-care behaviors, and HRQoL in adult T2DM patients. The observed HbA1c reduction of 1.05% reported by Debussche et al. (2018) aligns perfectly with global landmark trials showing that a 1.0% drop in HbA1c reduces microvascular complications by 37% and diabetes-related mortality by 21%.

Strengths of the Review

A principal strength of this systematic review lies in its **methodological rigor and adherence to PRISMA 2020 reporting standards**. By implementing a multi-tool risk of bias assessment—utilizing Cochrane RoB 2 for randomized controlled trials, ROBINS-I for non-randomized quasi-experimental designs, and JBI appraisal criteria for pilot and case studies—the review establishes a transparent, audited, and reproducible evaluation framework across all synthesized evidence. This structural consistency addresses historical methodological gaps

in self-management literature by ensuring that study quality is systematically evaluated relative to each study's empirical design.

Furthermore, the review provides a **broad and multi-dimensional outcome synthesis** that bridges traditional clinical endpoints with vital psychosocial metrics. Rather than restricting the evaluation strictly to glycemic control, the synthesis concurrently evaluates hard anthropometric and metabolic indicators—such as glycated hemoglobin (HbA1c), Body Mass Index (BMI), and waist circumference—alongside essential behavioral parameters, including self-efficacy, dietary compliance, self-care practices, and health-related quality of life (HRQoL). Capturing these interrelated domains yields a comprehensive understanding of how structured educational interventions empower patients to translate clinical knowledge into sustainable, daily self-management practices.

Finally, the findings offer **high contextual relevance for low- and middle-income countries (LMICs)**, where healthcare infrastructure and specialized diabetes care are frequently constrained. The synthesized evidence demonstrates the practical utility of cost-effective, highly adaptable delivery media—such as mobile SMS messaging, printed educational booklets, and peer-led support networks—highlighting that impactful Diabetes Self-Management Education (DSME) does not depend on costly technological platforms. These scalable modalities offer actionable strategies for empowering patients within resource-limited community settings.

Limitations of the Review

Despite these strengths, several limitations inherent to the primary evidence base must be noted. The most prominent constraint is the **marked geographic clustering of the included literature**, as eleven of the twelve synthesized studies originated exclusively from Indonesia. While this reflects a commendable regional research commitment to addressing diabetes within the Indonesian healthcare system, the concentration on a single nation limits the direct generalizability of the findings to non-Asian LMIC populations and differing institutional or cultural settings.

In addition, the review is constrained by **sample size limitations and study design variability** across the primary literature. Several included studies operated with small sample sizes—such as a six-participant pilot trial, pre-experimental designs with sixteen to twenty-three subjects, or single-family and small-group case studies—which reduces statistical power and limits the precision of observed intervention effects. Furthermore, many primary studies focused predominantly on immediate post-intervention evaluations, leaving the long-term sustainability of behavioral changes and ongoing glycemic maintenance unexamined.

Lastly, the body of evidence exhibited **substantial methodological heterogeneity**, which ultimately precluded quantitative meta-analytic pooling. The synthesized studies spanned a broad spectrum of research designs, ranging from small qualitative case reports and cross-sectional surveys to non-randomized quasi-experiments and randomized controlled trials, while also employing disparate outcome measurement instruments and intervention durations. Consequently, attempting to pool statistical estimates or generate forest plots would have been methodologically invalid, rendering a structured narrative synthesis the most defensible approach for synthesizing the evidence.

CONCLUSION AND RECOMMENDATIONS

Conclusion

Diabetes Self-Management Education (DSME) is a clinically proven, highly versatile, and essential intervention for Type 2 Diabetes Mellitus control. Regardless of whether it is delivered via peer-led community groups, mobile SMS, printed booklets, or specialized structured modules, DSME consistently empowers patients, improves dietary compliance, elevates self-efficacy, lowers glycemic levels, and dramatically enhances overall quality of life.

Recommendations for Practice and Policy

- Routine Clinical Integration: Healthcare providers should mandate structured DSME as a core non-pharmacological component of standard T2DM outpatient protocols.
- Diversified Delivery Platforms: Public health programs should leverage multi-channel delivery—combining digital SMS reminders with tangible printed booklets—to ensure equitable access in remote and low-resource settings.
- Future Research Directions: Researchers should conduct large-scale, multi-center RCTs with extended follow-up periods (> 12 months) to establish long-term clinical and cost-effectiveness.

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