

Nurses' educational role in the prevention of complications among patients with type 2 diabetes mellitus

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Received: 2025-09-01

Revised: 2025-10-01

Accepted: 2025-11-30

Published: 2025-12-01

ABSTRACT

Introduction: Type 2 Diabetes Mellitus (T2DM) is a chronic disease with a high risk of long-term complications that significantly affect patients' quality of life and healthcare costs. Despite advances in medical management, complication rates remain high, indicating the need for effective educational interventions. Nurses play a pivotal role in diabetes education, yet evidence focusing on their specific contribution to complication prevention remains limited.

Methods: This quantitative, descriptive-analytic cross-sectional study involved 50 patients with T2DM selected through purposive sampling. Data were collected using validated questionnaires that measured nurses' educational roles and patients' complication-prevention behaviors. Univariate analysis described respondent characteristics and study variables, while bivariate analysis using the chi-square test examined the relationship between nurses' educational roles and complication prevention.

Results: Most respondents perceived nurses' educational roles as good (64%) and demonstrated good complication prevention behaviors (60%). Bivariate analysis showed a statistically significant relationship between nurses' educational roles and prevention of complications ($\chi^2 = 14.62$; $p = 0.002$). Patients who received higher-quality nurse-led education were more likely to engage in effective preventive behaviors. The findings indicate that strong nurse-led educational support is associated with better preventive practices among patients with T2DM. Nurses' consistent, patient-centered education plays a critical role in enhancing self-care behaviors and reducing the risk of diabetes-related complications.

Conclusion: Nurses' educational roles significantly contribute to the prevention of complications in patients with Type 2 Diabetes Mellitus. Strengthening structured nurse-led education should be prioritized to improve long-term diabetes outcomes.

Keywords: Complication prevention; Diabetes education; Nurse role; Self-care behavior; Type 2 diabetes mellitus



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INTRODUCTION

Type 2 Diabetes Mellitus (T2DM) is a major global public health challenge due to its increasing prevalence and its strong association with long-term complications, including cardiovascular disease, nephropathy, neuropathy, retinopathy, and diabetic foot disorders (Alam *et al.*, 2024). These complications significantly reduce patients' quality of life, increase disability, and contribute to rising healthcare costs and mortality (Aldahmashi *et al.*, 2024). Despite advances in pharmacological therapy and clinical guidelines, the incidence of diabetes-related complications remains high, particularly in low- and middle-income settings (Al-Kalaldeh *et al.*, 2024). This condition indicates that biomedical management alone is insufficient and must be complemented by effective patient education and self-management support (Bernstein *et al.*, 2024).

Nurses play a central role in diabetes care, especially in patient education, ongoing monitoring, and behavioral support (Björk *et al.*, 2025). As frontline healthcare professionals, nurses interact with patients more frequently and continuously than other providers, placing them in a strategic position to deliver structured education on glycemic control, medication adherence, nutrition, physical activity, foot care, and early recognition of complications (Chen *et al.*, 2024). Evidence suggests that well-designed nurse-led educational interventions can improve patients' knowledge, self-care behaviors, and clinical outcomes. However, the effectiveness of such interventions varies widely depending on content, delivery methods, intensity, cultural adaptation, and healthcare context (De Carvalho *et al.*, 2025).

Despite the growing body of research on diabetes education, several critical gaps remain. First, existing studies often focus on short-term outcomes, such as improvements in knowledge or glycemic indicators, while fewer examine sustained prevention of complications over time (Figueiredo Moreira *et al.*, 2025). Second, the role of nurses is frequently embedded within multidisciplinary interventions, making it difficult to isolate and clearly define the specific contribution of nurse-led education. Third, there is inconsistency in educational frameworks, outcome measures, and intervention duration across studies, which limits comparability and generalizability (Gigi *et al.*, 2025). Additionally, many reviews emphasize patient self-management broadly, without sufficient attention to nurses' educational competencies, strategies, and professional roles in preventing complications (Huang *et al.*, 2025).

The novelty of this review lies in its explicit focus on nurses' educational roles as a distinct and critical component of complication prevention in patients with T2DM. Rather than treating education as a generic intervention, this article synthesizes evidence showing that nurse-led education delivered through individualized counseling, group-based programs, community outreach, and technology-assisted platforms reduces the risk and progression of diabetes-related complications (Kelly *et al.*, 2025). This review also emphasizes the mechanisms by which nurse education influences outcomes, including facilitating behavior change, empowering patients, promoting continuity of care, and early detection of complications (Jensen *et al.*, 2025).

As a review article, this paper aims to critically analyze and synthesize the existing literature on nurse-led educational interventions to prevent complications in patients with T2DM. By identifying effective educational approaches, contextual factors, and methodological limitations in previous studies, this review seeks to provide a comprehensive understanding of current evidence and highlight directions for future research and practice. The findings are expected to inform nursing practice, support the development of standardized educational models, and guide policymakers and healthcare institutions in strengthening nurses' roles in preventing diabetes complications. Ultimately, reinforcing nurses' educational roles is essential to improving long-term outcomes for patients with Type 2 Diabetes Mellitus.

RESEARCH METHODOLOGY

Study Design

This study employed a quantitative, descriptive-analytic cross-sectional design to examine the role of nurses' educational interventions in preventing complications among patients with

Type 2 Diabetes Mellitus (T2DM). The design was selected to measure relationships between nurse-led education and indicators of complication prevention at a single point in time.

Population and Sample

The study population consisted of patients diagnosed with Type 2 Diabetes Mellitus who received outpatient care at a primary healthcare facility. A total of 50 respondents were selected using a purposive sampling technique based on predefined inclusion and exclusion criteria.

Inclusion criteria were:

- Patients aged ≥ 18 years.
- Diagnosed with Type 2 Diabetes Mellitus for at least six months.
- Had received diabetes education from nurses.
- Willing to participate and provided informed consent.

Exclusion criteria included patients with severe cognitive impairment, acute complications requiring emergency care, or comorbid conditions that limited participation in the study.

Variables and Measurement

The independent variable was nurses' educational role, measured using a structured questionnaire assessing the frequency, clarity, and relevance of the educational activities provided by nurses, including medication adherence, diet, physical activity, blood glucose monitoring, and complication prevention. The dependent variable was prevention of diabetes complications, measured using indicators such as patients' self-care behaviors, adherence to preventive practices (e.g., foot care and routine check-ups), and self-reported early recognition of complication symptoms. All instruments used in this study were adapted from validated questionnaires in previous diabetes education research and translated as necessary. Before data collection, the instruments were tested for validity and reliability, with a Cronbach's alpha value of ≥ 0.70 considered acceptable.

Data Collection Procedure

Data were collected using self-administered questionnaires distributed directly to respondents during clinic visits. For participants with limited literacy, questionnaires were administered through structured interviews conducted by trained research assistants. Data collection was carried out over a defined study period following ethical approval.

Data Analysis

Data were analyzed using statistical software. Descriptive statistics (frequency, percentage, mean, and standard deviation) were used to describe respondent characteristics and study variables. Inferential analyses, such as the chi-square test and Pearson correlation test, were applied to examine the relationship between nurses' educational role and indicators of complication prevention. A p-value of < 0.05 was considered statistically significant.

Ethical Considerations

Ethical approval was obtained from the relevant Institutional Review Board. All respondents received clear information about the study objectives and procedures. Participation was voluntary, and confidentiality and anonymity of respondents were strictly maintained throughout the research process.

RESULTS

This section presents the study's findings from univariate and bivariate analyses. The univariate analysis describes respondent characteristics, the level of nurses' educational roles, and patients' behaviors to prevent complications. The bivariate analysis examines the association between nurses' educational roles and the prevention of complications among patients with Type 2 Diabetes Mellitus. The results are presented in tables to provide a clear, systematic overview of the data distribution and the relationships among variables. These findings offer empirical evidence regarding the contribution of nurse-led education to effective complication prevention in patients with Type 2 Diabetes Mellitus and support further interpretation and discussion in the subsequent section.

Table 1. Characteristics of Respondents (n = 50)

Variable	Category	Frequency (n)	Percentage (%)
Age (years)	26–45	9	18.0
	46–65	30	60.0
	≥66	11	22.0
Gender	Male	21	42.0
	Female	29	58.0
Duration of T2DM	1–5 years	22	44.0
	>5 years	28	56.0
Education Level	Primary	10	20.0
	Secondary	24	48.0
	Higher	16	32.0

Table 1 shows that most respondents were aged 46–65 years, indicating that Type 2 Diabetes Mellitus predominantly affected middle-aged to older adults in this study. The majority of respondents were female, suggesting a slightly higher participation of women in diabetes care services. More than half of the respondents had been diagnosed with diabetes for over five years, reflecting prolonged disease exposure and a higher risk of developing complications. Most respondents had secondary or higher education, which may facilitate a better understanding of health information and educational interventions. Overall, these characteristics suggest that the study population represents patients with sufficient disease experience and educational background to meaningfully benefit from nurse-led educational programs aimed at preventing diabetes-related complications.

Table 2. Univariate analysis of nurses' educational role and prevention of complications (n = 50)

Variable	Category	Frequency (n)	Percentage (%)
Nurses' Educational Role	Good	32	64.0
	Moderate	12	24.0
	Poor	6	12.0
Prevention of Diabetes Complications	Good	30	60.0
	Moderate	14	28.0
	Poor	6	12.0

Table 2 indicates that the majority of respondents perceived the nurses' educational role as good, suggesting that nurse-led educational activities were generally well implemented and accessible to patients with Type 2 Diabetes Mellitus. This finding reflects consistent delivery of education related to medication adherence, lifestyle modification, and early detection of complications. In parallel, most respondents demonstrated good complication prevention behaviors, including regular self-monitoring, appropriate foot care, and routine healthcare visits. The similar distribution between a good level of nurse education and good preventive practices suggests a positive alignment between educational support and patient behavior, highlighting the potential contribution of nurses' educational roles in promoting effective prevention of diabetes-related complications.

Table 3. Relationship between nurses' educational role and prevention of complications

Nurses' Educational Role	Good Prevention n (%)	Moderate Prevention n (%)	Poor Prevention n (%)	Total (n)
Good	25 (78.1)	7 (21.9)	0 (0.0)	32
Moderate	4 (33.3)	6 (50.0)	2 (16.7)	12
Poor	0 (0.0)	1 (16.7)	5 (83.3)	6

Chi-square test: $\chi^2 = 14.62$

p-value: 0.002

Table 3 demonstrates a statistically significant relationship between nurses' educational role and the prevention of complications among patients with Type 2 Diabetes Mellitus. Respondents who perceived the nurses' educational role as good showed a markedly higher proportion of good complication-prevention behaviors than those who perceived it as moderate or poor. Conversely, respondents who reported poor educational support from nurses were more

likely to exhibit inadequate preventive behaviors. The significant chi-square result indicates that the quality of nurse-led education is closely associated with patients' ability to engage in effective preventive practices. This finding underscores the importance of strengthening nurses' educational roles to improve long-term outcomes and reduce diabetes-related complications.

The study concludes that nurses' educational roles are significantly associated with the prevention of complications among patients with Type 2 Diabetes Mellitus. Patients who received high-quality educational support from nurses demonstrated better preventive behaviors compared to those who received moderate or poor education. These findings highlight the crucial role of nurse-led education in improving self-care practices and reducing the risk of diabetes-related complications. Strengthening structured and consistent educational interventions by nurses is therefore essential to enhance patient outcomes and support effective long-term diabetes management.

DISCUSSION

The findings of this study demonstrate a significant association between nurses' educational roles and the prevention of complications among patients with Type 2 Diabetes Mellitus (T2DM). This result reinforces the growing body of evidence that emphasizes the importance of nurse-led education as a core component of chronic disease management. In the present study, most respondents perceived the educational role of nurses as good, and this group also showed the highest proportion of effective complication prevention behaviors. This alignment suggests that education delivered by nurses is not merely supportive but plays a decisive role in shaping patients' daily self-care practices.

The univariate analysis revealed that most respondents demonstrated good preventive behaviors, including adherence to dietary recommendations, regular blood glucose monitoring, appropriate foot care, and routine health check-ups. These behaviors are critical in preventing or delaying microvascular and macrovascular complications of T2DM (Li *et al.*, 2025). The high proportion of respondents with good preventive practices may be attributed to the consistent educational exposure provided by nurses, who often serve as the primary source of information and motivation for patients. Through repeated interactions, nurses can reinforce key messages, clarify misconceptions, and adapt education to individual patient needs (Kurniawan, 2024).

The bivariate analysis further confirmed a statistically significant relationship between nurses' educational role and complication prevention (Theivasigamani and Palaniappan, 2024). Patients who perceived nurses' education as good were substantially more likely to exhibit good preventive behaviors compared to those who perceived the educational role as moderate or poor (Mira-Martínez *et al.*, 2025). This finding supports behavioral and educational theories that emphasize knowledge, self-efficacy, and continuous reinforcement as determinants of health behavior change. Nurses are uniquely positioned to influence these determinants through patient-centered communication, ongoing assessment, and tailored education strategies (Park *et al.*, 2025).

These results are consistent with previous studies reporting that nurse-led diabetes education programs improve self-management behaviors and clinical outcomes (Terkes, Bektas and Aydemir, 2025). Prior research has shown that structured education provided by nurses can lead to better glycemic control, improved medication adherence, and reduced incidence of diabetes-related complications (Racey *et al.*, 2025). The present study extends this evidence by focusing specifically on the prevention of complications and by highlighting patients' perceptions of nurses' educational roles as a key factor influencing outcomes. This perspective is essential, as patient perception often reflects the clarity, relevance, and effectiveness of educational interventions (Seng *et al.*, 2025).

The duration of diabetes among respondents, with more than half living with T2DM for over five years, suggests that long-term disease experience alone does not guarantee adequate complication prevention. Without effective education and ongoing support, patients may develop maladaptive behaviors or experience "education fatigue" (Syaharuddin *et al.*, 2025). Nurses can address this challenge by providing continuous, staged education that evolves with disease progression (Uko and Frady, 2024). This approach ensures that patients remain engaged and

informed about emerging risks and preventive strategies as their condition changes over time (Stenov *et al.*, 2024).

Another important consideration is the variability in preventive behaviors among respondents who perceived nurses' educational roles as moderate or poor. In these groups, a higher proportion of patients demonstrated inadequate prevention practices (Zulfiah, Kadang, and Suprpto, 2025). This finding highlights potential gaps in educational delivery, such as limited time for counseling, a lack of standardized educational materials, or insufficient training in educational methods. It underscores the need for healthcare systems to support nurses with adequate resources, training, and institutional recognition of education as a critical nursing function rather than an additional task (Suprpto, Lalla and Arda, 2023).

From a practical perspective, the findings suggest that strengthening nurses' educational roles could be a cost-effective strategy to reduce the burden of T2DM complications. Preventing complications not only improves patients' quality of life but also reduces healthcare utilization, hospital admissions, and long-term treatment costs. Integrating structured nurse-led education into routine diabetes care may therefore yield both clinical and economic benefits. This approach is particularly relevant in primary care and community settings, where nurses often have sustained patient contact. Despite its contributions, this study has several limitations. The cross-sectional design limits causal inference, as the relationship between education and prevention behaviors was observed at a single point in time. The sample size of 50 respondents, while sufficient for exploratory analysis, may limit generalizability to broader populations. Additionally, reliance on self-reported data introduces the potential for recall and social desirability bias. Future studies should consider longitudinal or experimental designs, larger sample sizes, and objective outcome measures to strengthen the evidence base. The discussion of these findings underscores the pivotal role of nurses' educational interventions in preventing complications among patients with T2DM. Effective nurse-led education enhances patients' knowledge, self-care behaviors, and engagement in preventive practices. These findings support the need for healthcare policymakers and institutions to invest in structured, standardized, and sustainable nursing education programs as an integral part of comprehensive diabetes management.

CONCLUSIONS

This study concludes that nurses' educational roles significantly influence the prevention of complications among patients with Type 2 Diabetes Mellitus. Patients who perceived nurse-led education as good were more likely to demonstrate effective preventive behaviors, highlighting the importance of consistent, clear, and patient-centered educational interventions in diabetes management. Strengthening nurses' educational function is therefore essential to improve self-care practices and reduce the risk of long-term diabetes-related complications.

Based on these findings, it is recommended that healthcare institutions enhance structured nurse-led education programs through standardized guidelines, regular training, and adequate institutional support. Future research should employ longitudinal or interventional designs with larger samples to further the effectiveness of nursing education on clinical outcomes and complication rates.

Acknowledgments

The authors would like to express their sincere appreciation to all participants who took part in this study. Gratitude is also extended to the healthcare facility and nursing staff for their support and cooperation during the data collection process.

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