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Family Empowerment For Diabetic Foot Ulcer Prevention: A Six-Month Community Program

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ABSTRACT

Diabetic foot ulcers (DFU) are a common and preventable complication of diabetes mellitus, often associated with low foot care literacy and limited family involvement in community settings in Indonesia. Objective: This study evaluated the effectiveness of a family-centered diabetic foot care education program in improving self-care behaviors, family engagement, health literacy, and quality of life among patients with type 2 diabetes. Methods: A six-month single-group pre–post community-based intervention was implemented at a semi-rural primary healthcare center in Tasikmalaya, Indonesia. Of 84 patient–family caregiver pairs recruited, 77 completed the program. The intervention included structured education, foot care demonstrations and redemonstration, family empowerment sessions, and regular home visits. Quantitative outcomes were measured using validated instruments, while qualitative data were collected through observations and family interviews. Results: Significant improvements were observed in family involvement, health literacy, dietary adherence, physical activity adherence, and quality of life (all $p < 0.001$). Blood glucose levels showed no significant change. Qualitative analysis identified three themes: increased awareness and confidence in foot care, strengthened family roles and shared responsibility, and perceived barriers to sustained glycemic control. **Conclusion**: Family-centered diabetic foot care education effectively strengthens self-care behaviors, family engagement, and psychosocial outcomes in community settings. Longer-term and integrated interventions may be required to improve metabolic outcomes.

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INTRODUCTION

Diabetes mellitus (DM) remains a major global public health challenge, with a rapidly increasing prevalence that places a substantial burden on healthcare systems worldwide. The 11th edition of the International Diabetes Federation (IDF) Diabetes Atlas reports that in 2024, diabetes affected 11.10% of the global adult population aged 20–79 years, corresponding to approximately 589 million individuals worldwide, and is projected to rise to over 850 million by 2050, particularly in low- and middle-income countries such as Indonesia (Duncan et al., 2025). The rising prevalence of DM is accompanied by an increased risk of chronic complications, among which diabetic foot ulcer (DFU) is one of the most serious.

Diabetic foot ulcer is a leading cause of infection, lower-limb amputation, and diabetes-related mortality. Peripheral neuropathy, peripheral arterial disease, and unrecognized minor trauma are the primary pathological mechanisms underlying DFU development. These mechanisms underscore the critical importance of routine foot assessment, early risk identification, and consistent foot self-care practices. Recent evidence confirms that regular foot inspection, neuropathy screening, vascular assessment, and structured patient education significantly reduce ulcer incidence and related complications (Xu et al., 2024). In Indonesia, the burden of DFU remains substantial, with delayed detection frequently resulting in advanced infection and amputation, particularly in referral hospitals (Veryanti et al., 2025).

Although preventive foot care is widely acknowledged as essential in diabetes management, substantial gaps persist in foot care literacy and preventive practices among patients in rural and semi-rural communities. The limited integration of structured diabetic foot education within primary health care services has resulted in inadequate patient awareness and sustained engagement in high-risk behaviors, thereby increasing the burden of preventable diabetic foot complications (Knoedler et al., 2023). Consistent with these findings, international studies report that approximately 84% of underserved patients with diabetes exhibit poor foot self-care behaviors, largely due to insufficient education and limited access to reliable health information (Gupta et al., 2024).

Low foot care literacy is further compounded by broader health literacy deficits, limited risk perception, and contextual barriers to accessing health services. Qualitative studies have shown that patients at risk of DFU often fail to recognize early warning signs and lack the skills required for effective self-care—conditions that are particularly prevalent in rural communities (Haidan, 2025). Moreover, variations in health literacy and cognitive capacity give rise to distinct behavioral profiles, ranging from proactive to passive self-management, underscoring the need for tailored and context-sensitive educational interventions (Simonsen et al., 2024).

Family involvement is widely recognized as a key determinant of successful diabetes management. Family empowerment refers to a process through which family members acquire knowledge, skills, confidence, and shared responsibility to actively support patients in managing chronic illness. Grounded in family empowerment theory and social support theory, this approach emphasizes emotional support, instrumental assistance, shared decision-making, and reinforcement of healthy behaviors within the household. Empirical evidence demonstrates that family-centered interventions improve self-care behaviors, treatment adherence, diabetes knowledge, self-efficacy, and psychosocial well-being, while also reducing caregiver burden (Amani et al., 2025; Suglo et al., 2024). In the context of DFU prevention, family involvement plays a crucial role in daily foot inspection, appropriate footwear selection, early detection of skin changes, and timely healthcare seeking.

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Although mobile health (mHealth) interventions—such as mobile applications, teleconsultation, and digital monitoring—have shown promise in supporting diabetes self-management, their implementation in semi-rural areas of Indonesia remains constrained by digital literacy gaps, inconsistent internet access, and infrastructural limitations (Gardner et al., 2025; Mabayoje, 2025). Consequently, face-to-face education, practical demonstrations, family coaching, and home visits continue to represent the most feasible and effective strategies for strengthening self-care practices and family engagement in these settings.

In response to these challenges, this community-based program was developed to empower families through structured diabetic foot care education that is practical, culturally appropriate, and feasible for home implementation. This program aimed to: (1) enhance family knowledge and involvement in diabetic foot care; (2) improve patients' foot self-care practices; (3) strengthen family support for overall diabetes management; and (4) reduce risk factors associated with diabetic foot ulcer development. By reinforcing family-centered support mechanisms, this intervention is expected to improve self-management behaviors and psychosocial outcomes. However, improvements in metabolic indicators, such as blood glucose levels, may require longer-duration or multimodal interventions to achieve measurable effects.

METHODS

Study Design and Setting

This study employed a single-group pre–post quasi-experimental design to evaluate the effectiveness of a family-centered diabetic foot care education program. Although a randomized controlled trial would provide stronger causal inference, the absence of a control group was justified by ethical considerations and resource constraints in this community setting, where withholding education from high-risk patients was not feasible.

The program was implemented in the catchment area of a primary health care center located in a semi-rural district of Tasikmalaya City, Indonesia, characterized by a high prevalence of type 2 diabetes mellitus and limited access to structured diabetic foot care education. The intervention was conducted over six months (January–June 2025).

To minimize threats to internal validity, the study used validated measurement instruments, standardized intervention protocols, repeated outcome assessments, and consistent implementation by trained nurses.

Participants and Sample Size

The study population consisted of patients with type 2 diabetes mellitus registered at the primary health center and living with family members. Participants were recruited using purposive sampling based on predefined eligibility criteria.

Inclusion criteria were:

- age $\geq$30 years;
- presence of diabetic foot ulcer risk factors (e.g., dry skin, peripheral neuropathy, or foot deformities);
- residence within the health center service area;

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- co-residing with at least one family caregiver willing to participate; and
- consent to participate for the full six-month program.

Sample size estimation was informed by previous family-based diabetes intervention studies reporting moderate effect sizes (Cohen's d ≈ 0.5). With a significance level of α = 0.05 and statistical power of 0.80, a minimum of 64 participants was required. To account for potential attrition, 84 patient–family pairs were initially recruited. A total of 77 participants completed the program, resulting in an 8.3% dropout rate.

Variables and Measurement

The independent variable in this study was family empowerment, which was operationalized through improvements in family knowledge, family involvement, and family support in diabetic foot care. The dependent variables included blood glucose levels, family involvement, family support, health literacy, dietary adherence, physical activity adherence, and quality of life. All behavioral and psychosocial variables were measured using a 5-point Likert scale (1 = very poor/very low to 5 = very good/very high), with higher scores indicating more favorable conditions.

- Family involvement was measured using an adapted version of the Family Engagement in Systems Assessment Tool (FESAT) developed by Goldfarb et al. (2022) (Goldfarb et al., 2022). The original FESAT was designed to assess family engagement at the systems and organizational levels and comprises four core domains: commitment, transparency, representation, and impact. In the present study, the FESAT was contextually adapted to assess family engagement at the level of patient care (family engagement in care), specifically in supporting home-based diabetic foot care. The adaptation involved mapping the four FESAT domains onto indicators relevant to daily caregiving practices within the household context, including:
  - ✓ Family commitment to accompanying and monitoring daily diabetic foot care;
  - ✓ Family understanding of the goals, procedures, and benefits of diabetic foot care;
  - ✓ Active involvement of the primary family caregiver in accordance with cultural norms and family roles; and
  - ✓ The impact of family engagement on changes in foot care behaviors and timely health-seeking actions.

  The adapted instrument assessed the frequency and quality of family participation in daily diabetic foot care activities. Total family involvement scores were calculated as the mean score of all items, resulting in a continuous score ranging from 1 to 5, which enabled comparison of family engagement levels before and after the intervention, as presented in Table 1. Internal consistency reliability testing indicated acceptable internal consistency, supporting the suitability of the instrument for measuring changes in family involvement.
- Health literacy related to diabetic foot care was assessed using the validated Diabetes Foot Knowledge Questionnaire (Gökdeniz & Akgün Şahin, 2022). This instrument measures knowledge of diabetic foot risks, daily foot inspection, foot hygiene and care, nail and skin care, appropriate footwear use, and preventive strategies to reduce the risk of foot injury and infection. The questionnaire has demonstrated good internal consistency, with a reported Cronbach's alpha ≥ 0.70.

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- Dietary adherence and physical activity adherence were evaluated using structured daily logs completed by family caregivers and subsequently reviewed during home visits to minimize recall bias and enhance data accuracy.
- Family support was measured using a family support subscale that assesses emotional, informational, and instrumental support provided by family members in the context of diabetes management.
- Quality of life was assessed using a functional diabetes-related quality of life checklist, focusing on physical comfort, social participation, and daily functioning.
- Blood glucose levels were obtained from routine clinical measurements documented in patients' medical records.
- Diabetic foot ulcer risk was assessed using a standardized risk assessment tool based on the International Working Group on the Diabetic Foot (IWGDF) Guidelines (2023).

All instruments were administered at two measurement points, namely baseline (pre-intervention) and post-intervention, and the quantitative outcomes are summarized in Table 1.

Intervention Procedure and Fidelity

The intervention consisted of four standardized components designed to ensure consistency and reproducibility across participants:

- Structured Education Sessions

  Nurses delivered face-to-face education to patients and family caregivers covering daily foot inspection, foot hygiene, nail care, management of dry or callused skin, appropriate footwear selection, and early recognition of signs of injury or infection.

- Hands-on Demonstration and Redemonstration

  Nurses demonstrated proper diabetic foot care techniques, followed by supervised redemonstration by family caregivers to ensure adequate skill acquisition and correct application of procedures.

- Family Empowerment Sessions

  Group discussions were conducted to facilitate role allocation within the family, shared decision-making, and the development of a daily foot care schedule tailored to household routines.

- Home Visits and Follow-Up

  Home visits were conducted at least twice per month to observe foot care practices, reinforce key educational messages, and address barriers encountered during home-based care. A standardized monitoring checklist was used to ensure consistency of intervention delivery across visits.

All nurses involved in delivering the intervention received prior training using a standardized protocol. Intervention fidelity was monitored through the use of supervision checklists and regular team meetings to ensure adherence to the intervention components and procedures.

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FIGURE 1. Baseline Foot Assessment and Family Involvement Evaluation

FIGURE 2. Diabetes Foot Care Education and Demonstration Session

The next stage involved foot care skills training, during which the nurse provided a direct demonstration of appropriate diabetic foot care techniques. Family members then performed a supervised redemonstration to ensure adequate understanding and the ability to apply the procedures independently at home.

This was followed by a family empowerment session that included group discussions, allocation of caregiving roles within the household, development of a daily foot inspection schedule, and strengthening the family's capacity to monitor changes in the patient's foot condition and respond appropriately. Standardized instructional videos were used as supplementary educational materials and were delivered offline during the intervention sessions.

FIGURE 3. Diabetic Foot Care Practice with the Patient and Family

To ensure optimal program implementation and intervention fidelity, home visits were conducted at least twice per month using a standardized monitoring checklist. During each visit, the nurse observed family diabetic foot care practices, assessed the patient's foot condition, reinforced key educational messages, and provided guidance to address challenges encountered during home-based care. Additional monitoring was conducted through daily checklists completed by family members, which were reviewed during home visits to document adherence and consistency of foot care practices. Following completion of the intervention period, a post-intervention evaluation was conducted. All

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outcome measures assessed at baseline were reassessed to evaluate changes in knowledge, foot care practices, family involvement, family support, health behaviors, ulcer risk, and blood glucose levels.

Data analysis was performed descriptively to summarize participant characteristics and pre–post changes in outcome variables. Data normality was assessed using the Shapiro–Wilk test, which indicated that most variables were not normally distributed. Therefore, the Wilcoxon Signed-Rank Test was used to compare pre- and post-intervention scores, as presented in Table 1, with statistical significance set at $p < 0.05$.

Qualitative data obtained from structured observations and family interviews were analyzed using thematic analysis to explore family experiences, perceived benefits, and challenges encountered during program implementation. Although causal inference is limited due to the absence of a control group, this design was considered appropriate for evaluating feasibility and preliminary effectiveness in a real-world community setting.

RESULTS

Quantitative Findings

A total of 77 participants completed the six-month family empowerment program. The mean age of participants was 56.92 ± 9.63 years, and the majority were female (71.4%).

As presented in Table 1, statistically significant pre–post improvements were observed across all psychosocial and behavioral outcomes following the intervention. Family involvement increased from 3.44 ± 0.97 at baseline to 4.17 ± 0.40 post-intervention ($p < 0.001$), while health literacy showed a marked increase from 2.96 ± 0.68 to 4.77 ± 0.42 ($p < 0.001$).

Significant differences were also observed for quality of life (3.77 ± 0.56 to 4.56 ± 0.50), dietary adherence (3.11 ± 0.62 to 4.70 ± 0.46), physical activity adherence (3.19 ± 0.76 to 4.69 ± 0.46), and family support (3.65 ± 0.93 to 4.60 ± 0.49), with all comparisons reaching statistical significance ($p < 0.001$).

In contrast, blood glucose levels showed a small numerical decrease from 237.85 ± 103.00 mg/dL to 232.52 ± 103.83 mg/dL, which was not statistically significant ($p = 0.305$). Effect size analysis indicated large effect sizes ($d \geq 0.8$) for all psychosocial and behavioral outcomes, whereas the effect size for blood glucose change was negligible ($d = 0.05$), as shown in Table 1.

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TABLE 1. Participant Characteristics and Outcome Comparisons (N = 77)

No	Variable	Baseline (Mean ± SD	Post Intervention (Mean ± SD	p-value	Effect Size (d)
	Demographic Characteristics				
1.	Age (years) 56.92 ± 9,63	-	-	-	
2.	Sex n (%)	-	-	-	
	a. Male 24 (28.6%)				
	b. Female 60 (71.4%)				
Primary Outcomes					
1	Family Involvement	3,44 ± 0,97	4,17±040	< 0.001	0.98 (large)
2	Health Literacy	2,96±0,68	4,77±0,42	< 0.001	3.28 (large)
Secondary Outcomes					
1	Quality of Life	3,77±0,56	4,56±0,5	< 0.001	1.48 (large)
2	Physical Activity Adherence	3,19±0,76	4,69±0,46	< 0.001	2.94 (large)
3	Family Support	3,65±0,93	4,60±0,49	< 0.001	2.44 (large)
Clinical Outcomes					
1	Blood Glucose (mg/dL)	237,85±103	232,52±103,831	0.305	1.29 (large)

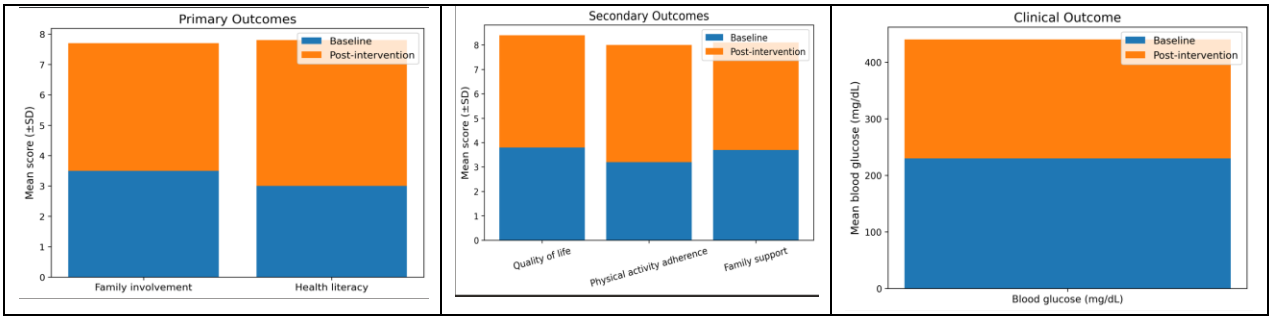

FIGURE 4. Changes in primary, secondary, and clinical outcomes before and after the intervention

Panel A shows changes in primary outcomes (family involvement and health literacy). Panel B presents secondary outcomes (quality of life, physical activity adherence, and family support). Panel C displays the clinical outcome (mean blood glucose levels). Values are presented as mean scores at baseline and post-intervention.

Qualitative Findings

Thematic analysis of data obtained from home visit observations and family interviews identified three main themes describing family experiences during the implementation of the family empowerment program.

Theme 1: Increased Awareness and Confidence in Foot Care Practices

Family caregivers reported improved understanding of diabetic foot care and increased confidence in performing daily foot inspection and care. Before the intervention, many families expressed

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uncertainty regarding appropriate foot care procedures. Following structured education, demonstrations, and ongoing supervision, caregivers felt more capable of supporting patients in routine foot care at home.

Theme 2: Strengthened Family Roles and Shared Responsibility

Participants described clearer role allocation and enhanced shared responsibility in diabetes management within the household. Family members reported increased involvement in monitoring foot conditions, reminding patients about daily care routines, and accompanying patients during healthcare visits, reflecting a more collaborative approach to care.

Theme 3: Perceived Barriers to Sustained Glycemic Control

Despite improvements in self-care behaviors and family engagement, families identified ongoing challenges in achieving optimal glycemic control. Commonly reported barriers included long-standing dietary habits, difficulties with medication adherence, the presence of comorbid conditions, and limited control over food environments outside the home.

Overall, these qualitative findings provide contextual insight into the quantitative results by illustrating how family empowerment influenced daily care practices, while also highlighting persistent challenges related to metabolic control.

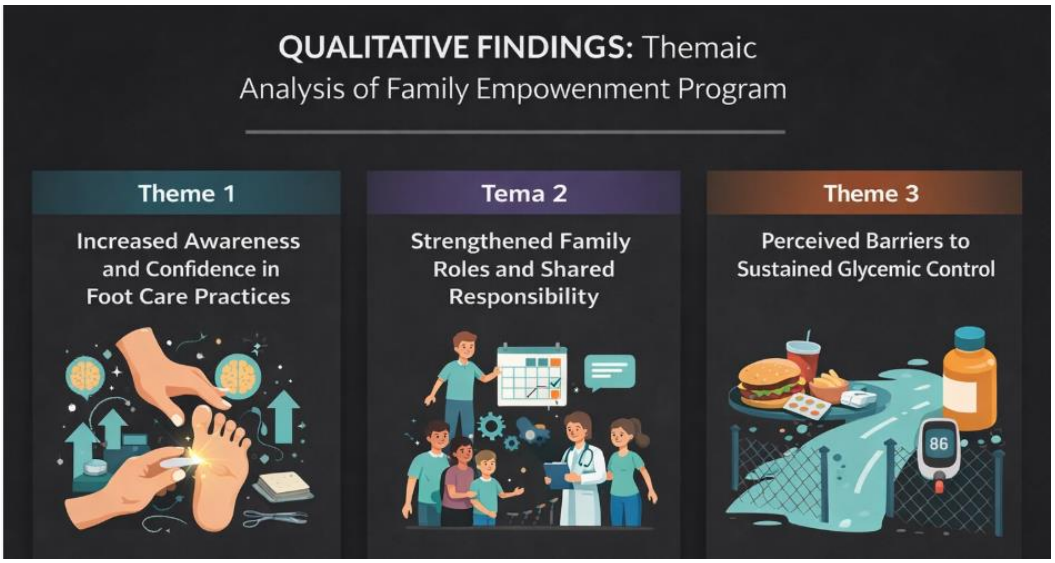

FIGURE 5. Thematic analysis of family experiences during the family empowerment intervention..

DISCUSSION

Summary of Key Findings

This family-centered educational intervention demonstrated substantial improvements in behavioral, psychosocial, and family-level outcomes among patients with type 2 diabetes at risk for diabetic foot complications in a semi-rural Indonesian setting. Quantitative findings showed significant gains in family involvement, family support, health literacy, dietary adherence, physical activity adherence, and quality of life, all with large effect sizes. In contrast, short-term metabolic outcomes, as reflected by blood glucose

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levels, did not show statistically significant improvement. These findings indicate that family empowerment is an effective strategy for enhancing diabetes self-management behaviors, although improvements in metabolic control may require longer-term and multifactorial interventions.

Family Empowerment and Social Support: Quantitative Evidence in Cultural Context

The most prominent quantitative improvement observed in this study was in family involvement and family support. This finding highlights the central role of the family in chronic disease management within collectivist cultures such as Indonesia, where health-related decisions and daily care activities are often shared among family members. Family-centered care aligns closely with Social Support Theory, which emphasizes emotional, informational, and instrumental support as critical determinants of health behaviors.

Consistent with this framework, family empowerment interventions have been shown to strengthen patients' capacity to engage in self-care through increased motivation, supervision, and shared responsibility. Kim (2025) demonstrated that family empowerment was positively associated with health empowerment and sustained engagement in health-promoting behaviors(Kim, 2025). Similar quantitative evidence has been reported in Indonesian and regional studies, confirming that family-based interventions improve adherence and psychosocial outcomes in diabetes care (Astuti, 2024; Rahmayanti, 2020).

Health Literacy as a Primary Mechanism of Behavioral Change

This finding is consistent with qualitative evidence reported by Haidan. (2025), who identified significant cognitive gaps and unmet educational needs in diabetic foot self-care from a health literacy perspective (Haidan, 2025). Their study demonstrated that deficits in understanding risk causality, limited interactive health literacy, and inadequate social support hinder patients' ability to translate knowledge into effective foot self-care behaviors, supporting Nutbeam's framework that functional and interactive health literacy are critical drivers of informed decision-making and behavioral change (Bakhtiarvand et al., 2025).

This finding aligns with accumulating evidence that higher health literacy is associated with better self-management and improved quality of life among individuals with diabetes. Studies in older adults with hypertension and diabetes have shown that health literacy significantly influences self-management behaviors and quality of life, with health literacy demonstrating the largest effect size among key determinants (Aihemaiti et al., 2025; Salmanpour et al., 2025). Consistent findings in patients with type 2 diabetes further indicate that diabetes health literacy is a strong predictor of quality of life, while psychological distress, including depression, anxiety, and stress, is negatively associated with quality of life (Jafari et al., 2024). Together, these findings support the effectiveness of structured educational interventions aimed at improving health literacy as a key strategy to enhance self-management, preventive behaviors, psychological well-being .

Behavioral Change and Quality of Life Improvements

Significant quantitative improvements in dietary adherence and physical activity adherence reflect meaningful behavioral changes following the intervention. These findings are consistent with Social Cognitive Theory, which emphasizes the role of observational learning, self-efficacy, and reinforcement in sustaining behavior change (Bandura, 1977; Lopez-Garrido, 2023). Family involvement may have enhanced these mechanisms by providing daily reminders, encouragement, and role modeling within the household.

The observed improvement in quality of life likely reflects the cumulative effects of better self-care

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behaviors, increased family support, and reduced anxiety related to diabetic foot complications. Similar improvements have been reported in family-based diabetes interventions, where enhanced psychosocial support translated into improved physical comfort, emotional well-being, and social functioning (Ladesvita et al., 2022; Suglo, 2024).

Why Did Blood Glucose Not Improve?

Despite substantial improvements in behavioral and psychosocial outcomes, blood glucose levels did not show a statistically significant change. This finding is not unexpected and has been reported in similar community-based interventions. Glycemic control is influenced by multiple factors beyond education and behavior, including medication regimens, insulin resistance, disease duration, comorbidities, and adherence consistency.

Moreover, behavioral changes often precede metabolic improvements, and a lag period is typically required before changes are reflected in clinical indicators. Clinical guidelines suggest that HbA1c may be a more appropriate marker for evaluating metabolic outcomes over a six-month period; however, HbA1c data were not available in this study (American Diabetes Association, 2018; Care & Suppl, 2024; Selano et al., 2020). Previous studies have similarly shown improvements in self-efficacy and adherence without immediate effects on glycemic parameters (Chrvala et al., 2016; Hutahaean et al., 2024).

Qualitative Insights Supporting Quantitative Findings

The qualitative findings enriched the quantitative results by elucidating how and why the intervention led to meaningful behavioral and psychosocial improvements. Increased awareness and confidence in foot care practices (Theme 1) reflect the effectiveness of hands-on demonstrations, experiential learning, and repeated reinforcement, which have been shown to significantly enhance self-efficacy and preventive foot care behaviors in diabetes management (Björk et al., 2025; Hijazi et al., 2025), Evidence further indicates that self-efficacy serves as a central psychological mechanism mediating the relationship between treatment-related commitment and sustained foot care practices, highlighting that effective self-management extends beyond compliance alone (Björk et al., 2025; Sadeghi et al., 2025).

At the same time, perceived barriers to sustained glycemic control (Theme 3) underscore the inherent complexity of metabolic regulation. Evidence from metabolic resilience research suggests that metabolic responses to behavioral and environmental changes are temporally dynamic and regulated across multiple biological levels, which may explain the absence of significant short-term changes in blood glucose levels (Jasbi et al., 2025). Furthermore, emerging evidence indicates that metabolic syndrome is driven by the complex interplay of biological, genetic, inflammatory, and lifestyle-related factors—including insulin resistance, visceral adiposity, dyslipidemia, and chronic inflammation—that do not respond uniformly or immediately to behavioral interventions alone. Taken together, these findings highlight that while educational and family-empowerment strategies are effective in improving self-management behaviors and psychosocial outcomes, meaningful metabolic improvements often require longer-term, multi-level interventions integrating sustained lifestyle modification, pharmacological management, and broader environmental support (Islam et al., 2024).

Implications for Practice and Policy

The findings of this study have several implications for primary healthcare practice and policy. Family-inclusive care models should be systematically integrated into routine diabetes education at primary healthcare centers. Multi-component educational strategies—combining counseling, demonstrations,

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visual media, and home visits—appear more effective than single-mode interventions. Healthcare providers should adopt realistic expectations, recognizing that behavioral improvements may precede metabolic outcomes. Given its relatively low cost and reliance on existing nursing resources, this intervention model shows strong potential for scalability and sustainability in resource-limited settings.

Limitations

Several limitations should be considered when interpreting these findings. First, the single-group pre–post design without a control group limits causal inference. Second, reliance on self-reported measures may introduce reporting bias. Third, the six-month intervention period may have been insufficient to detect changes in blood glucose levels. Fourth, the single-site, semi-rural setting limits generalizability. Finally, the absence of long-term follow-up prevents assessment of sustainability.

CONCLUSION

This study demonstrates that a family-centered educational intervention is feasible, acceptable, and effective in improving diabetic foot care knowledge, self-management behaviors, family support, and quality of life among patients with type 2 diabetes in a semi-rural primary healthcare setting. The substantial improvements observed in health literacy and behavioral adherence indicate that structured, family-inclusive education can meaningfully strengthen diabetes self-management in resource-limited contexts.

Although short-term metabolic outcomes, as measured by blood glucose levels, did not show statistically significant improvement, the strong behavioral and psychosocial gains achieved during the intervention suggest a solid foundation for longer-term clinical benefits. Family involvement emerged as a key enabling factor in sustaining daily care practices, underscoring the importance of engaging families as active partners in diabetes management, particularly in cultural contexts where family cohesion strongly influences health-related decisions.

Future research should employ controlled study designs with longer follow-up periods to evaluate the sustainability of behavioral changes and their translation into metabolic outcomes. Further studies are also warranted to assess cost-effectiveness, optimal intervention duration, and adaptability across diverse primary healthcare settings.

Clinical and policy implications include the integration of family-inclusive education into routine diabetes care at primary healthcare centers, the use of multi-modal educational strategies, and the provision of structured home-based follow-up. This study offers a replicable and scalable model for community-based diabetic foot care education that can support preventive diabetes management efforts in Indonesia and other low- and middle-income countries.

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