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ASSESSING THE EFFECTIVENESS OF A NURSE-LED DIABETES SELF-MANAGEMENT EDUCATION PROGRAM ON GLYCEMIC CONTROL AND QUALITY OF LIFE

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Abstract

Background: Diabetes is a chronic condition that requires ongoing self-management to maintain optimal glycemic control and prevent complications. Diabetes self-management education (DSME) programs have been shown to improve patient outcomes, but the effectiveness of nurse-led DSME programs in Saudi Arabia has not been well studied. This study aimed to assess the effectiveness of a nurse-led DSME program on glycemic control and quality of life among patients with type 2 diabetes in a tertiary care hospital in Riyadh, Saudi Arabia.

Methods: A quasi-experimental study design was used, with a pre-test and post-test evaluation of a convenience sample of 150 patients with type 2 diabetes. The intervention consisted of a 6-week nurse-led DSME program that included weekly group sessions and individualized counseling. The primary outcomes were glycemic control (measured by HbA1c) and quality of life (measured by the Diabetes Quality of Life questionnaire). Data were collected at baseline and at 3 and 6 months post-intervention.

Results: Of the 150 participants, 120 (80%) completed the study. There was a significant reduction in HbA1c levels from baseline to 3 months (9.2% vs. 7.8%, $p<0.001$) and 6 months post-intervention (9.2% vs. 7.4%, $p<0.001$). There was also a significant improvement in overall quality of life scores from baseline to 3 months (3.2 vs. 4.1, $p<0.001$) and 6 months post-intervention (3.2 vs. 4.4, $p<0.001$). Participants reported high satisfaction with the program, with 95% stating they would recommend it to others.

Conclusion: The nurse-led DSME program was effective in improving glycemic control and quality of life among patients with type 2 diabetes in Saudi Arabia. The program was well-received by participants and has the potential to be scaled up to other healthcare settings in the country. Further research is needed to evaluate the long-term sustainability and cost-effectiveness of the program.

Keywords: Diabetes self-management education, type 2 diabetes, glycemic control, quality of life, nurse-led intervention, Saudi Arabia

Introduction

Diabetes is a global health problem that affects over 463 million people worldwide, with estimates projecting a rise to 700 million by 2045 (1). In Saudi Arabia, the prevalence of diabetes is alarmingly high, with nearly 1 in 5 adults affected (2). Diabetes is a chronic condition that requires ongoing self-management to maintain optimal glycemic control and prevent complications such as cardiovascular disease, neuropathy, and retinopathy (3).

Diabetes self-management education (DSME) is a critical component of diabetes care that empowers patients with the knowledge, skills, and abilities necessary for effective self-management (4). DSME programs have been shown to improve glycemic control, reduce

complications, and enhance quality of life among patients with diabetes (5,6). However, despite the proven benefits of DSME, many patients in Saudi Arabia do not receive adequate education and support to manage their condition effectively (7).

Nurses play a crucial role in providing DSME and supporting patients with diabetes in their self-management efforts (8). Nurse-led DSME programs have been implemented in various settings and have demonstrated positive outcomes (9,10). However, the effectiveness of nurse-led DSME programs in Saudi Arabia has not been well studied, and there is a need for culturally-sensitive and context-specific interventions that address the unique needs of the Saudi population (11).

This study aimed to assess the effectiveness of a nurse-led DSME program on glycemic control and quality of life among patients with type 2 diabetes in a tertiary care hospital in Riyadh, Saudi Arabia. The specific objectives were to:

1. Evaluate the effect of the program on glycemic control (measured by HbA1c) at 3 and 6 months post-intervention
2. Assess the impact of the program on quality of life (measured by the Diabetes Quality of Life questionnaire) at 3 and 6 months post-intervention
3. Explore participants' satisfaction with the program and their willingness to recommend it to others

Methods

Study Design and Setting

A quasi-experimental study design was used, with a pre-test and post-test evaluation of a convenience sample of patients with type 2 diabetes. The study was conducted at the diabetes clinic of a tertiary care hospital in Riyadh, Saudi Arabia, from January to December 2022. The hospital is a large, government-funded facility that serves a diverse population of patients from Riyadh and surrounding areas.

Participants and Sampling

The target population was adult patients (aged 18 years and above) with type 2 diabetes who were attending the diabetes clinic at the hospital. Inclusion criteria were: (1) confirmed diagnosis of type 2 diabetes for at least one year; (2) HbA1c level of 7.5% or higher; (3) ability to communicate in Arabic or English; and (4) willingness to participate in the study. Exclusion criteria were: (1) type 1 diabetes; (2) gestational diabetes; (3) severe comorbidities such as end-stage renal disease or cancer; and (4) cognitive impairment or mental illness that would interfere with participation in the program.

A convenience sampling method was used to recruit participants. Patients who met the inclusion criteria were approached during their clinic visits and invited to participate in the study. A sample size of 150 participants was targeted based on a power analysis using a medium effect size, an alpha level of 0.05, and a power of 0.80.

Intervention

The intervention consisted of a 6-week nurse-led DSME program that was developed based on the American Association of Diabetes Educators' (AADE) Seven Self-Care Behaviors framework (12). The program included weekly group sessions and individualized counseling, with a focus on improving knowledge, skills, and self-efficacy related to diabetes self-management.

The group sessions were conducted by a team of trained diabetes nurse educators and covered the following topics: (1) healthy eating; (2) being active; (3) monitoring blood glucose; (4) taking medication; (5) problem-solving; (6) reducing risks; and (7) healthy coping. Each session lasted approximately 2 hours and included a combination of didactic teaching, interactive discussions, and hands-on activities. Participants were provided with educational materials, including handouts and a workbook, to reinforce their learning and encourage self-management practices at home.

In addition to the group sessions, each participant received three individualized counseling sessions with a diabetes nurse educator. The counseling sessions were tailored to the participant's specific needs and goals and focused on addressing barriers to self-management, providing support and motivation, and developing personalized action plans.

Data Collection and Measures

Data were collected at three time points: baseline (before the intervention), 3 months post-intervention, and 6 months post-intervention. The primary outcomes were glycemic control and quality of life.

Glycemic control was measured by HbA1c levels, which reflect the average blood glucose levels over the past 2-3 months. HbA1c was measured using a point-of-care testing device (DCA Vantage Analyzer, Siemens Healthcare, Germany) that provides results in 6 minutes. A target HbA1c level of less than 7% was considered optimal, as recommended by the American Diabetes Association (13).

Quality of life was measured using the Diabetes Quality of Life (DQOL) questionnaire, which is a validated tool that assesses the impact of diabetes on various aspects of life, including satisfaction, impact, and worry (14). The DQOL consists of 46 items rated on a 5-point Likert scale, with higher scores indicating better quality of life. The Arabic version of the DQOL, which has been validated in Saudi Arabia, was used inthis study (15).

Participants' satisfaction with the program was assessed using a self-administered questionnaire that was developed by the researchers. The questionnaire consisted of 10 items rated on a 5-point Likert scale, with higher scores indicating greater satisfaction. The questionnaire also included an open-ended question that asked participants to provide any additional comments or feedback about the program.

Demographic and clinical data, including age, gender, duration of diabetes, and comorbidities, were collected from participants' medical records.

Data Analysis

Data were analyzed using SPSS version 25.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics, including means, standard deviations, and frequencies, were used to summarize the demographic and clinical characteristics of the participants.

Paired t-tests were used to compare the mean HbA1c levels and DQOL scores between baseline and 3 months, and between baseline and 6 months post-intervention. A p-value of less than 0.05 was considered statistically significant.

Participants' satisfaction with the program was analyzed using descriptive statistics, including means and standard deviations for each item on the satisfaction questionnaire. The open-ended responses were analyzed using thematic analysis to identify common themes and patterns.

Ethical Considerations

The study was approved by the Institutional Review Board of the hospital and the Ministry of Health in Saudi Arabia. All participants provided written informed consent prior to enrollment in the study. Participants were assured of the confidentiality of their data and their right to withdraw from the study at any time without consequences.

Results

Participant Characteristics

A total of 150 participants were enrolled in the study, of whom 120 (80%) completed the 6-month follow-up. The mean age of the participants was 52.3 years (SD = 10.5), and 58% were female. The mean duration of diabetes was 8.2 years (SD = 5.6), and the most common comorbidities were hypertension (45%), dyslipidemia (38%), and obesity (35%). Table 1 presents the baseline demographic and clinical characteristics of the participants.

Table 1. Baseline Demographic and Clinical Characteristics of Participants (N = 150)

Characteristic	**Mean (SD) or n (%)**
Age (years)	52.3 (10.5)
Gender	
- Male	63 (42%)

Characteristic	Mean (SD) or n (%)
- Female	87 (58%)
Duration of diabetes (years)	8.2 (5.6)
HbA1c (%)	9.2 (1.8)
Comorbidities	
- Hypertension	68 (45%)
- Dyslipidemia	57 (38%)
- Obesity	53 (35%)
- Coronary artery disease	20 (13%)
- Retinopathy	17 (11%)
- Neuropathy	15 (10%)

Glycemic Control

There was a significant reduction in HbA1c levels from baseline to 3 months post-intervention (9.2% vs. 7.8%, $p<0.001$) and from baseline to 6 months post-intervention (9.2% vs. 7.4%, $p<0.001$). The proportion of participants who achieved the target HbA1c level of less than 7% increased from 0% at baseline to 25% at 3 months and 35% at 6 months post-intervention. Table 2 presents the changes in HbA1c levels over time.

Table 2. Changes in HbA1c Levels Over Time

Time Point	HbA1c (%)	p-value
Baseline	9.2 (1.8)	-

Time Point	HbA1c (%)	p-value
3 months post-intervention	7.8 (1.2)	<0.001
6 months post-intervention	7.4 (1.0)	<0.001

Quality of Life

There was a significant improvement in overall DQOL scores from baseline to 3 months post-intervention (3.2 vs. 4.1, $p<0.001$) and from baseline to 6 months post-intervention (3.2 vs. 4.4, $p<0.001$). Participants reported significant improvements in all three domains of the DQOL: satisfaction, impact, and worry. Table 3 presents the changes in DQOL scores over time.

Table 3. Changes in DQOL Scores Over Time

Domain	Baseline	3 months	6 months	p-value
Satisfaction	3.0 (0.8)	4.2 (0.6)	4.5 (0.5)	<0.001
Impact	3.3 (0.9)	4.0 (0.7)	4.3 (0.6)	<0.001
Worry	3.4 (1.0)	4.1 (0.8)	4.4 (0.7)	<0.001
Overall	3.2 (0.8)	4.1 (0.6)	4.4 (0.5)	<0.001

Participant Satisfaction

Participants reported high satisfaction with the program, with a mean overall satisfaction score of 4.5 out of 5 (SD = 0.6). The highest-rated items were "The program was well-organized" (4.7, SD = 0.5) and "The nurse educators were knowledgeable and supportive" (4.6, SD = 0.6). The lowest-rated item was "The program duration was sufficient" (4.2, SD = 0.8).

In the open-ended responses, participants expressed appreciation for the program and the support they received from the nurse educators. One participant wrote, "This program has changed my life. I feel more confident and in control of my diabetes now." Another participant commented, "I wish I had this kind of education and support when I was first diagnosed with diabetes. It would have made a big difference."

Discussion

This study demonstrates the effectiveness of a nurse-led DSME program in improving glycemic control and quality of life among patients with type 2 diabetes in Saudi Arabia. The program, which was based on the AADE's Seven Self-Care Behaviors framework, resulted in significant reductions in HbA1c levels and improvements in DQOL scores at 3 and 6 months post-intervention.

The findings of this study are consistent with previous research that has shown the benefits of DSME programs for patients with diabetes. A systematic review and meta-analysis by Chrvala et al. (16) found that DSME programs led to significant reductions in HbA1c levels, particularly in the short term (less than 6 months). Similarly, a meta-analysis by Steinsbekk et al. (17) found that group-based DSME programs had positive effects on clinical, lifestyle, and psychosocial outcomes in patients with type 2 diabetes.

The nurse-led approach used in this study has several advantages over traditional physician-led models of diabetes care. Nurses are well-positioned to provide patient education and support, as they have more frequent and prolonged contact with patients compared to physicians (18). Nurses also have the skills and expertise to deliver individualized and culturally-sensitive care, which is essential for effective diabetes self-management (19).

The high satisfaction rates reported by participants in this study suggest that the program was well-received and met their needs and expectations. The positive feedback from participants highlights the importance of patient-centered care and the value of engaging patients as active partners in their own health management.

Despite the promising results, this study has some limitations that should be acknowledged. First, the quasi-experimental design and lack of a control group limit the ability to establish causality between the intervention and the outcomes. Second, the convenience sampling method and single-site setting may limit the generalizability of the findings to other populations and settings. Third, the study relied on self-reported measures of quality of life, which may be subject to recall and social desirability bias.

Conclusion

In conclusion, this study provides evidence for the effectiveness of a nurse-led DSME program in improving glycemic control and quality of life among patients with type 2 diabetes in Saudi Arabia. The program, which was based on the AADE's Seven Self-Care Behaviors framework and delivered through group sessions and individualized counseling, resulted insignificant reductions in HbA1c levels and improvements in DQOL scores at 3 and 6 months post-intervention. Participants reported high satisfaction with the program, highlighting the value of patient-centered care and the important role of nurses in diabetes self-management education.

The findings of this study have several implications for practice and policy. First, they support the integration of nurse-led DSME programs into routine diabetes care in Saudi Arabia and other

similar settings. Second, they highlight the need for ongoing training and support for nurses to deliver effective DSME interventions. Third, they suggest that group-based and individualized approaches to DSME may be more effective than traditional didactic methods.

Further research is needed to confirm the long-term sustainability and cost-effectiveness of nurse-led DSME programs in Saudi Arabia and to explore the potential for scaling up these interventions to other healthcare settings and populations. Additionally, future studies should consider using randomized controlled designs and objective measures of clinical outcomes to strengthen the evidence base for DSME interventions.

In summary, this study demonstrates that a nurse-led DSME program can effectively improve glycemic control and quality of life among patients with type 2 diabetes in Saudi Arabia. The program was well-received by participants and has the potential to be integrated into routine diabetes care in the country. By empowering patients with the knowledge, skills, and support they need to manage their diabetes effectively, nurse-led DSME programs can play a critical role in reducing the burden of diabetes and improving health outcomes for individuals and communities.

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