

Nurse-Led Psychoeducational Interventions for Glycemic and Psychosocial Outcomes in Type 2 Diabetes Mellitus: A Systematic Review and Meta-Analysis

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Background: Conventional didactic education may be limited in addressing the psychosocial complexities of Type 2 Diabetes Mellitus (T2DM). Nurse-led multicomponent psychoeducational interventions provide a potential approach by integrating clinical and psychosocial support. This study aims to evaluate the glycemic and psychosocial outcomes of these interventions through a systematic review and meta-analysis.

Methods: A systematic search was conducted across PubMed, Scopus, and EBSCOhost following PRISMA 2020 guidelines. Methodological quality was assessed using the Cochrane Risk of Bias tool. A meta-analysis using a random-effects model was performed for the primary outcome (HbA1c), while psychosocial outcomes were synthesized narratively in accordance with SWiM guidelines.

Results: Fifteen primary studies involving diverse global cohorts were synthesized. Nine of the 15 trials showed statistically significant HbA1c reductions favoring the intervention group. Meta-analysis of 13 trials (n=3,568) revealed a pooled HbA1c reduction of -0.69% (95% CI: -1.00 to -0.37; P < 0.0001). Sensitivity analysis, excluding two outliers, indicated a stable mean difference (MD) of -0.51% (95% CI: -0.69 to -0.32; P < 0.00001) and substantially reduced heterogeneity in long-term subgroups (I-squared decreased from 96% to 23%). Beyond glycemic outcomes, the synthesis suggests that interventions combining emotional validation with structured behavioral action particularly those utilizing motivational interviewing and cognitive-behavioral techniques show potential in reducing diabetes distress and enhancing self-efficacy.

Conclusion: Current meta-analytical evidence suggests that nurse-led multicomponent interventions may help bridge the gap between clinical requirements and humanistic needs, showing potential improvements in both HbA1c and psychosocial well-being. Based on these synthesized findings, this review presents the Education, Validation, and Action (EVA-Diabetes Care Model) framework as an exploratory conceptual model, positing that emotional validation may support sustained behavioral modification. Future well-powered, prospective, multicenter randomized controlled trials are required to empirically validate the clinical efficacy and long-term sustainability of the EVA-Diabetes Care Model protocol.

Keywords: type 2 diabetes mellitus, nurse-led interventions, meta-analysis, HbA1c, diabetes distress, EVA-Diabetes Care Model

Introduction

Type 2 Diabetes Mellitus (T2DM) remains a profound global public health challenge with an alarming rate of escalating prevalence. The International Diabetes Federation (IDF) estimates that approximately 537 million adults are currently living with diabetes, a figure projected to surge to 783 million by 2045.¹ His trajectory warrants critical attention, as uncontrolled chronic hyperglycemia can precipitate severe microvascular and macrovascular complications, posing significant threats to

patient survival and contributing to premature mortality.² Furthermore, the greatest morbidity burden is disproportionately concentrated in regions with low to middle Sociodemographic Indices (SDI), underscoring the urgent need for targeted, context-sensitive, and accessible interventions.³

Comprehensive T2DM management requires robust interprofessional collaboration, as treatment must be coupled with consistent lifestyle modifications and behavioral adaptations.^{1,4} Within this paradigm, self-care serves as the fundamental component for maintaining clinical stability. However, sustaining long-term adherence remains a formidable clinical challenge. The primary barrier is frequently not a mere knowledge deficit, but rather the emotional burden following a chronic diagnosis. Diabetes distress is strongly correlated with poor adherence, a phenomenon aligning with the self-regulation resource depletion model, wherein continuous efforts to regulate diet and monitor blood glucose inevitably deplete mental energy, thereby significantly impairing self-care capacity.^{5,6}

To mitigate these psychological barriers, health education programs must be grounded in robust theoretical frameworks, such as the Middle-Range Theory of Self-Care of Chronic Illness (SCCI).⁷ Recent updates to this theory emphasize the pivotal role of intrapersonal factors, such as self-reflection and stress management, in sustaining health behaviors when cognitive resources deplete.⁸ Within a multidisciplinary care system, nurses hold a strategic position as facilitators bridging clinical interventions with the psychosocial needs of patients.⁹ Despite this, current educational practices often overemphasize cognitive knowledge while the critical component of emotional validation remains inadequately addressed. Conversely, evidence suggests that purely psychological nurse-led interventions, while successful in reducing diabetes distress, often yield inconsistent effects on glycemic control.^{10,11} This highlights a critical gap: existing diabetes care models lack specific operational guidance for nurses to seamlessly integrate emotional support with structured behavioral action at the bedside, often treating psychological distress as a secondary complication rather than a primary barrier that must be validated during routine care.

Therefore, the primary objective of this systematic review and meta-analysis is to comprehensively evaluate the clinical effectiveness (specifically glycemic control via HbA1c) and psychosocial outcomes of nurse-led multicomponent psychoeducational interventions for adults with Type 2 Diabetes Mellitus. By identifying and synthesizing the core effective elements such as clinical education, psychological support, and behavioral training across existing trials, this review aims to provide a clearer understanding of how to optimize nursing interventions to bridge the gap between clinical metabolic requirements and the humanistic needs of patients. The findings from this synthesis will subsequently inform the development of a structured approach to enhance routine bedside nursing care.

Methods

Study Design

This systematic review was designed and reported in strict adherence to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines.¹² To ensure scientific rigor and mitigate the risk of methodological bias, the entire research protocol encompassing the comprehensive literature search strategy, study screening and selection, data extraction, and narrative data synthesis was executed in accordance with the methodological framework recommended by the Cochrane Handbook for Systematic Reviews of Interventions.

Eligibility Criteria

Studies were included in this review if they met the following PICO (Population, Intervention, Comparison, and Outcome) criteria:

Inclusion Criteria

Studies were deemed eligible for inclusion in this review if they met all of the following parameters:

- Population (P): Involved adult patients (aged 18 years or older) with a confirmed clinical diagnosis of Type 2 Diabetes Mellitus (T2DM).
- Intervention (I): Evaluated nurse-led multicomponent psychoeducational programs that comprehensively integrated clinical education, emotional validation, and behavioral change training.

- Comparison (C): Utilized a control group receiving standard care, routine care, or an active control (including wait-list control groups).
- Outcome (O): Reported the primary outcome of glycemic control (measured by HbA1c levels) and/or secondary psychosocial outcomes, including diabetes distress, self-efficacy scores, and quality of life.
- Study Design (S): Exclusively restricted to Randomized Controlled Trials (RCTs).

Exclusion Criteria

Conversely, studies were excluded if they met any of the following conditions:

- Involved populations primarily diagnosed with Type 1 Diabetes Mellitus (T1DM) or gestational diabetes.
- Utilized non-RCT designs, such as quasi-experimental studies, observational designs, case reports, conference proceedings, or literature reviews.
- Evaluated interventions that were not led or facilitated by nursing professionals, or that employed fully automated digital platforms lacking human interaction.
- Failed to report adequate outcome data requisite for either meta-analysis (for HbA1c) or systematic narrative synthesis (for psychosocial outcomes).
- Were published prior to 2016. This specific temporal boundary was established to align with the significant 2016 conceptual update of the Middle-Range Theory of Self-Care of Chronic Illness (SCCI). This update shifted the paradigm toward integrating intrapersonal factors and stress management into routine care, ensuring that the synthesized evidence reflects current theoretical and clinical standards.
- Full-text articles were unavailable in either English or Indonesian.

Search Strategy

A comprehensive and systematic literature search was executed across three primary electronic databases PubMed, Scopus, and EBSCOhost to identify relevant studies published between January 2016 and February 2026. The search syntax was rigorously developed utilizing a combination of Boolean operators, Medical Subject Headings (MeSH), and free-text terms specifically tailored to target three foundational domains of diabetes care: clinical education, psychosocial support, and behavioral self-management training. The primary search string included variations of the following terms: (“Type 2 Diabetes Mellitus” OR “T2DM”) AND (“Nurse-led” OR “Nursing intervention” OR “Nurse-directed”) AND (“Psychoeducation” OR “Psychological support” OR “Diabetes distress” OR “HbA1c”). These search parameters were designed to capture the holistic nature of multicomponent nursing interventions, with the detailed search algorithms and specific strings deployed for each respective database thoroughly documented in [Supplementary File 1](#).

As a complementary measure to mitigate the risk of omitting relevant literature, a snowballing approach encompassing meticulous hand-searching and citation tracking was applied to the reference lists of all included studies and previous relevant reviews. This manual screening process was conducted to identify high-quality evidence that might have been overlooked during the initial automated database query. This dual-strategy search process ensured a rigorous and exhaustive retrieval of empirical evidence, providing a robust foundation for the subsequent narrative synthesis and the formulation of the proposed conceptual framework. While the protocol for this systematic review was not prospectively registered in PROSPERO, the methodology and reporting strictly adhered to the PRISMA 2020 guidelines to ensure transparency, reproducibility, and scientific rigor.

Study Selection and Data Extraction

All literature retrieved from the systematic search was imported into the Mendeley reference management software for automated deduplication. Two independent reviewers (E.S. and M.A.A.) rigorously screened the retrieved records based on titles and abstracts, followed by a comprehensive eligibility assessment via full-text review. Any discrepancies arising during the selection process were resolved through collaborative discussion to reach a consensus, or by consulting a third senior reviewer as an adjudicator. The entire study selection workflow, including the specific reasons for study exclusion at the full-text stage, was transparently documented utilizing the PRISMA 2020 flow diagram.

Data extraction was independently executed by the two reviewers using an a priori standardized data extraction form. The extracted data elements comprised the methodological characteristics of the studies, participants' demographic profiles, and specific details of the intervention components systematically categorized according to their educational, psychosocial (validation-based), and behavioral action-oriented components. Furthermore, outcome data were extracted for the primary clinical indicator (HbA1c levels) and psychometric instrument scores for the secondary psychosocial outcomes, including diabetes distress and self-efficacy. This structured extraction process ensured that all multifaceted elements of the nursing interventions were captured to facilitate a robust narrative synthesis.

Quality Appraisal and Risk of Bias

The methodological quality and risk of bias for each included study were independently appraised by two reviewers (E.S. and M.A.A.) utilizing the standardized Cochrane Risk of Bias tool.¹³ This instrument was employed to evaluate seven specific domains: (1) random sequence generation, (2) allocation concealment, (3) blinding of participants and personnel, (4) blinding of outcome assessment, (5) incomplete outcome data, (6) selective reporting, and (7) other bias. Each domain was rigorously categorized into low risk, unclear risk, or high risk of bias. Any discrepancies in appraisal were resolved through collaborative discussion to achieve consensus, or by consulting a third senior reviewer acting as an adjudicator.

Data Synthesis

Quantitative pooling (meta-analysis) was performed for the primary outcome (HbA1c) using Review Manager (RevMan) version 5.4. Given the clinical heterogeneity across trials, a random-effects model was utilized to calculate the pooled Mean Difference (MD) and 95% Confidence Intervals (CI). Statistical heterogeneity was assessed using the I^2 statistic, where values $>50\%$ indicated substantial heterogeneity. To address this, subgroup analyses based on follow-up duration (short-term: 3–6 months vs. long-term: 12–18 months) and sensitivity analyses by excluding outlier studies were conducted. Publication bias was assessed visually using a funnel plot. Psychosocial outcomes were synthesized narratively following the SWiM guidelines due to the use of diverse psychometric scales.

Results

Study Selection

The comprehensive workflow of the study selection process is detailed in the PRISMA 2020 flow diagram (Figure 1). A systematic literature search across three primary electronic databases PubMed, Scopus, and EBSCOhost yielded a total of 711 records. Following the automated removal of 231 duplicates utilizing reference management software, 480 unique records underwent initial screening. Evaluating the relevance of titles and abstracts against the predefined inclusion criteria resulted in the exclusion of 428 records, leaving 52 potentially relevant reports sought for full-text retrieval.

Of these 52 reports, three were excluded due to full-text access limitations, leaving 49 reports for comprehensive eligibility assessment. A rigorous full-text evaluation led to the further exclusion of 33 reports for several primary reasons: 22 interventions were not nurse-led or utilized fully automated app-based platforms, four were pilot or feasibility study designs, four failed to report quantitative glycemic control outcomes or had an irrelevant study focus, and three were excluded for other specific methodological reasons. Following this multilayered selection process, a definitive total of 15 unique studies, reported across 16 publications, fulfilled all eligibility criteria and were ultimately included in this systematic review and narrative synthesis focusing on clinical and psychosocial outcomes.

Study Characteristics

The baseline characteristics of the 15 included studies (encompassing 16 publications) are comprehensively summarized in Table 1. All included trials utilized a randomized controlled trial (RCT) design, incorporating various methodological approaches such as multicenter, single-blind, pragmatic, and cluster RCTs. The studies were conducted across a highly diverse range of global settings, capturing populations from Asia (China, Pakistan, Iran, Malaysia), Europe (Spain, the

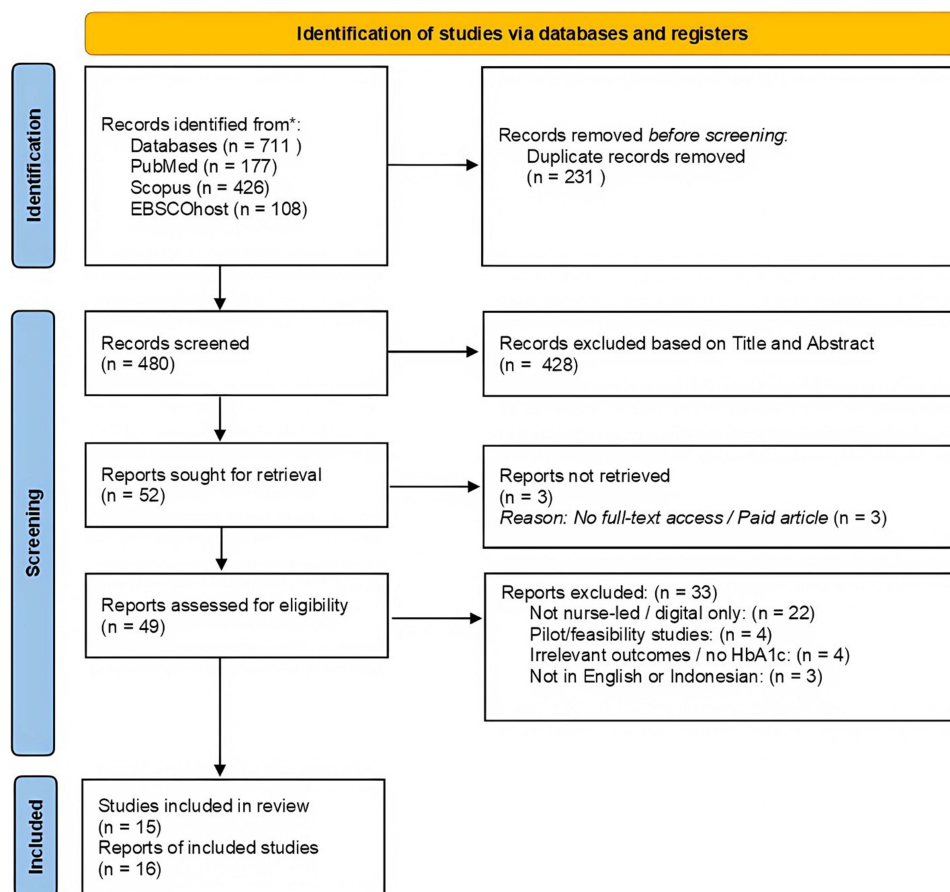


Figure 1 PRISMA 2020 flow diagram illustrating the systematic study selection process. Asterisk (*) denotes the primary electronic databases searched during the identification phase.

UK, Sweden, Belgium, Turkey), Africa (Nigeria), and Oceania (New Zealand). This extensive geographical distribution underscores the broad international relevance and cultural adaptability of the evaluated nurse-led interventions.

The sample sizes across the trials varied substantially, ranging from a minimum of 70 participants²⁴ to a maximum of 869 participants.²² The study populations predominantly comprised middle-aged to older adults, with mean ages generally ranging from 52 to 71 years, and both male and female patients were well-represented across all cohorts. Clinically, the participants exhibited suboptimal glycemic control at baseline, with mean HbA1c levels spanning from approximately 7.0% to 10.9%. The duration of the diabetes diagnosis also varied widely, encompassing newly diagnosed individuals (≤ 3 years) to those living with the condition for over a decade. Collectively, these diverse baseline parameters reflect a highly representative sample of the general T2DM population, thereby strengthening the external validity and generalizability of the findings of this systematic review.

Characteristics of Nursing Interventions and Theoretical Integration

The 15 included studies (encompassing 16 publications) demonstrated substantial heterogeneity in delivery modalities, dosages, and theoretical underpinnings, although all were consistently nurse-led, positioning nursing professionals as the primary therapeutic facilitators (Table 2). Based on delivery modalities, the interventional approaches can be classified into three predominant formats: face-to-face group psychoeducation, individual counseling, and remote monitoring via tele-nursing. Several trials relied heavily on face-to-face group dynamics to optimize peer support,^{18,29} whereas others utilized intensive individual sessions.^{14,19,23}

A prominent trend identified in this synthesis is the utilization of hybrid communication technologies; more than half of the studies combined face-to-face initiation sessions with persistent follow-up via telephone calls or asynchronous

Table 1 Characteristics of Primary Studies Included in the Review

| Study (Author & Year) | Country (Location) | Study Design | Sample Size (N) | Baseline Characteristics (Age & Gender) | Clinical Baseline (HbA1c & Duration) |
|---|-------------------------|--|-------------------------------|--|---|
| Asmat et al (2024) ¹⁴ | Pakistan (Multicenter) | Parallel randomized controlled trial | Total: 612 (IG: 302; CG: 310) | Age: 532 (IG) vs 538 (CG); Female: 520% (IG) vs 450% (CG) | HbA1c: 8.81% (IG) vs 8.70% (CG); Duration: 6.4y (IG) vs 6.2y (CG) |
| Azami et al (2018) ¹⁵ | Iran (Ilam) | Multicenter parallel-group RCT | Total: 142 (IG: 71; CG: 71) | Age: 550 (IG) vs 534 (CG); Female: 676% (IG) vs 634% (CG) | HbA1c: 932% (IG) vs 931% (CG); Duration: 88y (IG) vs 90y (CG) |
| Cheng et al (2018, 2021) ^{16,17} | China (Xi'an) | Multicenter parallel-group RCT | Total: 242 (IG: 121; CG: 121) | Age: 561 (IG) vs 539 (CG); Female: 231% (IG) vs 289% (CG) | HbA1c: 994% (IG) vs 1015% (CG); Duration: 81y (IG) vs 77y (CG) |
| Chew et al (2019) ¹⁸ | Malaysia | Cluster randomized controlled trial | Total: 124 (IG: 53; CG: 71) | Age: 557 (mean); Female: 600% (IG) vs 620% (CG) | HbA1c: 990% (IG) vs 950% (CG); Duration: 70y (median) |
| Essien et al (2017) ¹⁹ | Nigeria (Calabar) | Individually randomized controlled trial | Total: 118 (IG: 59; CG: 59) | Age: 526 (IG) vs 528 (CG); Female: 525% (IG) vs 678% (CG) | HbA1c: 109% (IG) vs 105% (CG); Duration: 69y (IG) vs 61y (CG) |
| Fu et al (2021) ²⁰ | China (Hengyang) | Parallel randomized controlled trial | Total: 88 (IG: 44; CG: 44) | Age/Gender: Not detailed in main text | HbA1c: 821% (IG) vs 817% (CG); Duration: > 6 months |
| Guo et al (2019) ²¹ | China (Changsha) | Randomized controlled trial | Total: 171 (IG: 86; CG: 85) | Age: 631 (IG) vs 643 (CG); Female: 570% (IG) vs 590% (CG) | HbA1c: 776% (IG) vs 764% (CG); Duration: Majority > 5y |
| Hu et al (2021) ²² | China (Guangzhou) | Single-blind randomized controlled trial | Total: 869 (IG: 434; CG: 435) | Age: 536 (IG) vs 547 (CG); Female: 394% (IG) vs 430% (CG) | HbA1c: 942% (IG) vs 923% (CG); Duration: 63y (IG) vs 78y (CG) |
| Ismail et al (2018) ²³ | UK (London) | Two-arm parallel cluster RCT | Total: 334 (IG: 164; CG: 170) | Age: 590 (IG) vs 589 (CG); Female: 500% (IG) vs 488% (CG) | HbA1c: 9.50% (IG) vs 9.40% (CG); Duration: 10y (IG) vs 9y (CG) |
| İşleyen et al (2025) ²⁴ | Turkey (Istanbul) | Single-blind parallel-group RCT | Total: 70 (IG: 36; CG: 34) | Age: 552 (IG) vs 555 (CG); Female: 611% (IG) vs 559% (CG) | HbA1c: 953% (IG) vs 931% (CG); Duration: 135y (IG) vs 128y (CG) |
| Jiang et al (2019) ²⁵ | China (Beijing/ Fujian) | Multicenter parallel-group RCT | Total: 265 (IG: 133; CG: 132) | Age: 573 (IG) vs 564 (CG); Female: 586% (IG) vs 51.5% (CG) | HbA1c: 8.58% (IG) vs 8.83% (CG); Duration: 5.9y (IG) vs 6.1y (CG) |
| Jutterström et al (2016) ²⁶ | Sweden (Umeå) | Three-arm RCT with external control | Total: 182 (IG: 97; CG: 85) | Age: 640 (IG) vs 626 (CG); Female: 374% (total) | HbA1c: 60% (Mono-S); Duration: Diagnosed ≤ 3y |
| Hoyo (2023) ²⁷ | Spain (Zaragoza) | Pragmatic parallel-group single-blind RCT | Total: 428 (IG: 225; CG: 203) | Age: 714 (IG) vs 715 (CG); Female: 716% (IG) vs 710% (CG) | HbA1c: 872% (IG) vs 865% (CG); Duration: 102y (IG) vs 98y (CG) |
| Odoletkova et al (2016) ²⁸ | Belgium (Aalst) | Parallel-group randomized controlled trial | Total: 574 (IG: 287; CG: 287) | Age: 638 (IG) vs 624 (CG); Female: 40% (IG) vs 37% (CG) | HbA1c: 79% (IG) vs 7.8% (CG); Duration: ~7y |
| Whitehead et al (2017) ²⁹ | New Zealand | Three-arm parallel-group RCT | Total: 118 (IG: 73; CG: 45) | Age: ~550 (mean); Female: ~460% (total) | HbA1c: ~800% (mean baseline); Duration: Majority > 5y |

Abbreviations: CG, control group; IG, intervention group; RCT, randomized controlled trial; y, years.

Table 2 Delivery Formats and Dosages of Nurse-Led Interventions

| Study | Intervention Program | Provider | Delivery Format | Intervention Dosage |
|---|---------------------------|------------------------------|-------------------------------|---|
| Asmat et al (2024) ¹⁴ | PACE-SMI | Registered Nurses | Face-to-face and home visits | 8 weekly sessions (60–90 min), 1 booster, and 1 home visit |
| Azami et al (2018) ¹⁵ | Nurse-Led DSME | Diabetes Specialist Nurses | Group education and telephone | 4 group sessions (120 min) then weekly calls for 2 months |
| Cheng et al (2018, 2021) ^{16,17} | Empowerment-based SM | Study Nurses | Group education and telephone | 6 weeks: 2 group sessions followed by 4 individual phone calls |
| Chew et al (2019) ¹⁸ | VEMOFIT | Trained Nurses | Face-to-face group sessions | 4 biweekly sessions plus 1 booster session after 3 months |
| Essien et al (2017) ¹⁹ | Intensive DSME | Nurses & Physicians | Individual face-to-face | 6 months: Monthly monitoring and refresher calls every 2–3 weeks |
| Fu et al (2021) ²⁰ | Multi-directional Nursing | Clinic Nurses | Face-to-face and telephone | 12 weeks: 3 sessions every 2 weeks followed by biweekly phone calls |
| Guo et al (2019) ²¹ | Team Management (NLTM) | Community Health Nurses | Lectures & home visits | 12 months: Lectures every 2 months and monthly home visits/calls |
| Hu et al (2021) ²² | Decision Support | Diabetes Specialist Nurses | WeChat & Telephone | 12 weeks: Daily app evaluation plus phone calls every 1–2 weeks |
| Ismail et al (2018) ²³ | Diabetes-6 (D6) | Trained Practice Nurses | Individual face-to-face | 12 months: Up to a maximum of 12 individual meeting sessions |
| İşleyen et al (2025) ²⁴ | MI Tele-nursing | Researcher Nurses | Remote tele-nursing | 3 months: 8 telephone sessions based on motivational interviewing |
| Jiang et al (2019) ²⁵ | Structured Education | Trained Nurses | Group & Telephone | 6 months: 4 group sessions followed by biweekly calls for 4 months |
| Jutterström et al (2016) ²⁶ | DIVA 2 | Diabetes Specialty Nurses | Group or Individual | 2-6 months: 6 sessions (45–90 min) based on patient needs |
| Hoyo (2023) ²⁷ | TELE-DD | Research Nurses | Telephonic intervention | 18 months: Monthly routine monitoring telephone calls |
| Odnoletkova et al (2016) ²⁸ | COACH Program | Certified Diabetes Nurses | Tele-coaching via telephone | 6 months: 5 telephone sessions (30 min) at 5-week intervals |
| Whitehead et al (2017) ²⁹ | ACT + Education | Primary/Mental Health Nurses | Group workshop | Single intensive 75-hour full-day group workshop |

Abbreviations: ACT, Acceptance and Commitment Therapy; DSME, diabetes self-management education; DSN, diabetes specialty nurse; MI, motivational interviewing; SM, self-management.

messaging applications.^{15,16,20,21,25} Intervention dosages varied widely, ranging from brief 6-week programs^{16,17} to extended longitudinal support spanning 12 to 18 months.^{23,27}

When analyzed through the analytical lens of the Middle-Range Theory of Self-Care of Chronic Illness (SCCI), all interventions consistently sought to facilitate the three core domains of self-care: maintenance, monitoring, and management. The specific mapping of care model components in Table 3 confirms that these studies integrated a foundational multicomponent psychoeducational framework that aligns with the Education, Validation, and Action (EVA) paradigm the fundamental building blocks of the proposed EVA-Diabetes Care Model.

Table 3 Mapping of Interventions Based on the EVA (Education, Validation, Action) Framework

| Study (Author & Year) | Theoretical Approach | Education (Clinical Content) | Validation (Emotional Support) | Action (Behavioral Component) |
|---|-----------------------------|--|---|---|
| Asmat et al (2024) ¹⁴ | Social Cognitive Theory | Structured education centered on patient needs (PACE-SMI) | Enhancing confidence in facing disease-related challenges | Skills training to improve daily self-care behaviors. |
| Azami et al (2018) ¹⁵ | DSME Framework | Fundamentals of diabetes management and clinical self-care | Strengthening group motivation to enhance self-efficacy | Encouraging active self-care behavioral practices. |
| Cheng et al (2018, 2021) ^{16,17} | Empowerment Model | Clinical self-management knowledge and glucose monitoring | SMART goal setting, situational reflection, and emotional stability | Action planning, problem-solving, and independent decision-making. |
| Chew et al (2019) ¹⁸ | Value-based Approach | Comprehensive diabetes education module | Systematic attention to emotions to reduce diabetes distress | Aligning health behaviors with the patient's personal values. |
| Essien et al (2017) ¹⁹ | Guideline-based DSME | Intensive education regarding hyperglycemia and complications | Intensive supportive approach during the educational process. | Execution of management routines based on clinical guidelines. |
| Fu et al (2021) ²⁰ | Multi-directional Nursing | Understanding complication risk factors (HbA1c, BP, LDL-C) | Support for role changes and addressing emotional frustration. | Integrating diet and exercise into daily life via phone guidance. |
| Guo et al (2019) ²¹ | Chronic Care Model | Health lectures and literacy in community facilities | Continuous emotional support through regular home interactions. | Improvement of self-management behaviors in community settings. |
| Hu et al (2021) ²² | Decision Support | Instructions on basal insulin self-titration protocols | Providing a sense of security through remote nurse supervision. | Daily self-evaluation and independent insulin dose titration. |
| Ismail et al (2018) ²³ | MI and CBT | Integrating standard clinical care with psychological counseling | Managing depressive symptoms and specific diabetes distress. | Holistic changes including weight control and lifestyle adjustment. |
| İşleyen et al (2025) ²⁴ | Motivational Interviewing | Remote education on metabolic control parameters | Remote motivational support to enhance patient self-efficacy. | Enhancement of independent and remote self-management. |
| Jiang et al (2019) ²⁵ | Social Cognitive Theory | Basic diabetes knowledge and DSM skills | Building self-efficacy to overcome perceived care barriers. | Establishing and sustaining consistent daily self-care behaviors. |
| Jutterström et al (2016) ²⁶ | PCC & Integration Theory | Thematic discussions on the meaning of diagnosis | Reflecting on personal illness experiences and understandings. | Improving illness integration to support long-term self-management. |
| Hoyo (2023) ²⁷ | MI & Collaborative Care | Individualized clinical protocol monitoring. | Collaborative care strategies to address comorbid depression. | Improving treatment adherence and emotional burden management. |
| Odoletkova et al (2016) ²⁸ | Target-driven Coaching | Understanding clinical targets (HbA1c, lipids, BP) | Personalized tele-coaching to address individual barriers. | Achievement of modifiable risk factor targets via tele-nursing. |
| Whitehead et al (2017) ²⁹ | CBT & ACT Frameworks | Comprehensive clinical diabetes education modules | Training in psychological acceptance (ACT) to reduce burden. | Commitment to behavioral change despite illness-related difficulties. |

Abbreviations: ACT, Acceptance and Commitment Therapy; BP, blood pressure; CBT, cognitive behavioral therapy; DSM, diabetes self-management; DSME, diabetes self-management education; EVA, Education, Validation, and Action; MI, motivational interviewing; PCC, patient-centered care.

- Education: Nurses acted as providers of comprehensive health literacy to bolster self-care maintenance behaviors. However, findings indicate that purely cognitive education is insufficient unless counterbalanced by emotional support.
- Validation: The majority of studies addressed the psychological burden of diabetes by adopting therapeutic tactics such as Motivational Interviewing,^{24,27} Cognitive Behavioral Therapy (CBT) and Acceptance and Commitment Therapy (ACT),^{23,29} and Empowerment Theory¹⁶ to validate patients' chronic frustration and reconstruct intrinsic motivation.
- Action: This cognitive and emotional transformation is ultimately crystallized into the action component, representing the pinnacle of the self-care management domain. Through precise nursing supervision, patients were trained to translate care intentions into concrete adaptive behaviors, such as clinical goal-setting, independent insulin dose titration,²² and the maintenance of adherence within community settings.²¹

The synergistic integration of these three elements Education, Validation, and Action diametrically distinguishes advanced multicomponent psychoeducational interventions from conventional, routine health education.

Methodological Quality and Risk of Bias Assessment

The methodological quality of the 15 included randomized controlled trials (RCTs) was rigorously evaluated utilizing the Cochrane Risk of Bias tool. A comprehensive visual synthesis of this assessment is presented in the Risk of Bias Graph (Figure 2) and the Risk of Bias Summary (Figure 3). Overall, the empirical evidence underpinning this systematic review is of substantial quality, with the majority of domains across the respective studies classified as indicating a low risk of bias.

Regarding selection bias, all included studies (100%) demonstrated a low risk concerning random sequence generation, successfully employing valid computerized methods or random number tables. In terms of allocation concealment, approximately 73% of the trials were deemed low risk, while the remainder ($n = 4$) were categorized as having an unclear risk. This unclear classification identified in studies by Azami et al¹⁵ Essien et al¹⁹ İşleyen et al²⁴ and Jutterströmet al²⁶ was primarily due to insufficient detailed reporting regarding the specific implementation of opaque sealed envelopes or centralized allocation systems.

Conversely, this review identified a uniform high risk of bias (100%) within the domain of blinding of participants and personnel (performance bias). This finding is an inherent and logical methodological consequence of nurse-led psychoeducational and behavioral training interventions, which inherently preclude the feasibility of double-blind procedures between nursing facilitators and patients. Notably, this potential threat to internal validity was effectively mitigated within the detection bias domain, where all studies (100%) successfully blinded the outcome assessors. This rigorous approach ensures that the primary outcome, HbA1c levels, was measured objectively by laboratory personnel who were completely blinded to the participants' group allocations.

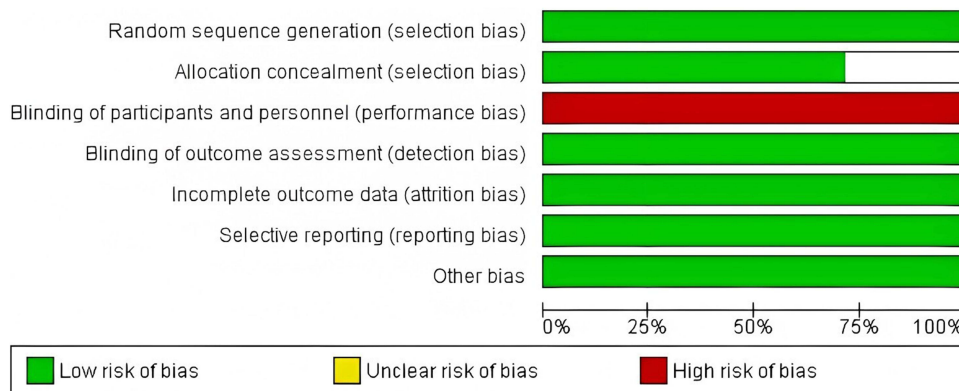


Figure 2 Risk of bias graph representing the review authors' judgments about each risk of bias item presented as percentages across all included randomized controlled trials.

pooled mean difference (MD) was -0.69% (95% CI: -1.00 to -0.37 ; $P < 0.0001$), indicating a clinically significant reduction in glycated hemoglobin. Although statistical heterogeneity was high (I-squared = 92%), a random-effects model was appropriately utilized to manage this variance.

Subgroup analysis based on the duration of follow-up revealed that the interventions were highly effective in the short-term (3–6 months), yielding an MD of -0.61% (95% CI: -0.86 to -0.36 ; $P < 0.00001$). For the long-term subgroup (12–18 months), the pooled MD was -0.91% (95% CI: -1.92 to 0.10 ; $P = 0.08$).

To address the high statistical heterogeneity, a sensitivity analysis was conducted by excluding two extreme outliers: Essien et al¹⁹ and Lozano del Hoyo et al²⁷. As shown in the sensitivity analysis forest plot (Figure 5), the intervention effect remained statistically significant with a stable pooled MD of -0.51% (95% CI: -0.69 to -0.32 ; $P < 0.00001$). This analysis also resulted in a substantial reduction in heterogeneity within the long-term subgroup, where the I-squared value dropped from 96% to 23%. These findings confirm the stability and robustness of the primary meta-analysis results against the influence of individual studies.

Finally, publication bias was assessed visually through the funnel plot (Figure 6). The plot displayed a generally symmetrical distribution of the studies around the pooled effect size, suggesting no evidence of significant publication bias within the synthesized evidence.

Clinical Effectiveness of Interventions on Glycemic Control

Nine of the 15 included trials demonstrated statistically significant HbA1c reductions favoring the intervention group^{15–17,19–22,27,28,30}. The effectiveness of nurse-led multicomponent psychoeducational interventions on glycated hemoglobin (HbA1c) levels was evaluated through a formal meta-analysis of 13 randomized controlled trials involving 3,568 participants. The pooled analysis demonstrated that the intervention group achieved a statistically significant reduction in HbA1c compared to the control group, with an overall mean difference (MD) of -0.69% (95% CI: -1.00 to -0.37 ; $P < 0.0001$; Figure 4).

While the magnitude of reduction varied across individual trials, the meta-analytical evidence confirms a consistent therapeutic direction favoring integrated multicomponent interventions. Sensitivity analysis, performed by excluding two extreme outliers Essien et al¹⁹ and Lozano del Hoyo et al²⁷ further confirmed a stable and significant reduction of -0.51% (95% CI: -0.69 to -0.32 ; $P < 0.00001$; Figure 5). This quantitative summary underscores the clinical superiority of combining education with emotional support and behavioral training over routine didactic education alone.

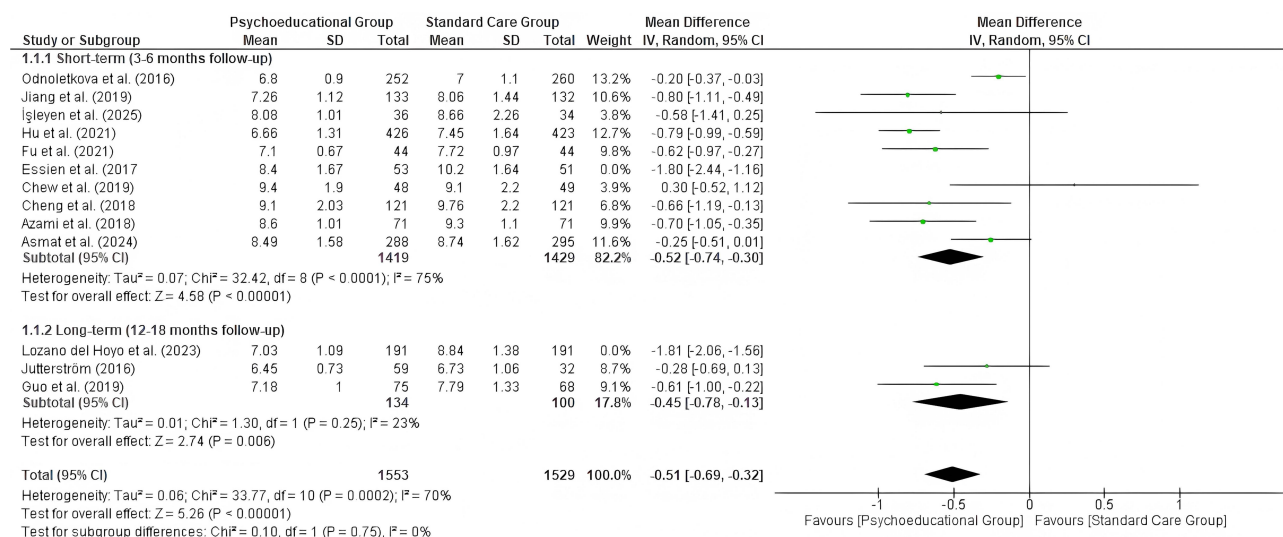


Figure 5 Forest plot representing the sensitivity analysis of HbA1c levels following the exclusion of extreme outliers.

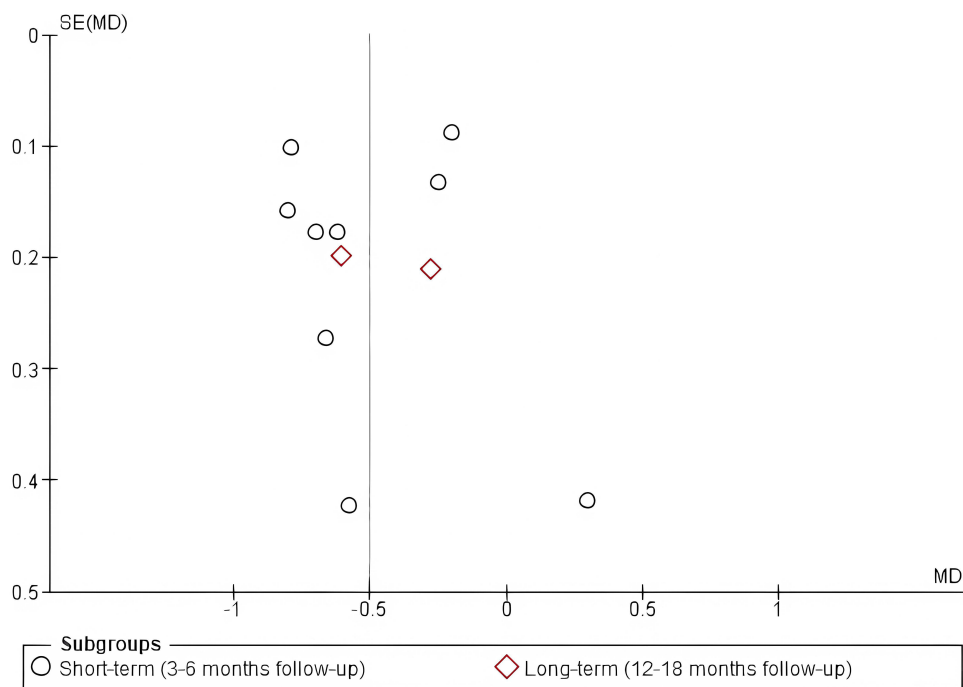


Figure 6 Funnel plot utilized for the assessment of potential publication bias across the included trials.

Consistency of Effect Across Follow-Up Durations

The therapeutic effect of nurse-led interventions was consistently observed across varying evaluation periods throughout this meta-analysis. Subgroup analysis for studies with short-term follow-ups (3 to 6 months)^{14-16,19,20,22,24,30} demonstrated a statistically significant pooled reduction in HbA1c, with a mean difference (MD) of -0.61% (95% CI: -0.86 to -0.36 ; $P < 0.00001$). Notably, trials by Cheng et al¹⁶ and Jiang et al³⁰ indicated that robust improvements were achieved when participants were equipped with enhanced self-care monitoring capacities, which serves as a crucial element of the “Action” component within the SCCI framework.

Furthermore, this glycemic reduction was successfully maintained in studies with extended evaluation periods ranging from 12 to 18 months.^{21,26,27} While initial analysis of the long-term subgroup showed high heterogeneity, the sensitivity analysis confirmed that after adjusting for outliers, the pooled effect remained stable and the heterogeneity (I-squared) significantly decreased from 96% to 23%. The long-term glycemic stability reported by Guo et al²¹ and Hoyo et al²⁷ underscores that continuous and persistent nursing support is fundamental in mitigating the risk of behavioral relapse and sustaining self-care behaviors. These meta-analytical findings provide a robust empirical foundation for the proposed EVA-Diabetes Care Model framework, suggesting that the integration of Education, Validation, and Action is essential for achieving and maintaining long-term clinical improvements in patients with Type 2 Diabetes Mellitus.

Analysis of Non-Significant Findings

While the majority of the trials included in this meta-analysis reported positive outcomes, six specific studies^{14,18,23,24,26,29} observed no statistically significant differences in primary HbA1c reductions between the intervention and control groups. A systematic comparison reveals three key differentiating factors that influenced these results.

First, the healthcare context and “ceiling effect” played a significant role. In the cohort evaluated by Ismail et al,²³ the non-significant result was likely influenced by the exceptionally high baseline quality of standard diabetes care already established within the primary healthcare system of the United Kingdom. Under such optimized clinical conditions, detecting the incremental metabolic benefit of additional nurse-led interventions becomes statistically more challenging compared to settings with conventional care standards.

Second, the frequency of contact and the duration of longitudinal follow-up emerged as critical differentiators. Highly effective interventions identified in this review consistently utilized continuous, high-frequency contact such as weekly or

biweekly tele-nursing to sustain behavioral changes. In contrast, interventions with lower contact intensity or insufficient duration struggled to maintain significant metabolic improvements. For instance, the intervention by Whitehead et al²⁹ utilized a single, intensive 7.5-hour group workshop; despite its comprehensive content, it lacked the persistent, longitudinal nursing support necessary to prevent self-care relapse. Similarly, studies by Jutterström et al²⁶ İşleyen et al,²⁴ and Asmat et al¹⁴ highlighted that while psychosocial outcomes improved, the intensity of the nursing follow-up was perhaps insufficient to drive the rigorous physiological changes required for HbA1c reduction.

Finally, the specific nature of psychosocial integration played a definitive role in clinical efficacy. The findings by Chew et al.¹⁸ and Whitehead et al²⁹ demonstrate that interventions focusing predominantly on emotional or psychological support without a robust and structured integration of behavioral action training are less effective in achieving stringent glycemic targets. While successful trials consistently paired emotional validation with concrete skills training such as dietary self-monitoring or independent insulin dose titration interventions focusing primarily on psychological acceptance did not automatically translate into improved HbA1c levels.

These outliers critically reinforce the central proposition of the proposed EVA-Diabetes Care Model framework: optimal clinical outcomes in T2DM management necessitate a synergistic and balanced integration of Education, Validation, and Action (EVA). These findings confirm that providing emotional validation alone, while highly beneficial for mental health and reducing diabetes distress, is insufficient to drive complex metabolic changes unless it is explicitly coupled with concrete, persistent behavioral action strategies.

Effectiveness of the Interventions on Psychosocial Outcomes

Beyond the clinical impact on glycemic control, the synthesis demonstrates that nurse-led multicomponent psychoeducational interventions exert a consistently positive influence on various psychosocial dimensions. The most frequently reported outcomes include reductions in diabetes-specific distress, enhanced self-efficacy, and improvements in health-related quality of life (HRQoL) and self-management behaviors, as summarized in Table 4.

Table 4 Summary of Findings and Secondary Outcomes

| Study | Follow-Up | IG HbA1c (%) | CG HbA1c (%) | Psychosocial & Secondary Outcomes |
|---|------------|---|---|---|
| Asmat et al (2024) ¹⁴ | 3 months | 8.49 ± 1.58 | 8.74 ± 1.62 | Improved self-efficacy and self-care behaviors (P < 0.001). |
| Azami et al (2018) ¹⁵ | 3 months | 8.60 ± 1.01 | 9.30 ± 1.10 | Significant increase in self-efficacy (P < 0.001). |
| Cheng et al (2018, 2021) ^{16,17} | 3-5 months | 9.10 ± 2.03 | 9.76 ± 2.20 | Reduced distress (P=0.024) and improved QoL (P=0.004). |
| Chew et al (2019) ¹⁸ | 12 months | 9.5 ± 2.2 (Baseline: 9.9 ± 1.8) | 8.8 ± 1.9 (Baseline: 9.5 ± 2.1) | HbA1c p = 0.82. Significant reduction in diabetes distress (P < 0.05). |
| Essien et al (2017) ¹⁹ | 6 months | 8.4 ± 1.3 | 10.2 ± 1.4 | Clinically significant HbA1c reduction (P < 0.0001). |
| Fu et al (2021) ²⁰ | 12 weeks | 7.10 ± 0.67 | 7.72 ± 0.97 | Improved patient satisfaction and management scores. |
| Guo et al (2019) ²¹ | 12 months | 7.18 ± 1.00 | 7.79 ± 1.33 | Better adherence to diet and exercise (P < 0.0001). |
| Hu et al (2021) ²² | 12 weeks | 6.66 ± 1.31 | 7.45 ± 1.64 | Enhanced confidence in insulin self-titration. |
| Ismail et al (2018) ²³ | 18 months | NR* (Baseline: 81.0 ± 17.1 mmol/mol) | NR* (Baseline: 80.1 ± 19.1 mmol/mol) | HbA1c adj. mean diff: -0.79 mmol/mol (95% CI -5.75 to 4.18). Improvement in PAID distress scores (P > 0.05). |
| İşleyen et al (2025) ²⁴ | 6 months | 8.08 ± 1.01 | 8.66 ± 2.26 | Significant increase in self-efficacy (P < 0.001). |
| Jiang et al (2019) ²⁵ | 6 months | 7.26 ± 1.12 | 8.06 ± 1.44 | Increased self-efficacy and knowledge (P < 0.001). |

(Continued)

Table 4 (Continued).

| Study | Follow-Up | IG HbA1c (%) | CG HbA1c (%) | Psychosocial & Secondary Outcomes |
|--|-----------|--------------|--------------|--|
| Jutterström et al (2016) ²⁶ | 12 months | 6.45 ± 0.73 | 6.73 ± 1.06 | Improved illness understanding (P < 0.001). |
| Hoyo (2023) ²⁷ | 18 months | 7.03 ± 1.09 | 8.84 ± 1.38 | Significant reduction in comorbid depression burden. |
| Odnoletkova et al (2016) ²⁸ | 6 months | 6.80 ± 0.90 | 7.00 ± 1.10 | No significant difference in treatment satisfaction. |
| Whitehead et al (2017) ²⁹ | 6 months | 7.74 ± NR | 8.40 ± NR | No differences in anxiety or depression scores. |

Notes: * = Absolute post-intervention values were not reported; however, the adjusted mean difference was provided and used for analysis. A total of six studies (Asmat et al¹⁴, Chew et al,¹⁸ Ismail et al²³ İşleyen et al²⁴ Jutterström et al²⁶ and Whitehead et al²⁹) reported non-significant differences in HbA1c reduction. Significance for Ismail et al²³ and Chew et al¹⁸ was determined based on their reported P-values and adjusted mean differences, despite the absence of absolute Mean/SD values (NR) in some categories.

Abbreviations: HbA1c, Glycated Hemoglobin; IG, Intervention Group; CG, Control Group; NR, Not Reported.

Diabetes Distress and Emotional Burden

A reduction in diabetes-related emotional burden was a prominent psychosocial finding across the included studies Utilizing psychometric instruments such as the Problem Areas in Diabetes (PAID) scale and the Diabetes Distress Scale (DDS), significant decreases in emotional distress were reported, notably by^{16,17} The integration of psychosocial support effectively alleviated the psychological burden on patients, Hoyo et al,²⁷ reporting a significant reduction in comorbid depression. Notably, even in studies where primary glycemic results were non-significant, such as the trial by Chew et al¹⁸ the intervention successfully reduced diabetes distress levels significantly (P < 0.05). These results underscore that nurse-led support can improve mental health outcomes independently of biological fluctuations.

Self-Efficacy and Self-Care Behaviors

Enhanced self-efficacy was identified as a primary mediator in driving behavioral change. Large-scale trials by^{14,15,24,25} reported highly significant increases in self-efficacy scores (P < 0.001). Patients demonstrated increased confidence in managing complex clinical tasks, such as independent insulin dose self-titration Hu et al.²²

These behavioral shifts align with the management domain of self-care, as evidenced by improved adherence to dietary requirements and physical activity reported by Guo et al.²¹

Quality of Life and Patient Satisfaction

The synthesized evidence indicates that nurse-led interventions holistically improved Health-Related Quality of Life (HRQoL) and patient satisfaction. Significant improvements in HRQoL were reported Cheng et al^{16,17} (P = 0.004). Additionally, Fu et al²⁰ noted enhanced patient satisfaction and overall management scores following the intervention. Collectively, these psychosocial findings demonstrate that interventions incorporating educational and emotional components effectively address the behavioral complexities of diabetes care, providing a robust empirical foundation for patient-centered multidisciplinary management.

Discussion

This systematic review provides a comprehensive synthesis of empirical evidence regarding the effectiveness of nurse-led multicomponent psychoeducational interventions for patients with Type 2 Diabetes Mellitus (T2DM). The primary findings demonstrate that this nursing approach is significantly superior to standard care in improving glycemic control, with nine of the 15 included trials demonstrating statistically significant HbA1c reductions favoring the intervention group. The meta-analysis revealed a statistically significant pooled HbA1c reduction of -0.69% (95% CI: -1.00 to -0.37; P < 0.0001). From a clinical perspective, achieving a reduction of at least 0.5% in HbA1c is widely recognized as a crucial threshold capable of substantially mitigating the risk of both microvascular and macrovascular complications.² These findings fundamentally affirm the strategic position of nurses not merely as passive purveyors of information, but as pivotal facilitators of clinical behavioral modification within an interdisciplinary collaborative framework.

The success of the interventions observed in this review highlights the inherent limitations of conventional diabetes care paradigms, which often rely exclusively on purely didactic education. Patients living with chronic illnesses are highly susceptible to self-regulation resource depletion, a state where the monotonous demands of daily care routines exhaust cognitive energy and trigger diabetes-specific distress. By utilizing therapeutic techniques such as motivational interviewing or cognitive behavioral therapy, nurses were able to explicitly validate patients' emotional frustrations.^{24,27} This emotional validation acts as a catalyst that reduces psychological burden and enhances self-efficacy, profoundly improving mental health outcomes independently of biological fluctuations.

While the majority of the included trials reported positive outcomes, it is critical to systematically analyze the four studies^{18,23,28,29} that reported non-significant glycemic differences. A comparative analysis reveals three primary differentiators between effective and ineffective interventions. First, the healthcare context plays a pivotal role; cohorts evaluated by Ismail et al and Odnoletkova et al likely experienced a "ceiling effect" due to the exceptionally high baseline quality of standard primary diabetes care already established in their respective regions. Under such optimized clinical conditions, detecting the incremental metabolic benefit of additional interventions becomes statistically challenging. Second, intervention dosage and contact frequency are crucial differentiators. Highly effective interventions identified in this review consistently utilized continuous, high-frequency contact such as weekly or biweekly tele-nursing to sustain behavioral changes. In contrast, interventions with lower contact intensity, such as the single intensive workshop utilized by Whitehead et al²⁹ lacked the persistent longitudinal nursing support necessary to prevent self-care relapse over time. Third, the specific nature of psychosocial integration determines clinical efficacy. Interventions focusing predominantly on emotional support or psychological acceptance without a robust integration of structured behavioral action training as seen in Chew et al¹⁸ and Whitehead et al²⁹ are less effective in achieving stringent glycemic targets.

This systematic comparison critically reinforces a key finding: providing emotional validation alone, while highly beneficial for mental health, is insufficient to drive complex metabolic change unless it is explicitly coupled with concrete, persistent behavioral action strategies. Therefore, by synthesizing these effective interventional elements, this review formally derives and proposes the Education, Validation, and Action (EVA-Diabetes Care Model) framework as an exploratory conceptual model. Designed to complement the Middle-Range Theory of Self-Care of Chronic Illness (SCCI),^{8,31} the EVA-Diabetes Care Model framework posits that optimal clinical outcomes necessitate a synergistic integration of clinical education, emotional validation, and concrete behavioral action. Compared to established paradigms such as the Chronic Care Model (CCM)²¹ or the Diabetes Empowerment Model,¹⁶ which primarily emphasize structural support and cognitive autonomy, EVA-Diabetes Care Model highlights emotional validation as a foundational prerequisite for clinical action. The incorporation of the Validation pillar signifies a profound shift toward patient-centered care, moving the clinical focus beyond the mere reduction of HbA1c levels to a more holistic engagement with the patient's lived experience. This fosters a therapeutic alliance where patients are empowered as active partners in their care, ensuring that psychological resilience is prioritized as a foundational component of long-term metabolic success.

Multidisciplinary Applicability

The findings of this systematic review and the proposed EVA-Diabetes Care Model framework demonstrate clinical relevance across at least two healthcare disciplines: Nursing and Internal Medicine (Diabetology). Furthermore, the integration of emotional validation techniques suggests significant applicability for Health Psychology and behavioral therapy practitioners working within multidisciplinary diabetes care teams. By institutionalizing this framework, healthcare management can bridge the persistent gap between acute inpatient care and long-term community-based self-management, thereby optimizing both patient outcomes and interprofessional efficiency.

Strengths and Limitations of the Review

Strengths

The primary strength of this systematic review and meta-analysis lies in its stringent methodological adherence to the PRISMA 2020 guidelines. The utilization of the Cochrane Risk of Bias tool ensured a rigorous and transparent evaluation of the internal validity of the 15 included randomized controlled trials (RCTs). Unlike previous qualitative

reviews, this study provides a robust quantitative synthesis through a meta-analysis involving 3,568 participants, demonstrating a significant pooled reduction in HbA1c.

The inclusion of sensitivity analysis which confirmed a stable effect size of -0.51% after excluding outliers and subgroup analysis further strengthens the reliability of these findings by effectively addressing and resolving statistical heterogeneity in long-term data. Furthermore, this review offers a significant conceptual contribution by proposing the EVA-Diabetes Care Model framework, an exploratory strategy grounded in the Middle-Range Theory of Self-Care of Chronic Illness (SCCI). The inclusion of longitudinal trials with follow-up periods reaching 12 to 18 months also enhances the review's capacity to evaluate the sustainability of nurse-led interventions.

Limitations

Several limitations must be acknowledged to ensure a balanced interpretation of the results:

- **Clinical Heterogeneity:** Although statistical heterogeneity was successfully managed in the meta-analysis, substantial clinical and methodological variance remains regarding the diverse delivery modes of psychoeducation and the varying intervention dosages.
- **Performance Bias:** There was a pervasive high risk of performance bias across the primary studies. This is largely unavoidable in behavioral and psychoeducational research, where double-blinding between the nursing facilitators and patients is unfeasible.
- **Retrospective Framework Mapping:** The mapping of intervention components to the proposed EVA-Diabetes Care Model framework is entirely retrospective and interpretive. Crucially, none of the included trials were originally designed to empirically test the EVA-Diabetes Care Model protocol. This inherently limits the strength of its empirical basis, meaning the framework must be viewed strictly as an exploratory conceptual synthesis that requires rigorous future prospective validation.
- **Protocol Registration and Language Bias:** The protocol for this review was not prospectively registered in an international database such as PROSPERO, which is a methodological limitation regarding early protocol transparency.
- **Language Restriction Bias:** As correctly highlighted by the updated PRISMA flow diagram, the literature search was strictly limited to publications available in English and Indonesian. We acknowledge this language restriction as a notable methodological gap. This introduces a potential language bias that may have inadvertently excluded relevant, high-quality clinical trials published in other languages, thereby potentially affecting the comprehensive global representation of the synthesized evidence.

Conclusion

This systematic review and meta-analysis provide robust evidence indicating that nurse-led multicomponent psychoeducational interventions are significantly superior to standard care in optimizing both glycemic control and psychosocial well-being among patients with type 2 diabetes mellitus (T2DM). The statistically significant pooled reduction in HbA1c, coupled with a consistent decrease in diabetes distress and enhanced self-efficacy, demonstrates that the successful management of chronic metabolic conditions benefits greatly from the harmonious integration of Education, Validation, and Action (EVA). These findings underscore that moving beyond routine didactic education toward a multidimensional approach is essential for addressing the intricate interplay between biological outcomes and the psychological burden of the disease.

By synthesizing these successful interventional elements, this review proposes the EVA-Diabetes Care Model framework as an exploratory conceptual model. This framework aligns with and further supports the Middle-Range Theory of Self-Care of Chronic Illness (SCCI), suggesting that the strengthening of intrapersonal factors through emotional validation serves as a crucial foundation for patients to perform complex self-care maintenance and management autonomously. Ultimately, this study highlights the transformative role of nurses as pivotal therapeutic facilitators who bridge the gap between clinical metabolic requirements and the humanistic needs of the patient.

However, because the proposed EVA-Diabetes Care Model framework is currently an exploratory conceptual synthesis derived from meta-analytical data, it strictly requires future empirical validation. Therefore, it is strongly recommended that future research prioritize well-powered, prospective, multicenter Randomized Controlled Trials (RCTs) specifically designed to directly test the clinical efficacy of the EVA-Diabetes Care Model protocol against standard care. Furthermore, incorporating cluster RCT designs or hybrid effectiveness-implementation methodologies would be highly valuable to evaluate not only the long-term metabolic sustainability but also the real-world feasibility and cost-effectiveness of integrating this framework into diverse clinical settings.

Clinical Practice and Policy Implications

The findings of this systematic review provide a compelling empirical justification to transition from traditional didactic education toward humanistic, theoretically grounded care models. Clinically, nurses should proactively integrate the Education, Validation, and Action (EVA) elements into routine care and post-discharge support programs, utilizing both face-to-face and tele-nursing modalities. Prioritizing emotional validation is a critical prerequisite to ensure patients are emotionally prepared and empowered to sustain complex self-care tasks, thereby preventing self-regulation resource depletion.

However, operationalizing this clinical shift requires immediate and synchronized policy revisions. Rather than treating psychosocial support as a secondary service, healthcare administrators and policymakers must formally integrate emotional validation protocols into standardized care guidelines and reimbursement models. Recognizing nurse-led psychoeducational sessions as essential, billable components of high-quality clinical care is imperative. Furthermore, sustaining these post-discharge programs demands targeted resource allocation toward the continuous professional development of nursing staff particularly in advanced therapeutic communication techniques such as motivational interviewing as well as strategic investments in digital health infrastructure. By institutionalizing this consolidated framework at both the bedside and systemic levels, healthcare systems can effectively bridge the persistent gap between acute inpatient care and long-term community-based self-management, optimizing both patient outcomes and institutional efficiency.

Declaration of Generative AI

The authors used Google Gemini during the preparation of this work to improve readability and language structure. After using this tool, the authors reviewed and edited the content and take full responsibility for the integrity of the manuscript.

Data Sharing Statement

All data generated or analyzed during this study are included in this published article and its [Supplementary Information File](#).

Ethics Statement

Ethical approval and informed consent were not required for this study, as it constitutes a systematic review of previously published and publicly available literature. This research did not involve any direct interaction with human participants or animal subjects. All synthesized data were extracted from peer-reviewed publications, and the study was conducted in accordance with standard ethical guidelines for secondary research.

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Disclosure

The authors report no conflicts of interest in this work.

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