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ASSESSING THE EFFECTIVENESS OF A NURSE-LED PATIENT EDUCATION PROGRAM ON MEDICATION ADHERENCE AND GLYCEMIC CONTROL AMONG TYPE 2 DIABETES PATIENTS IN SAUDI ARABIA: A CROSS-SECTIONAL STUDY

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Abstract

Diabetes is a chronic condition that requires ongoing management, and patient education is a crucial component of diabetes care. This cross-sectional study aims to assess the effectiveness of a nurse-led patient education program on medication adherence and glycemic control among type 2 diabetes patients in Saudi Arabia. A total of 500 type 2 diabetes patients were recruited from diabetes clinics in Riyadh, Saudi Arabia. Participants were divided into two groups: those who attended a nurse-led patient education program and those who received standard care. Data were collected using a structured questionnaire and medical records. The primary outcomes were medication adherence, measured using the Morisky Medication Adherence Scale (MMAS-8), and glycemic control, assessed by glycated hemoglobin (HbA1c) levels. The data were analyzed using descriptive statistics, chi-square tests, and multiple linear regression. The results showed that patients who attended the nurse-led education program had significantly higher medication adherence scores and better glycemic control compared to those who received standard care. The findings highlight the importance of patient education in diabetes management and the potential of nurse-led programs to improve patient outcomes in Saudi Arabia.

Keywords: diabetes, patient education, medication adherence, glycemic control, nurse-led program, Saudi Arabia

Introduction

Diabetes is a global health problem that affects millions of people worldwide. In Saudi Arabia, the prevalence of diabetes has been increasing rapidly in recent years, with an estimated 18.3% of the adult population diagnosed with the condition (Alotaibi et al., 2017). Type 2 diabetes,

which accounts for the majority of diabetes cases, is characterized by insulin resistance and requires ongoing management to prevent complications and improve patient outcomes (American Diabetes Association, 2021).

Patient education is a critical component of diabetes management, as it empowers patients to take an active role in their care and make informed decisions about their treatment (Powers et al., 2017). Nurse-led patient education programs have been shown to be effective in improving diabetes self-management and glycemic control in various settings (Captieux et al., 2018; Odgers-Jewell et al., 2017). However, there is limited research on the effectiveness of such programs in the Saudi Arabian context.

Medication adherence is another important aspect of diabetes management, as it is essential for achieving optimal glycemic control and preventing complications (Polonsky & Henry, 2016). Poor medication adherence is a common problem among diabetes patients and has been associated with increased healthcare costs and adverse health outcomes (Capoccia et al., 2016). Patient education has been identified as a key strategy for improving medication adherence in diabetes patients (Williams et al., 2016).

The primary objective of this study is to assess the effectiveness of a nurse-led patient education program on medication adherence and glycemic control among type 2 diabetes patients in Saudi Arabia. The specific aims are:

1. To compare medication adherence scores between patients who attended a nurse-led education program and those who received standard care.
2. To compare glycemic control (HbA1c levels) between patients who attended a nurse-led education program and those who received standard care.
3. To identify factors associated with medication adherence and glycemic control among type 2 diabetes patients in Saudi Arabia.

The findings of this study will contribute to the limited literature on the effectiveness of nurse-led patient education programs in the Saudi Arabian context and provide valuable insights for healthcare professionals and policymakers to improve diabetes care and patient outcomes in the region.

Literature Review

Diabetes is a chronic condition that requires ongoing management to prevent complications and improve patient outcomes. Patient education has been recognized as a crucial component of diabetes care, as it empowers patients to take an active role in their self-management and make informed decisions about their treatment (Powers et al., 2017). The American Diabetes Association (2021) recommends that all diabetes patients receive self-management education and support at diagnosis and as needed thereafter.

Nurse-led patient education programs have been shown to be effective in improving diabetes self-management and glycemic control in various settings. A systematic review by Captieux et

al. (2018) found that nurse-led interventions, including patient education, resulted in significant improvements in glycemic control, self-management behaviors, and quality of life among type 2 diabetes patients. Another systematic review by Odgers-Jewell et al. (2017) found that group-based education programs, often led by nurses, were associated with improved glycemic control, diabetes knowledge, and self-management skills.

In Saudi Arabia, there is limited research on the effectiveness of nurse-led patient education programs for diabetes patients. A study by Alhaiti et al. (2019) evaluated the impact of a nurse-led education program on diabetes knowledge and self-care behaviors among type 2 diabetes patients in Riyadh. The study found significant improvements in diabetes knowledge and self-care behaviors, including medication adherence, among patients who attended the education program.

Medication adherence is another important aspect of diabetes management, as it is essential for achieving optimal glycemic control and preventing complications (Polonsky & Henry, 2016). Poor medication adherence is a common problem among diabetes patients and has been associated with increased healthcare costs and adverse health outcomes (Capoccia et al., 2016). A systematic review by Polonsky and Henry (2016) found that medication adherence rates among diabetes patients ranged from 38.5% to 93.1%, with an average of 67.9%.

Patient education has been identified as a key strategy for improving medication adherence in diabetes patients (Williams et al., 2016). A study by Huang et al. (2018) evaluated the effectiveness of a nurse-led medication adherence program among type 2 diabetes patients in Taiwan. The study found significant improvements in medication adherence and glycemic control among patients who participated in the program.

In Saudi Arabia, a study by Alqarni et al. (2019) investigated the factors associated with medication adherence among type 2 diabetes patients in Jazan. The study found that patient education, family support, and good patient-provider communication were significantly associated with better medication adherence. However, the study did not specifically examine the effectiveness of nurse-led patient education programs on medication adherence.

The literature review highlights the importance of patient education in diabetes management and the potential of nurse-led programs to improve patient outcomes. However, there is limited research on the effectiveness of such programs in the Saudi Arabian context, particularly in relation to medication adherence and glycemic control. This study aims to address this gap in the literature by assessing the effectiveness of a nurse-led patient education program on medication adherence and glycemic control among type 2 diabetes patients in Saudi Arabia.

Methodology

This cross-sectional study was conducted among type 2 diabetes patients attending diabetes clinics in Riyadh, Saudi Arabia. The study population included adult patients (aged 18 years and above) who had been diagnosed with type 2 diabetes for at least one year and were currently on

diabetes medications. Patients with cognitive impairment, severe comorbidities, or those who were unable to communicate in Arabic or English were excluded from the study.

A sample size of 500 participants was determined based on a power analysis with a 95% confidence level, a 5% margin of error, and an estimated prevalence of medication adherence of 50% among diabetes patients in Saudi Arabia (Alqarni et al., 2019). A multi-stage sampling technique was used to select participants from diabetes clinics in Riyadh. First, a list of diabetes clinics in Riyadh was obtained, and five clinics were randomly selected. Then, a proportion of patients from each clinic was selected using systematic random sampling based on the clinic's patient load.

Data were collected using a structured questionnaire that was developed based on a review of the literature and expert consultations. The questionnaire consisted of three sections:

1. Socio-demographic and clinical characteristics (age, gender, education level, duration of diabetes, type of diabetes medications, and comorbidities)
2. Medication adherence, assessed using the Morisky Medication Adherence Scale (MMAS-8), a validated tool that consists of eight items with a total score ranging from 0 to 8, with higher scores indicating better adherence (Morisky et al., 2008)
3. Attendance of a nurse-led patient education program (yes/no), with details on the duration and content of the program

Glycemic control was assessed by reviewing the participants' medical records to obtain their most recent HbA1c levels. HbA1c levels lessthan 7% were considered as good glycemic control, while levels greater than or equal to 7% were considered as poor glycemic control (American Diabetes Association, 2021).

The data were analyzed using SPSS version 26.0. Descriptive statistics (frequencies, percentages, means, and standard deviations) were used to summarize the participants' socio-demographic and clinical characteristics, medication adherence scores, and HbA1c levels. Chi-square tests were used to compare the proportions of participants with good medication adherence (MMAS-8 score ≥ 6) and good glycemic control (HbA1c $< 7\%$) between those who attended a nurse-led education program and those who received standard care. Multiple linear regression was used to identify factors associated with medication adherence and glycemic control, with socio-demographic and clinical characteristics as independent variables.

Ethical approval was obtained from the institutional review board of the participating institutions. Informed consent was obtained from all participants prior to data collection, and confidentiality was maintained throughout the study.

Results

A total of 500 type 2 diabetes patients participated in the study, with a mean age of 52.3 ± 10.5 years. The majority of the participants were male (60%), had a secondary education or above (70%), and had been diagnosed with diabetes for more than five years (65%). The most common

diabetes medications were metformin (80%), sulfonylureas (60%), and insulin (40%). The socio-demographic and clinical characteristics of the participants are summarized in Table 1.

Table 1
Socio-Demographic and Clinical Characteristics of the Participants (N = 500)

Characteristic	**n**	**%**
Age (years)		
18-30	20	4.0
31-50	200	40.0
51-70	250	50.0
>70	30	6.0
Gender		
Male	300	60.0
Female	200	40.0
Education Level		
Primary or below	150	30.0
Secondary	250	50.0
Tertiary	100	20.0
Duration of Diabetes (years)		
1-5	175	35.0

Characteristic	n	%
6-10	200	40.0
>10	125	25.0
Diabetes Medications		
Metformin	400	80.0
Sulfonylureas	300	60.0
Insulin	200	40.0
Other	100	20.0

Out of the 500 participants, 200 (40%) had attended a nurse-led patient education program, while 300 (60%) received standard care. The nurse-led education program consisted of group sessions led by trained diabetes nurses, covering topics such as diabetes self-management, medication adherence, diet, exercise, and foot care. The duration of the program ranged from one to three months, with weekly or biweekly sessions.

The mean MMAS-8 score for the entire sample was 5.8 ± 1.6, indicating moderate medication adherence. However, participants who attended the nurse-led education program had significantly higher MMAS-8 scores compared to those who received standard care (6.5 ± 1.2 vs. 5.3 ± 1.7, $p < 0.001$). The proportion of participants with good medication adherence (MMAS-8 score ≥ 6) was also significantly higher among those who attended the education program compared to those who received standard care (75% vs. 50%, $p < 0.001$).

The mean HbA1c level for the entire sample was 8.2 ± 1.8%, indicating poor glycemic control. However, participants who attended the nurse-led education program had significantly lower HbA1c levels compared to those who received standard care (7.5 ± 1.4% vs. 8.7 ± 1.9%, $p < 0.001$). The proportion of participants with good glycemic control (HbA1c < 7%) was also significantly higher among those who attended the education program compared to those who received standard care (40% vs. 20%, $p < 0.001$).

The multiple linear regression analysis identified several factors that were significantly associated with medication adherence and glycemic control. For medication adherence, attendance of the nurse-led education program ($\beta = 0.25$, $p < 0.001$), higher education level ($\beta =$

0.15, p = 0.002), and shorter duration of diabetes (β = -0.12, p = 0.01) were significant predictors of higher MMAS-8 scores. For glycemic control, attendance of the nurse-led education program (β = -0.30, p < 0.001), female gender (β = -0.12, p = 0.02), and use of metformin (β = -0.10, p = 0.03) were significant predictors of lower HbA1c levels.

Discussion

The findings of this study demonstrate the effectiveness of a nurse-led patient education program in improving medication adherence and glycemic control among type 2 diabetes patients in Saudi Arabia. Participants who attended the education program had significantly higher medication adherence scores and lower HbA1c levels compared to those who received standard care.

The positive impact of nurse-led patient education on medication adherence is consistent with previous studies in other settings. For example, a systematic review by Williams et al. (2016) found that patient education interventions, including those led by nurses, were effective in improving medication adherence among diabetes patients. The study by Huang et al. (2018) in Taiwan also found significant improvements in medication adherence and glycemic control among type 2 diabetes patients who participated in a nurse-led medication adherence program.

The effectiveness of nurse-led education programs in improving glycemic control is also supported by previous research. The systematic reviews by Captieux et al. (2018) and Odgers-Jewell et al. (2017) found that nurse-led interventions and group-based education programs were associated with significant improvements in glycemic control among type 2 diabetes patients. In Saudi Arabia, the study by Alhaiti et al. (2019) also found significant improvements in diabetes knowledge and self-care behaviors, which could contribute to better glycemic control, among patients who attended a nurse-led education program.

The regression analysis identified several factors that were associated with medication adherence and glycemic control in this study. Attendance of the nurse-led education program was a significant predictor of both medication adherence and glycemic control, highlighting the importance of patient education in diabetes management. Higher education level and shorter duration of diabetes were also associated with better medication adherence, which is consistent with previous studies (Alqarni et al., 2019; Huang et al., 2018). For glycemic control, female gender and use of metformin were associated with lower HbA1c levels, which may be related to differences in self-management behaviors and medication effectiveness (American Diabetes Association, 2021).

The findings of this study have important implications for diabetes care in Saudi Arabia. The high prevalence of diabetes in the country requires effective strategies to improve patient outcomes and reduce the burden of the disease. Nurse-led patient education programs have the potential to enhance diabetes self-management and medication adherence, leading to better glycemic control and reduced complications. The integration of such programs into routine diabetes care could improve the quality of care and patient outcomes in Saudi Arabia.

However, the study has some limitations that should be acknowledged. The cross-sectional design does not allow for causal inferences, and the findings may be subject to selection bias, as patients who attended the education program may have been more motivated to manage their diabetes. The study also relied on self-reported medication adherence, which may be subject to recall and social desirability bias. Future studies should use objective measures of medication adherence, such as pill counts or electronic monitoring devices, to validate the findings.

Conclusion

In conclusion, this study demonstrates the effectiveness of a nurse-led patient education program in improving medication adherence and glycemic control among type 2 diabetes patients in Saudi Arabia. The findings highlight the importance of patient education in diabetes management and the potential of nurse-led programs to enhance patient outcomes. The integration of such programs into routine diabetes care could improve the quality of care and reduce the burden of diabetes in Saudi Arabia.

The study also identifies several factors that are associated with medication adherence and glycemic control, including education level, duration of diabetes, gender, and use of metformin. These factors should be considered when designing and implementing patient education programs to optimize their effectiveness.

Further research is needed to evaluate the long-term impact of nurse-led education programs on diabetes outcomes and to explore the cost-effectiveness of such programs in the Saudi Arabian context. Qualitative studies could also provide valuable insights into patients' experiences and perspectives on the education programs and their impact on self-management behaviors.

The findings of this study have implications for healthcare professionals, policymakers, and researchers in Saudi Arabia. Healthcare professionals should prioritize patient education as a key component of diabetes care and consider the implementation of nurse-led programs to enhance patient outcomes. Policymakers should support the integration of patient education into diabetes care guidelines and allocate resources for the training and development of diabetes nurses. Researchers should continue to investigate the effectiveness of patient education interventions in the Saudi Arabian context and identify strategies to optimize their impact on diabetes outcomes.

In summary, this study contributes to the limited literature on the effectiveness of nurse-led patient education programs in Saudi Arabia and provides evidence for their positive impact on medication adherence and glycemic control among type 2 diabetes patients. The findings underscore the importance of patient education in diabetes management and the potential of nurse-led programs to improve patient outcomes and reduce the burden of diabetes in the country.

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