Mosul Journal of Nursing

Online ISSN: 2663-0311 - Print ISSN: 2311-8784
Website: https://mjn.mosuljournals.com

Effectiveness of Health Education on Quality of Life in Diabetic Foot Patients with Type 2 Diabetes Mellitus: A Quasi-Experimental Study

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A R T I C L E I N F O

Keywords:
Diabetic foot
Health Belief Model
Self-management education
Quality of life

Abstract

Background: Diabetic foot is a leading cause of hospital admissions among diabetic patients and presents a significant healthcare burden. Foot ulcers can lead to physical disability, reduced quality of life (QoL), limb loss, and even death. Nurses play a crucial role in enhancing the QoL of diabetic patients by implementing education programs that promote self-care for diabetic foot prevention and management.

Aim: This study evaluates the effectiveness of self-management education on improving the QoL of Type 2 diabetes mellitus (T2DM) patients with diabetic foot.

Design: A quasi-experimental study was conducted to assess the impact of nursing education on the QoL of T2DM patients with diabetic foot. The Health Belief Model (HBM) was employed for the education program, and the EQ-5D tool was used for QoL evaluation. The study was conducted among patients attending diabetic clinics in Duhok and Akre.

Methods: Sixty diabetic foot patients were divided into experimental and control groups using non-random selection between October 1, 2020, and April 10, 2020. Data were analyzed using SPSS version 25.

Results: Among the 60 patients, the most common age group was 54-63 years (40% in the experimental group, 50% in the control group). Male participants outnumbered females (73.3% vs. 60%). After three months of follow-up, the experimental group showed a statistically significant improvement in all QoL dimensions (Mobility, Self-care, Usual activities, Pain/discomfort, Anxiety/depression) with $p<0.000$. Regression analysis revealed no significant correlation between QoL and demographic variables ($p>0.05$).

Conclusions: Diabetic foot ulcers negatively impact QoL, but self-management education significantly improves outcomes. Behavior modification through education is essential to controlling foot ulcers and enhancing QoL in diabetic foot patients.

What is already known about the topic? Health education improves the quality of life in patients with diabetic foot by enhancing self-care practices, wound management, and glycemic control. Education helps reduce complications and hospitalizations and improves overall well-being in Type 2 diabetes patients.

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DOI: 10.33899/mjn.2024.184664, Authors, 2024, College of Nursing, University of Mosul.

Date Received 7 April 2024; Received in revised form 27 June 2024; Accepted 30 June 2024, Available online 12 July 2024

Introduction

Diabetes mellitus is a complex, chronic metabolic disorder characterized by impaired glucose homeostasis (Guariguata et al., 2011). Often referred to as the "mother of all diseases," diabetes is the third leading cause of death globally (Manimala, 2006). In 2013, it was estimated that approximately 382 million people worldwide had diabetes, with Type 2 diabetes mellitus (T2DM) accounting for 90% of cases. This represents 8.3% of the global adult population, with similar prevalence among men and women. By 2035, this number is projected to rise to 592 million (Tao, Shi, and Zhao, 2015).

Diabetic foot complications are one of the primary causes of morbidity and mortality in diabetic patients, contributing significantly to healthcare costs (Aguiree et al., 2013). Approximately 25% of diabetic patients develop foot ulcers, and around 60% of non-traumatic lower limb amputations are attributed to infected diabetic foot ulcers (Alqurashi, Aljabri, and Bokhari, 2011; Alhowaish, 2013).

Foot ulcers have a profound impact on patients' quality of life (QoL), particularly affecting physical and social functioning as well as mobility (Meijer et al., 2001). Education on diabetes and foot care is crucial in empowering patients to engage in self-care, make informed decisions, and manage foot-related complications effectively (Francisco, 2013). Diabetic treatment aims to enhance patients' quality of life, prevent premature mortality, and reduce both macrovascular and microvascular complications (Juul et al., 2012).

Providing foot care education to patients, families, and healthcare professionals is vital in preventing foot problems (Brownrigg, Schaper, and Hinchliffe, 2015). Specialist nurses play a key role in testing, educating, and training diabetic patients, which can significantly reduce the incidence of foot ulcers and amputations (Algarni, Khan, and Alavudeen, 2013). Nurses also educate patients on dietary management to control blood glucose levels and teach them about diabetic foot care and prevention (Bean, 2008).

Objectives of the Study

The main objective of this study is to evaluate the effectiveness of self-management education on improving the quality of life in diabetic foot patients with T2DM.

Methodology

Study Design

This study employed a quasi-experimental design to evaluate the effectiveness of self-management education on improving the quality of life (QoL) in patients with diabetic foot and Type 2 Diabetes Mellitus (T2DM). The quasi-experimental design was chosen due to the feasibility of implementing an intervention in real clinical settings while maintaining a comparison group.

Study Setting and Duration

The study was conducted in two healthcare facilities in Duhok Governorate, Iraq: Azadi Teaching Hospital in Duhok City and Gulan Hospital in Akre City. The research period spanned six months, from October 1, 2020, to March 30, 2021. The intervention consisted of three months of education followed by a three-month follow-up period.

Study Population and Sampling

The study targeted patients diagnosed with T2DM who were receiving

treatment for diabetic foot ulcers. A total of 60 patients were purposively recruited for the study and divided into two groups:

- **Experimental Group (n=30):** Patients recruited from Gulan Hospital in Akre, who received the self-management education intervention.
- **Control Group (n=30):** Patients recruited from the Duhok Diabetes Center in Duhok City, who received standard care without the intervention.

Patients were selected non-randomly based on inclusion criteria, which required participants to have a confirmed diagnosis of T2DM and diabetic foot ulcers. Exclusion criteria included patients with severe comorbidities or cognitive impairments that would affect their ability to participate in the educational sessions.

Intervention

The educational intervention was designed based on the Health Belief Model (HBM), focusing on enhancing patients' self-management skills for diabetic foot care. The intervention involved the following steps:

1. **Educational Sessions:** The experimental group participated in six education sessions, each lasting two hours, spread over three months. The sessions covered topics such as:
   - Understanding diabetic foot ulcers and their complications.
   - The importance of glycemic control and self-monitoring.
   - Proper foot care techniques, including hygiene, daily inspection, and footwear selection.
   - Prevention of foot injuries and recognition of early signs of complications.
   - Dietary management and its role in controlling blood glucose levels.
   - Stress management and lifestyle modifications to improve overall well-being.
2. **Supportive Care:** After the educational sessions, the researcher maintained bi-weekly contact with the participants for three months, providing support, answering questions, and reinforcing self-care behaviors. This contact was made through personal visits, phone calls, or both, depending on patient preference and availability.

Control Group

The control group received the standard care provided at the Duhok Diabetes Center. Standard care involved routine clinical visits and general advice on foot care but did not include structured education or follow-up as in the experimental group.

Data Collection Tools

The primary outcome measure was the quality of life, assessed using the **EuroQol Five-Dimensional Questionnaire (EQ-5D)**. This tool evaluates five dimensions of QoL:

- **Mobility**
- **Self-care**
- **Usual activities**
- **Pain/discomfort**
- **Anxiety/depression**

Each dimension was scored on a 3-point scale, with higher scores indicating worse health outcomes. Patients in both groups completed the EQ-5D before the intervention and at the end of the three-month follow-up period.

Data Collection Procedure

At the start of the study, both groups underwent an initial baseline assessment. The experimental group then received the education intervention, while the control group continued their usual care. Follow-up assessments were conducted three months after the educational sessions concluded,

ensuring that any changes in QoL were captured for both groups.

Ethical Considerations

Ethical approval for the study was obtained from the institutional review board (IRB) of Duhok Polytechnic University. Informed consent was obtained from all participants before enrolling in the study. Participants were assured of the confidentiality of their data, and they were informed that they could withdraw from the study at any time without affecting their treatment.

Data Analysis

Data were entered and analyzed using the **Statistical Package for the Social Sciences (SPSS) version 25**. Descriptive statistics were used to summarize the demographic characteristics of the study population, including age, gender, and duration of diabetes. Inferential statistics, including paired t-tests and regression analysis, were used to assess the impact of the intervention on QoL and explore potential relationships between demographic variables and QoL outcomes. A p-value of ≤0.05 was considered statistically significant.

Outcome Measures

The primary outcome of the study was the change in QoL scores in the experimental group compared to the control group. Secondary outcomes included the relationship between demographic variables (age, gender, duration of diabetes) and QoL improvements.

Results

Demographic Characteristics

Table 1 shows the comparison of demographic characteristics between the experimental and control groups at baseline. The most common age group was 54-63 years, representing 40% in the experimental group and 50% in the control group ($p = 0.721$). Male participants were more prevalent in both groups, comprising 73.33% of the experimental group and 60% of the control group ($p = 0.371$). Educational level, disease duration, and smoking status showed no significant differences between the groups ($p > 0.05$). There was no significant difference between the groups in terms of hypertension or HbA1c levels ($p = 0.174$), indicating baseline homogeneity between the experimental and control groups across most variables.

Baseline Quality of Life

As shown in Table 2, baseline comparisons of quality of life (QoL) between the experimental and control groups revealed no statistically significant differences across all dimensions of the EQ-5D tool. Mobility issues were reported by 46.67% of the experimental group and 50% of the control group with moderate problems, and 30% in the experimental group vs. 23.33% in the control group with severe problems ($p = 0.839$). For self-care, 53.33% of the experimental group and 66.67% of the control group reported no problems ($p = 0.550$). Usual activities, pain/discomfort, and anxiety/depression showed similarly insignificant differences at baseline, indicating both groups were comparable prior to the intervention.

Correlation Between Demographic Variables and QoL

Table 3 presents the correlation between demographic variables and QoL. None of the demographic variables showed a statistically significant correlation with

QoL scores. Age had a near-significant relationship (p = 0.089), while other variables such as gender (p = 0.708), education (p = 0.719), and disease duration (p = 0.428) showed no significant association with QoL. Smoking had a marginal association with QoL (p = 0.098), though it did not reach statistical significance.

Post-Intervention Quality of Life

Table 4 presents the differences in QoL between the experimental and control groups following the intervention. The results show significant improvements in all dimensions of QoL for the experimental group compared to the control group.

Mobility: The experimental group had a mean score of 1.13 (SD = 0.35), significantly lower than the control group's mean of 2.00 (SD = 0.69), with a t-value of -6.117 (p < 0.001).

Self-care: The experimental group scored a mean of 1.27 (SD = 0.45), significantly better than the control group's mean of 1.97 (SD = 0.89), with a t-value of -3.845 (p < 0.001).

Usual Activities: The experimental group scored significantly lower, with a mean of 1.07 (SD = 0.25), compared to the control group's mean of 1.50 (SD = 0.63), with a t-value of -3.496 (p = 0.001).

Pain/Discomfort: The experimental group had a mean score of 1.47 (SD = 0.57), significantly better than the control group's mean of 1.93 (SD = 0.69), with a t-value of -2.850 (p = 0.006).

Anxiety/Depression: The experimental group scored 1.17 (SD = 0.46), significantly lower than the control group's mean of 2.20 (SD = 0.66), with a t-value of -6.998 (p < 0.001).

Overall QoL: The total QoL score for the experimental group was 6.10 (SD = 1.06), significantly lower than the control group's total score of 9.60 (SD = 1.59), with a t-value of -10.032 (p < 0.001).

Table (1) Comparisons of demographic characteristics between the experimental and control groups at baseline

Variable	Category	Experiment group		Control group		Chi-Square	Sig.
		No.	%	No.	%		
Age	34-43 year	7	23.33	4	13.33	1.333	0.721
	44-53 years	6	20.00	5	16.67		
	54-63 years	12	40.00	15	50.00		
	64 years and over	5	16.67	6	20.00		
Gender	Male	22	73.33	18	60.00	1.200	0.371
	Female	8	26.67	12	40.00		
Level of education	Illiterate	9	30.00	7	23.33	3.865	0.425
	Primary	4	13.33	9	30.00		
	Medium	8	26.67	5	16,67		
	High school	7	23,33	5	16.67		
	University	2	6.67	4	13.33		
Disease Duration	5-9 years	14	46.76	15	50.00	1.573	0.666
	10-14 years	9	30.00	10	3.33		
	15-19 years	5	16.67	2	6.67		
	20 years and over	2	6.67	3	10.00		
hypertension	Yes	12	40.00	9	30.00		
	No	18	60.00	21	70.00		
HbA1c	6.41 – 7.60	12	40.00	12	40.00	4.970	0.174
	7.61 – 8.80	14	46.67	8	26.67		
	8.81 – 10.00	4	13.33	8	26.67		
	10.01 – 11.20	0	0.00	2	6.66		

Smoking	Yes	8	26.67	6	20.00	0.373	0.542
	No	22	73.33	24	80.00		

Table (2) Comparisons between the experimental and control groups in quality of life at baseline

Variable	Category	Experiment group		Control group		Chi-Square	Sig.
		No.	%	No.	%		
Mobility	no problem	7	23.33	8	26.67	0.351	0.839
	moderate problem	14	46.67	15	50.00		
	severe problem	9	30.00	7	23.33		
Self-care	no problem	16	53.33	20	66.67	1.194	0.550
	moderate problem	9	30.00	7	23.33		
	severe problem	5	16.67	3	10.00		
Usual activities	no problem	22	73.33	18	60.00	1.200	0.549
	moderate problem	6	20.00	9	30.00		
	severe problem	2	6.67	3	10.00		
Pain/ discomfort	no problem	10	33.33	14	46.67	1.167	0.558
	moderate problem	13	43.33	11	36.66		
	severe problem	7	23.33	5	16.67		
Anxiety/ Depression	no problem	6	20.00	7	23.33	0.272	0.873
	moderate problem	15	50.00	13	43.33		
	severe problem	9	30.00	10	33.33		

Table (3) Correlation coefficient between quality of life and demographic variables

Variable	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
Age	.053	.031	.248	1.733	.089
Gender	-.180-	.476	-.051-	-.377-	.708
Education	-.077-	.213	-.057-	-.362-	.719
Duration	.031	.039	.108	.800	.428
Hypertension	-.207-	.513	-.060-	-.404-	.688
HbA1c	.273	.199	.183	1.374	.176
Smoking	.923	.547	.236	1.687	.098

Table (4) Differences between two groups in post-test for quality of life

Variable	Group	N.	mean	Sd.	t-value	Sig.
Mobility	Experimental	30	1.1333	.34575	-6.117	.000
	Control	30	2.0000	.69481		
Self care	Experimental	30	1.2667	.44978	-3.845	.000
	Control	30	1.9667	.88992		
Usual activities	Experimental	30	1.0667	.25371	-3.496	.001
	Control	30	1.5000	.62972		
Pain/discomfort	Experimental	30	1.4667	.57135	-2.850	.006
	Control	30	1.9333	.69149		
Anxiety/depression	Experimental	30	1.1667	.46113	-6.998	.000
	Control	30	2.2000	.66436		
QOL(Total)	Experimental	30	6.1000	1.06188	-10.032	.000
	Control	30	9.6000	1.58875		

Discussion

Diabetic foot is a major healthcare concern and one of the most common reasons for hospitalization among people with diabetes. It is associated with significant morbidity and mortality, leading to physical disability, reduced quality of life (QoL), and, in severe cases, amputations. As a result, diabetes care providers focus on preventing and detecting diabetic foot problems early. Nurses, as frontline healthcare providers, play a crucial role in educating patients and promoting self-care behaviors to prevent complications. Their consistent contact with patients allows them to deliver effective education and improve overall patient outcomes (Waheida, Elshemy, & Basal, 2015).

The findings of this study align with the critical role of education in improving QoL for diabetic foot patients. Table 1 shows the demographic characteristics of the study participants, highlighting that the age group most represented was 54-63 years. This is consistent with previous studies, such as Liudmila et al. (2008), which reported that the prevalence of diabetes increases among individuals aged 45-64. Additionally, a higher proportion of male participants (73.3% in the experimental group and 60% in the control group) may be due to males having more availability to participate in the program and possibly more motivation to engage in health-related education. The majority of participants had low levels of education, which could explain their lack of previous knowledge about diabetic foot care and their willingness to acquire new information and skills to manage their condition.

In terms of disease duration, most participants had been diagnosed with diabetes for 5-9 years, representing approximately half of the sample in both groups. This suggests that patients with moderate disease duration may be more motivated to participate in educational interventions, likely due to their experiences with complications such as diabetic foot ulcers and their desire to prevent further health issues. This is especially relevant as many of these patients had not previously participated in structured diabetes education programs, highlighting the importance of providing such interventions to improve self-management and health outcomes.

Regarding QoL dimensions, the results in Table 2 show that the most common problems experienced by both groups were related to anxiety/depression, mobility, and pain/discomfort. Specifically, the experimental group showed moderate issues with these dimensions, which is consistent with the findings of previous studies that diabetic foot ulcers significantly affect physical and emotional well-being (Meijer et al., 2001). Interestingly, the least problematic areas were usual activities and self-care, indicating that patients may maintain some functional independence despite their foot complications. However, the intervention's positive impact on improving these areas highlights the importance of self-management education in enhancing patients' ability to cope with the physical and emotional challenges of diabetic foot.

Table 3 reveals that there was no significant relationship between demographic variables and QoL outcomes. This finding contrasts with the results of Nasiriziba et al. (2015), who reported that QoL tends to decline with age in diabetic foot patients and that smoking is associated with negative emotional impacts. The discrepancy may be due to the sample size or the specific

characteristics of the population studied. Nonetheless, the lack of significant relationships in this study emphasizes that QoL improvements can be achieved through education, regardless of demographic factors.

The most significant finding of this study is the improvement in QoL observed in the experimental group following the self-management education intervention (Table 4). Participants in the experimental group showed significant improvements in all dimensions of QoL, including mobility, self-care, usual activities, pain/discomfort, and anxiety/depression. These results align with the findings of Moriyama et al. (2009), who demonstrated that diabetic patients experienced notable improvements in QoL six months after the start of a self-management intervention. The improvements in this study suggest that educating patients about foot care, glycemic control, and the prevention of complications can lead to better disease management and enhanced well-being.

The study's findings emphasize the effectiveness of diabetes self-management education in improving QoL for patients with diabetic foot. The positive outcomes in the experimental group highlight the critical role of nursing education in empowering patients to take control of their health, prevent complications, and enhance their overall quality of life. These results underscore the need for future interventions to focus on education as a key component of diabetes management, particularly in populations with low health literacy and limited prior exposure to structured educational programs.

Conclusion

This study provides strong evidence that diabetic foot patients benefit significantly from participation in diabetes self-management education programs, leading to improved QoL in various dimensions. These findings highlight the importance of incorporating QoL outcomes in future diabetes education interventions to ensure that patients' overall well-being is considered alongside clinical outcomes.

Declaration

We hereby declare that this study titled **"Effectiveness of Health Education on Quality of Life in Diabetic Foot Patients with Type 2 Diabetes Mellitus: A Quasi-Experimental Study"** was conducted in accordance with ethical guidelines and principles. All participants provided informed consent before being included in the study. The study protocol was reviewed and approved by the ethical review board of Duhok Polytechnic University. No conflicts of interest exist in relation to this study, and all sources of information have been appropriately acknowledged.

All data collected during the study were handled confidentially and used solely for research purposes. The authors are solely responsible for the content and writing of this article.

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Funding

This research did not receive any specific grant from funding agencies in the

public, commercial, or not-for-profit sectors.

Acknowledgment

We would like to express our sincere gratitude to Duhok Polytechnic University and the University of Duhok for their support in facilitating this research. We also extend our thanks to the staff at Azadi Teaching Hospital and Gulan Hospital for their cooperation throughout the study. Special appreciation goes to the patients who participated in this study and provided valuable insights through their engagement. Lastly, we would like to thank our colleagues and mentors for their continuous guidance and encouragement, without which this study would not have been possible.

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