

Effectiveness of Family Support System on Glycemic Control in Diabetes Mellitus Patients: A Systematic Review and Meta-Analysis

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ADMINISTRATIVE INFORMATION

Support - National Taiwan University Hospital Hsin-Chu Branch, Hsinchu, Taiwan.

Review Stage at time of this submission - The review has not yet started.

Conflicts of interest - None declared.

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Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 29 August 2026 and was last updated on 29 August 2026.

INTRODUCTION

Review question / Objective This systematic review and meta-analysis aims to evaluate the effectiveness of family support interventions in improving glycated hemoglobin (HbA1c) levels among patients with type 1 or type 2 diabetes mellitus.

The review question is: Among patients with type 1 or type 2 diabetes mellitus, do family support interventions improve HbA1c levels compared with usual care, general diabetes education, a waiting-list control, or care without a family involvement component?

The population includes patients diagnosed with type 1 or type 2 diabetes mellitus, without restrictions on age, sex, disease duration, or treatment modality. The intervention includes the active involvement of family members, spouses, parents, children, relatives, or primary caregivers in

diabetes management. The comparator includes usual care, general diabetes education, a waiting-list control, or care without family involvement. The primary outcome is HbA1c. Only randomized controlled trials are included.

The secondary objectives are to examine whether the effects of family support interventions on HbA1c differ according to: (1) the source of family support, including parents or adult family members; (2) intervention duration, classified as ≤ 3 months or > 3 months; and (3) intervention modality, classified as digital or remote interventions versus face-to-face interventions.

Condition being studied Diabetes mellitus is a chronic metabolic disease characterized by persistent hyperglycemia. This review includes patients with type 1 or type 2 diabetes mellitus, without restrictions on age, sex, disease duration, or treatment modality. Long-term inadequate glycemic control is associated with microvascular and macrovascular complications, including

diabetic nephropathy, retinopathy, neuropathy, cardiovascular disease, and cerebrovascular disease, as well as increased risks of disability and mortality.

Glycated hemoglobin (HbA1c) reflects average blood glucose levels over approximately the preceding two to three months and is widely used to assess long-term glycemic control. Effective diabetes management depends on sustained self-management behaviors, such as healthy eating, regular physical activity, blood glucose monitoring, medication or insulin use, and complication prevention. Because these behaviors are largely performed in daily family settings, support from parents, spouses, children, relatives, or primary caregivers may contribute to improved self-management and glycemic control. The condition of interest in this review is therefore inadequate glycemic control, as assessed by HbA1c, among patients with type 1 or type 2 diabetes mellitus.

METHODS

Participant or population Patients diagnosed with type 1 or type 2 diabetes mellitus are included, without restrictions on age, sex, disease duration, or treatment modality. Participants may include children, adolescents, adults, or older adults. Studies involving individuals without type 1 or type 2 diabetes mellitus are excluded.

Intervention Family support interventions involving the active participation of at least one family member, including parents, spouses, children, other relatives, or primary caregivers, in the patient's diabetes management are included. Eligible interventions may include diabetes education, dietary and physical activity management, blood glucose monitoring, medication or insulin management, emotional support, communication and problem-solving training, collaborative goal setting, participation in treatment-related decisions, and other strategies intended to improve diabetes self-management. Interventions may be delivered face-to-face or through digital or remote technologies, including telephone follow-up, video consultation, mobile applications, online platforms, data sharing, or remote monitoring.

Comparator Eligible comparators include usual diabetes care, standard diabetes self-management education, a waiting-list control, or care without a family involvement component. Studies in which the comparator group receives an active intervention involving family support are excluded.

Study designs to be included Randomized controlled trials, including individually randomized and cluster-randomized controlled trials.

Eligibility criteria Eligible reports must be full-text original research articles reporting completed randomized controlled trials. Studies must provide sufficient quantitative data for calculating an effect size for HbA1c, including the sample size, mean, and standard deviation for the intervention and comparator groups, or other statistics that can be converted into an effect size.

The following reports are excluded: systematic reviews, meta-analyses, qualitative studies, conference abstracts or proceedings, case reports, case series, ongoing or unpublished studies, single-group pretest-posttest studies, non-randomized studies, and duplicate publications. Studies are also excluded if the participants do not have type 1 or type 2 diabetes; the intervention does not include a family support component; the independent effect of family support cannot be determined; the comparator receives an active family support intervention; HbA1c is not reported as an outcome; sufficient data for effect-size calculation are unavailable; or the full text cannot be obtained.

Information sources The following ten electronic databases were searched: Taiwan National Digital Library of Theses and Dissertations, Airiti Library, Cochrane Library, Embase, ProQuest, PsycINFO, PubMed, Web of Science, and Scopus. Searches covered each database from its inception to March 31, 2026, with no restriction on publication year.

Search terms were developed using concepts related to diabetes mellitus, family members or family support, glycated hemoglobin, and randomized controlled trials. The search terms were adapted to the indexing system and search functions of each database.

Main outcome(s) The primary outcome is glycated hemoglobin (HbA1c), reported as a percentage, following the family support intervention. HbA1c reflects average blood glucose levels over approximately the preceding two to three months and is used as an indicator of long-term glycemic control.

For studies reporting multiple post-intervention measurements, the HbA1c measurement obtained at the time point closest to the end of the intervention or the prespecified principal follow-up time point is selected for the primary analysis to maintain comparability and avoid including

multiple dependent effect estimates from the same study.

The effect measure is the standardized mean difference (SMD) with a 95% confidence interval. Pooled effect estimates are calculated using a random-effects model. Statistical heterogeneity is assessed using Cochran's Q test and the I^2 statistic.

Quality assessment / Risk of bias analysis The risk of bias of the included randomized controlled trials was assessed using the Cochrane Risk of Bias 2 (RoB 2) tool. Five domains were evaluated: (1) bias arising from the randomization process; (2) bias due to deviations from intended interventions; (3) bias due to missing outcome data; (4) bias in the measurement of the outcome; and (5) bias in the selection of the reported result.

Two reviewers independently assessed each included study using the RoB 2 signaling questions and independently assigned judgments for each domain. Each domain and the overall risk of bias were classified as low risk of bias, some concerns, or high risk of bias. The reviewers compared their assessments after completing the independent evaluations. Any disagreement was resolved through discussion and consensus, with consultation of a third reviewer when necessary.

Strategy of data synthesis Quantitative synthesis was performed using Comprehensive Meta-Analysis (CMA), version 3. Data from the intervention and comparator groups, including sample sizes, means, and standard deviations, were extracted for the calculation of effect sizes. When available, data based on the intention-to-treat population were used. Other reported statistics that could be converted into an effect size were used when means and standard deviations were unavailable.

The effect of family support interventions on HbA1c was expressed as the standardized mean difference (SMD) with a 95% confidence interval. Because variations were expected across participant characteristics, diabetes type, family support strategies, intervention content, and intervention duration, pooled effect estimates were calculated using a random-effects model.

Statistical heterogeneity was assessed using Cochran's Q test and the I^2 statistic. A significance level of $p < 0.10$ was applied to Cochran's Q test. I^2 values of 0–40%, 30–60%, 50–90%, and 75–100% were interpreted as potentially unimportant,

moderate, substantial, and considerable heterogeneity, respectively.

Potential publication bias and small-study effects were evaluated using funnel-plot inspection and Egger's regression test. Classic fail-safe N and the trim-and-fill method were also used to examine the stability of the pooled effect estimate after considering potentially missing studies.

Subgroup analysis Subgroup analyses were conducted to explore whether the effect of family support interventions on HbA1c differed according to the following characteristics:

Source of family support: parental support versus support provided by adult family members, including spouses, adult children, or other adult relatives.

Intervention duration: ≤ 3 months versus > 3 months.

Intervention modality: interventions incorporating digital or remote technologies versus face-to-face interventions without a digital or remote component.

A random-effects model was applied within each subgroup. Differences between subgroups were examined using the between-group heterogeneity statistic, Q-between. Subgroup findings were interpreted cautiously because of the limited number of studies and the clinical and methodological heterogeneity across the included trials.

Sensitivity analysis Sensitivity analysis was performed using a leave-one-out approach. Each included study was removed individually, and the pooled SMD and its 95% confidence interval were recalculated using the random-effects model. The recalculated estimates were compared with the overall pooled estimate to determine whether the magnitude, direction, or statistical significance of the intervention effect changed after the exclusion of any single study. This analysis was used to assess the robustness of the findings and determine whether the overall result was disproportionately influenced by an individual study.

Language restriction No language restrictions were applied.

Country(ies) involved Taiwan.

Keywords Diabetes mellitus; Family support; Glycated hemoglobin; HbA1c; Systematic review; Meta-analysis.

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