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RESEARCH **Open Access**

The Effect of Family-Centered Care on Glycemic Control in Patients with Type 2 Diabetes

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Abstract
Effective diabetes self-care is essential for adults managing diabetes. Additionally, implementing family-centered care can significantly enhance home care efficiency. This study aims to collect and evaluate findings related to family-centered care in diabetic patients. A systematic review was conducted by searching the following electronic databases: PubMed, Scopus, Science Direct, and Google Scholar. The inclusion articles were published in English from 2013 to 2023, Randomized Controlled Trials (RCTs), and published reviews assessing family-centered care for Type 2 Diabetes Mellitus patients. The systematic review was carried out according to the Preferred Reporting Items for Systematic Review and Meta-analyses (PRISMA) flow diagram, relevant studies were identified and assessed based on the Joanna Briggs Institute (JBI) criteria. These results were discussed among researchers to resolve differences and reach a conclusion. Results: Five RCT reviews published between 2013 and 2023 met the inclusion criteria. Family-centered care can reduce HbA1c levels, blood pressure, weight, depressive symptoms score (PHQ8), and Low-Density Lipoprotein levels, increasing knowledge, self-efficacy, and self-management behaviors. This review has provided evidence regarding the effect of implementing family-centered care interventions in patients with type 2 diabetes mellitus. The evidence suggests that family-centred care can be an important approach to improving the quality of healthcare services for patients with type 2 diabetes mellitus.

Keywords: Family Centered-Care, Type 2 Diabetes, Systematic Review.

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1. INTRODUCTION

The global prevalence of diabetes is sharply increasing, with a yearly increase of about 2-4%. In 2019, there were 463 million people with diabetes worldwide, and this number is projected to rise to 578 million by 2030 and 700 million by 2045 (Saeedi et al., 2019). Additionally, diabetes-related deaths account for approximately 11.3% worldwide. More than 90% of people with diabetes have type 2 diabetes (Ruszkiewicz et al., 2020). Diabetes mellitus (DM) is characterized by high blood glucose, known as hyperglycemia, which leads to various complications including thrombosis, atherogenesis, vasoconstriction, and vascular inflammation (Vítovec et al., 2018). These complications were linked to quality of life in type 2 diabetes patients, including older age, female gender, lower education level, lower income, longer duration of diabetes, higher HbA1c levels, the presence of related complications, and comorbidities like hypertension, depression, and anxiety (Alshahrani et al., 2023; Wang, 2022).

Individuals with type 2 diabetes need specialized care to manage their condition and minimize the risk of long-term complications. Effective glycemic control is crucial in their care, and measuring HbA1c levels is a key way to assess this, as outlined in the guidelines and recommendations for diagnosing and managing diabetes mellitus (Sacks et al., 2011). HbA1c is commonly used as a reference for assessing glycemic control over the past twoto three months in the prognosis, diagnosis, and treatment of diabetes mellitus (Chehregosha et al., 2019). Many patients with type 2 diabetes struggle to achieve their glycemic control goals, necessitating family-centered diabetes management and glucose control interventions (Davoudi-Kiakalayeh et al., 2017). Family-centered educational interventions are essential formanaging HbA1c levels effectively (Appil et al., 2022). Family-centered care involves actively involving the family in decision-making and providing support to promote the family's well-being, which has a positive impact on managinglong-term home care for diseases, especially for diabetes patients (Petersen et al., 2004; Creasyet al., 2015). Meta-analyses have investigated peer support interventions and their relation to glycemic control (Azmiardi et al., 2021).

The benefits of family-centered care have been widely researched, but there hasn't been a meta-analysis study on family-centered care for glycemic control, as evidenced by the author's bibliometric data. The analysis used electronic data from PubMed, Scopus, and Google Scholar from 2013 to 2023. The results showed that there has not been any research related to a systematic review of FCC interventions on glycemic control. By investigating the impact of family-centered care interventions on glycemic control, this systematic review aims to fill important gaps in the body of knowledge and provide insightful information to enhance diabetes management.

2. RESEARCH METHOD

The meta-analysis focused on the comparison of family-centered care with usual care in Randomized Controlled Trials (RCTs). RCTs were selected due to their ability to minimize bias and establish causal relationships between interventions and outcomes. The researchers adhered to the PRISMA (Preferred Reporting Items for Systematic Review and Meta-Analyses) guidelines when reporting the meta-analysis (Page et al., 2021).

This study conducted the PICO framework and specific key terms such as "type 2 diabetes," "family-centered care," and "glycemic control" to search for relevant literature and English-language articles published between 2013 and 2023 in electronic databases including PubMed, Science Direct, Scopus, and Google Scholar. The search aimed to identify studies on the impact of family-centered care on glycemic control in patients with type 2 diabetes.

The study included randomized controlled trials (RCTs) featuring patients with type 2 diabetes mellitus (DM) who participated in a family-centered care intervention program, meeting the inclusion criteria. Family-centered care is defined as a model of healthcare that involves families in the planning, delivery, and evaluation of care. Studies that did not utilize

family-centered care as an intervention, did not measure HbA1c as an outcome or were not RCTs were excluded from theanalysis.

The screening process was carried out by two authors independently (S and AF). Initially, the reviewers individually collected information from abstracts and titles that were potentially relevant. Subsequently, the studies were screened for a full-text review. Each author evaluated and appraised their respective full-text articles based on the predetermined inclusion and exclusion criteria.

The methodological quality evaluation involved assessing the potential biases in study design, implementation, and analysis. We used the Joanna Briggs Institute (JBI) Critical Appraisal Tool for RCTs, which comprises thirteen elements (Aromataris, 2024). Both reviewers conducted separate assessments, and any discrepancies were resolved through consensus. Articles meeting the meta-analysis criteria were included based on this procedure.

After deduplicating 11 articles from our search results, we conducted a thorough review of 1,001 items. Based on their abstracts and titles, we excluded 982 publications. Subsequently, we assessed the full texts of the remaining 19 papers and excluded 14 articles. Finally, upon reviewing the full texts of the 5 remaining relevant articles, all 5 were included in this review.

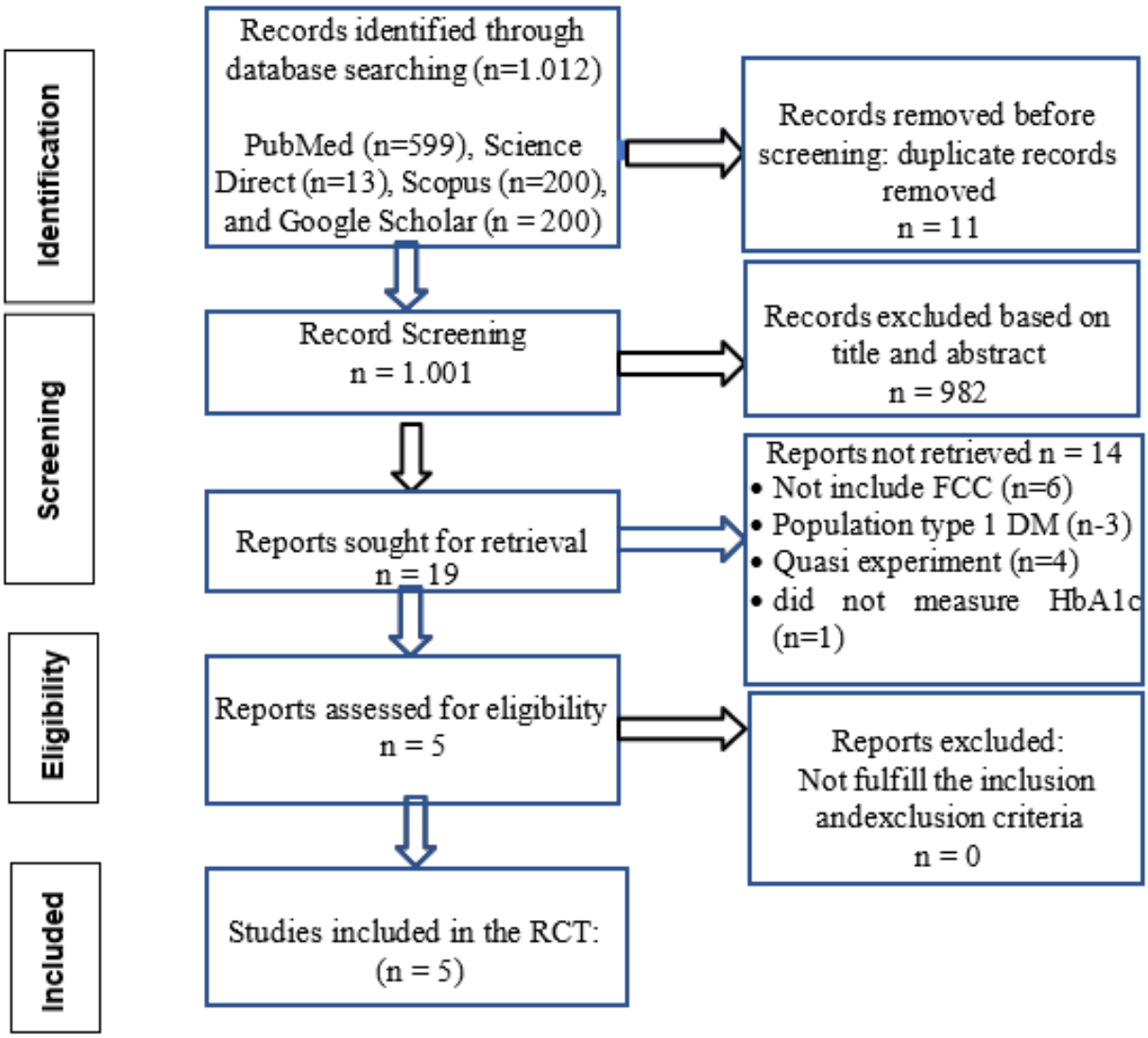

Figure 2. PRISMA flow diagram of study inclusion in the review.

The JBI (Joanna Briggs Institute) Critical Appraisal Checklist was used to evaluate the methodological quality of the articles. This checklist was specifically tailored to the study design for the screening procedure in this systematic review. The JBI Critical Appraisal Checklist for Randomized Controlled Trials, comprising thirteen items, served as the tool. The quality of the study methodology and the extent of potential bias in the design, intervention, and analysis discussed in the review were assessed using the JBI Critical Appraisal Checklists (Barker et al., 2023) The methodological quality assessment of the included studies was independently evaluated by both reviewers, resulting in 6 articles being included in the review, as shown in Table 1 below.

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Table 1. Summary of the critical appraisal

Question Checklist Criteria for RCT Studies	**(Samuel-Hodge et al., 2017)**	**(Poonprapai et al., 2022)**	**(Wichit et al., 2017)**	**(Nelson et al., 2023)**	**(Withidpanyawong et al., 2019)**
Was true randomization used for the assignment of participants to treatment groups?	Y	Y	Y	Y	Y
Was allocation to treatment groups concealed?	Y	Y	Y	Y	Y
Were treatment groups similar at the baseline?	Y	Y	Y	Y	Y
Were participants blind to treatment assignment?	Y	Y	Y	Y	Y
Were those delivering treatment blind to treatment assignment?	Y	Y	Y	Y	Y
Were outcomes assessors blind to treatment assignment?	U	Y	Y	U	Y
Were treatment groups treated identically other than the intervention of interest?	Y	Y	Y	Y	Y
Was follow-up complete and if not, were differences between groups in terms of their follow-up adequately Described and analyzed?	Y	Y	Y	Y	Y
Were participants analyzed in the groups to which they were randomized?	Y	Y	Y	Y	Y

Were outcomes measured in the Same way for treatment groups?	Y	Y	Y	Y	Y
Were outcomes measured reliably?	Y	Y	Y	Y	Y
Was appropriate statistical analysis used?	Y	Y	Y	Y	Y
Was the trial design appropriate, and any deviations from the standard RCT design individual randomization, parallel groups) accounted for in the conduct and analysis of the trial?	Y	Y	Y	Y	Y

The author SS reviewed all articles based on titles and abstracts using specific criteria and removed duplicate studies. Unrelated studies were excluded, and potential articles were reviewed in full. A senior researcher (S and AF) made an assessment based on the review findings. The study selection was conducted using the Joanna Briggs Institute (JBI) critical appraisal technique, and studies scoring higher than 6 in each of the 13 categories were included. Data extraction was done independently by two authors (SS and S) using an Excel worksheet, and disputes were resolved through open discussions. The study information, which includes the authors, year of publication, and country of the study, was divided into five main areas by the authors: A. study information (authors, year, and country); B. study design; C. title; D. objectives; E. sample; F. results; and G. conclusion. The findings were analyzed using narrative synthesis, focusing on family-centered care for patients with type 2 diabetes mellitus.

3. RESULTS AND DISCUSSION

The six systematic reviews included in this study were conducted in the United States and Thailand, focusing on interventions for patients with type 2 diabetes mellitus (Table 2). The reviews included quantitative randomized controlled trials with a total sample size of 930. Family-centered interventions showed improvements in HbA1c levels. Subgroup analysis was conducted based on the study, intervention duration, type of intervention, type of intervention delivery, measurement, and variables assessed (Table 3). Interventions lasted 3.25, 5, and 9 months, delivered in groups or through a combination of individual and group sessions. Measurements were taken once or twice, and the primary variable measured was the effect on weight loss, while secondary variables included mental health, self-efficacy, knowledge, and behavior.

The impact of family-centered care on glycemic control. Family-centered care for patients with type 2 diabetes has been found to have positive effects on HbA1c levels and glycemic control (Poonprapai et al., 2022; Samuel-Hodge et al., 2017;Withidpanyawong et al., 2019). Research indicates that patients with type 2 diabetes who receive family-centered care experience benefit such as improved diet quality, which is significantly associated with glucose outcomes in Korean immigrants with type 2 diabetes. Additionally, theperception of family support is linked to better glucose control (Choi, 2009). However, some studies have found no significant effect. For example, Nelson et al. (2023) reported that family-centered care did not affect HbA1c levels six months post-intervention, highlighting the challenges in maintaining behavioral changes such as dietary habits, physical activity, self-efficacy, and family/friend involvement (Nelson et al., 2023). The difference in findings may be caused by the sample size, the method, and study settings, which may reflect different cultures. Another study described similar findings regarding the effectiveness of health training interventions for patient-family pairs, noting improvements in self-efficacy and self-care behaviors but not in

HbA1c levels (Rosland et al., 2022). Interventions focusing on family-centered care (FAMS) have been shown to improve targeted behaviors, including dietary patterns, physical activity, self-efficacy, and supportive family/friend involvement. Furthermore, improvements in HbA1c levels post-intervention (at 9 months) and sustained improvements (at 12 months) were driven by enhancements in targeted behaviors, particularly dietary patterns, self-efficacy, and autonomy support (Nelson et al., 2023).

A different study demonstrated that interventions focused on families led to an improvement in diabetes knowledge, self-efficacy, and self-management among patients (Baig et al., 2015). Type 2 diabetes patients also experienced weight loss as a result of the Family PALS intervention (Samuel-Hodge et al., 2017), suggesting that family-centered care can contribute to weight management. Managing weight is particularly challenging for type 2 diabetes patients due to metabolic and psychological factors, and many common glucose-lowering medications, such as insulin, often result in weight gain (Van Gaal & Scheen, 2015). In addition to its impact on weight loss, a study by Poonprapai et al. (2022) found that family-centered care could influence blood pressure, knowledge, and behavior (Poonprapai et al., 2022).Furthermore, research by Withidpanyawong et al. (2019) also demonstrated its ability to affectlevels of Low-Density Lipoprotein (LDL) (Withidpanyawong et al., 2019).

Table 2. Summary of Accepted Articles

Author (Year), Country	Study Design	Study Purposes	Sample		Results	Conclusions
			Interven-tion	Control		
(Samuel-Hodge et al., 2017), United States	RCT	This study was aimed to examine a family-centered behavioral weight loss intervention for African American adults with type 2 diabetes	54	54	The study had 108 people, including 36 who were single and 18 who had partners. After the intervention, the study showed that the single people lost weight, averaging 23.6 kg, while those with partners gained a little weight, about 1.4 kg. Single people also get better in many health areas, like their blood sugar, mood, and how they get along with their families. Their family members who helped them lost an average of 23.9 kg, which was more than the 21.0 kg that the partners of the other group lost.	This study found that those in the Structured Intervention (SI) group lost more weight than those in the Diabetic Intervention (DI) group. SI participants' family partners also experienced significant weight loss. The results highlight the importance of diet, physical activity, and self-care in effective weight management for diabetes.
(Poonprapai et al., 2022), Thailand	RCT	To evaluate the impact of a family support intervention on clinical outcomes, family behavior, diabetes education, and medication adherence in older adults with	78	79	The intervention group showed significant improvements compared to the baseline in HbA1c, blood pressure, diabetes education, family involvement, self-management, and medication adherence ($P < 0.001$). HbA1c and blood pressure levels decreased more in the intervention group than in the control group ($P = 0.001$).	For the treatment of diabetes in older persons, pharmacists can provide a family support intervention through a mobile application.

Author (Year), Country	Study Design	Study Purposes	Sample		Results	Conclusions
			Interven-tion	Control		
		type 2 diabetes using a pharmacist-developed mobile app.				
(Wichit et al., 2017), Thailand	RCT	This study assessed a theoretically generated family-oriented intervention to enhance the quality of life, glycemic control, self-efficacy, and self-management of people with Type 2 diabetes.	70	70	The intervention group showed improvements in diabetes self-efficacy, self-management, and quality of life, while the control group did not. Risk-adjusted models revealed significantly higher self-efficacy, self-management, outcome expectations, and diabetes knowledge in the intervention group ($p < 0.001$). Slimmer and female patients exhibited higher self-management. Quality of life and glycemic control were unchanged, but better self-management scores correlated with improved outcomes.	A family-oriented diabetes education program, delivered by nurses, has improved self-efficacy and self-care behaviors in Thai patients and their families. This approach, based on self-efficacy theory, can reduce the burden on primary care services and may apply to other rural communities, potentially reducing the demands on diabetes educators and health services.
(Nelson et al., 2023), United States	RCT	This study aimed to assess, throughout a 15-month randomized controlled trial, the impact of the improved FAMS	164	165	PWDs had a mean HbA1c of 8.6±1.7%, 39% were from racial or ethnic minority groups, and 52% were men. The overall effects of FAMS were not significant, but among PWDs with a non-cohabiting support person, it improved HbA1c (-0.64%; 95% CI [-1.22%, -0.05%]).	Future family interventions should prioritize including non-cohabiting support individuals in their efforts, as evidenced by the fact that HbA1c improved exclusively among PWDs interacting with them, despite improvements in most

Author (Year), Country	Study Design	Study Purposes	Sample		Results	Conclusions
			Interven-tion	Control		
		intervention on Persons with Diabetes (PWDs)' HbA1c.			During the intervention period, FAMS enhanced self-efficacy, dietary behavior, and family/friend involvement. These enhancements allowed for sustained HbA1c improvements at 12 months (total indirect effect -0.19%; 95% CI [-0.40%, -0.01%]) and post-intervention HbA1c improvements (total indirect effect -0.27%; 95% CI [-0.49%, -0.09%]).	intervention aims. Subsequent research ought to aim at pinpointing intervention targets that facilitate enhancements in HbA1c.
(Withidpanyawong et al., 2019), Thailand	RCT	To look into glycaemic control factors and the efficacy of family interventions for type 2 diabetes	98	98	HbA1c decreased more in the intervention group than in the control group by the study's end (9-month follow-up), with reductions of -1.37% versus -0.21% ($P < 0.001$). Improvements in blood pressure and LDL-C were also significant ($P < 0.05$). The intervention group outperformed the control group in diabetes awareness, family support, medication adherence, self-management, and self-efficacy ($P < 0.05$). Furthermore, having married or female family members was linked to better glycemic management.	Diabetes control benefits from family engagement, particularly when spouses or other women are the primary caretakers.

Family-centered care on self-care activities. Family support is crucial for patients with type 2 diabetes, as it helps improve self-care activities and enhances self-efficacy (García-Huidobro et al., 2011). In Asian cultures, family members have a primary responsibility for the health of those living in the same household (Hong & Kim, 2008). Involving family members in the care of patients with type 2 diabetes can lead to additional benefits, as they play a special role in supporting their relatives with diabetesin managing their diet and meal preparation (Shi et al., 2016). Additionally, education programsfor type 2 diabetes based on self-efficacy have been shown to improve self-management behaviors (King et al., 2010; Yoo et al., 2011).

Table 3. Details of the study included

Author, Year	Duration (week/ month)	Intervention Type	Type of Delivery	Measurement (week/month)	Variables
(Samuel-Hodge et al., 2017)	20/5	Family partners in lifestyle support (PALS)	Group	20/5	HbA1C, BMI, depressive symptoms, family interactions, dietary, mental composite score, and diabetes self-care behaviors
(Poonprapai et al., 2022)	36/9	Family support usingthe mobile application	Combination	36/9	HbA1c, blood pressure, family behavior in diabetes care, diabetes knowledge, self-management practices and medication adherence
(Wichit et al., 2017)	13/3.25	Family-oriented self-management program	Group	5/1.25 and 13/3.25	HbA1c, diabetes self-efficacy, self-management, and quality of life
(Nelson et al., 2023)	36/9	Family-focused Intervention for adults with type 2 diabetes (FAMS)		24/6, 36/9, 48/12, 60/15	HbA1c, self-efficacy, dietary behavior
(Withidpanyawong et al., 2019)	36/9	Family-based intervention by pharmacists for diabetes type 2		36/9	HbA1c, BMI, LDL, HDL, triglyceride, blood pressure, self-efficacy.

**BMI: Body Mass Index; LDL: Low-Density Lipoprotein: HDL: High-Density Lipoprotein; HbA1c: glycatedhaemoglobin*

Duration of family-centered care. The review highlighted the positive impact of intervention durations of 5 and 9 months in groups and combinations on HbA1c levels. A shorter duration of diabetes might beassociated with a greater effect compared to a longer duration, as participants with a longer duration of diabetes may find it harder to change (Azmiardi et al., 2021). It also emphasized the need for further investigation into the factors affecting the effectiveness of interventions, such as the duration of having diabetes. Additionally, the research findings shed light on the relationship between type 2 diabetes and depression, particularly among individuals over the age of 50. This points to the importance of addressing mental health in the management of patients with type 2 diabetes.

The importance of mental health care for the family. The previous research also indicated that providing comprehensive mental health care for families should involve a multi-disciplinary approach to treating the entire family (Stolper et al., 2022). To achieve comprehensive mental health management, it is important to provide training for family members on how to help their sick family members stabilize their mental health. This training could be conducted by local healthcare providers in collaboration with psychologists, which may be beneficial given the urgent need for mental health support.

CONCLUSION

Family-centered care interventions have been found to impact glycemic control, blood pressure, Depressive Symptoms Score (PHQ8), weight, LDL levels, knowledge, self-efficacy, and self-management behaviors in patients with type 2 diabetes. PHQ8 is a validated screening tool that asks about the frequency of common depressive symptoms over the past week. Further research is needed to explore the various components of family support related to mental health to develop more effective interventions. Healthcare providers should consider incorporating the patient's mental well-being into coordinated programs, taking into account the intervention duration, frequency of meetings, and a combination of group and individual sessions to determine the most effective model for patients with type 2 diabetes.

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