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The Effect of Health Education on Family Knowledge Regarding Blood Glucose Control Among Patients with Diabetes

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ABSTRACT

Background: There are still many people with Diabetes Mellitus who experience failure in managing the disease due to limited knowledge related to controlling blood glucose levels, so they are at risk of relapse and complications. Family knowledge plays an important role in supporting the success of diabetes control in patients. Health education for the patient's family is very important to create a supportive environment and improve the quality of life of patients. **Objective:** This study aims to determine the effect of health education on family knowledge about controlling blood sugar levels in Diabetes Mellitus patients. **Methods:** The design or plan of this study is quantitative descriptive with an experiment using a pre-experimental method of one group pre-post test design with a pre-test and post-test questionnaire measuring instrument. **Results:** The results of the study showed that most of the respondents (55%) had sufficient knowledge before the intervention (pre-test) and all respondents (100%) had good knowledge after the intervention (post-test) with a p value of 0.001 (<0.05) then H1 is accepted meaning that there is an effect of health education on family knowledge. **Conclusion:** Looking at the results of the study, the researcher concluded that health education has an effect on family knowledge about controlling blood sugar levels in Diabetes Mellitus patients. It is hoped that further researchers can develop research by completing the characteristics of respondents that have not been studied, linking the characteristics of respondents with family knowledge about controlling blood sugar levels in Diabetes Mellitus patients so that the research results are more accurate and in-depth.

Keywords: health education; family knowledge; diabetes mellitus

Background

Diabetes mellitus is a chronic condition characterized by blood glucose levels above the normal range due to insufficient insulin secretion, impaired insulin action, or both (1). Diabetes is classified into several types, namely Type 1 Diabetes Mellitus, Type 2 Diabetes Mellitus, Gestational Diabetes Mellitus (GDM), and other specific types of diabetes (2). Diabetes mellitus has become a major public health issue, with both the number of cases and its prevalence increasing substantially over the past several decades (3) Although diabetes mellitus cannot be cured, its complications can be prevented through effective blood glucose control. Blood glucose level is a crucial indicator in the diagnosis and management of diabetes mellitus. However, many patients fail to achieve optimal diabetes management due to inadequate knowledge regarding blood glucose control, resulting in recurrent episodes of hyperglycemia and difficulties in maintaining stable blood glucose levels (4).

The management of diabetes mellitus does not solely depend on the patient but also requires active family involvement, which plays a crucial role in achieving successful blood glucose control (5). Family members, as the closest support system, can provide informational, emotional, appraisal, and instrumental support to assist patients in managing and controlling diabetes mellitus (6). Factors influencing knowledge include comprehension, perception of reality, interest, curiosity, reasoning, common sense, and human motivation (7). Health education is a systematically designed program aimed at modifying the behavior of individuals, families, and communities. It seeks to improve knowledge, attitudes, and practices to support treatment, rehabilitation, disease prevention, and health promotion (8). Previous studies have shown that many families of patients with diabetes mellitus in Indonesia possess inadequate knowledge

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regarding blood glucose control. Family knowledge regarding appropriate blood glucose management was categorized as moderate (40.9%) and poor (50.9%) (1).

Numerous epidemiological studies have demonstrated an increasing prevalence of diabetes mellitus worldwide. Approximately 422 million people worldwide are living with diabetes mellitus. WHO also reported that diabetes is directly responsible for approximately 1.6 million deaths annually, with 47% of all diabetes-related deaths occurring before the age of 70 years. Furthermore, approximately 530,000 deaths from kidney disease are attributable to diabetes, while elevated blood glucose contributes to approximately 11% of cardiovascular disease-related deaths. The global number of people living with diabetes increased from 422 million in 2016 to 830 million in 2022, with the prevalence rising more rapidly in low- and middle-income countries than in high-income countries (2).

According to the International Diabetes Federation (IDF), the global number of people living with diabetes reached 537 million in 2021 and is projected to increase to 643 million by 2030 and 783 million by 2045. Indonesia ranks fifth among countries with the highest number of people living with diabetes, with approximately 19.5 million cases reported in 2021, and this figure is projected to increase to 28.6 million by 2045. The Indonesian Ministry of Health reported that the number of individuals with diabetes mellitus reached 19.47 million in 2021 (9). Meanwhile, the East Java Provincial Health Office reported 929,535 diabetes mellitus cases in East Java Province in 2021, of which an estimated 867,257 patients (93.3%) had been diagnosed and had received health services (East Java Provincial Health Office, 2022). According to the Trenggalek Health Profile, the prevalence of diabetes mellitus increased from 2,105 cases per 100,000 population in 2018 to 3,684 cases per 100,000 population in 2019. Hospital records from the Raflesia Ward of Dr. Soedomo Regional General Hospital, Trenggalek, showed 62 hospitalized diabetes mellitus cases between January and March 2023, increasing to 92 cases between January and February 2024 (10).

The increasing prevalence of diabetes mellitus is influenced by several factors, including genetic predisposition, environmental conditions, lifestyle, and delayed diabetes management due to undiagnosed cases, poor adherence to treatment among diagnosed patients, limited family involvement in patient care, and inadequate knowledge regarding diabetes management (11). Failure to achieve adequate blood glucose control is frequently associated with insufficient knowledge, lack of motivation, and limited financial resources for treatment, resulting in recurrent hyperglycemia and difficulties in maintaining glycemic control (4). Family knowledge about diabetes serves as an essential resource in supporting patients to manage their condition effectively. Patients with limited knowledge about diabetes mellitus are at greater risk of developing serious complications, including stroke, kidney failure, and diabetic ulcers (11).

The management of diabetes mellitus involves both pharmacological and non-pharmacological approaches. Pharmacological therapy includes oral antidiabetic medications and insulin therapy, whereas non-pharmacological management consists of medical nutrition therapy, physical activity, and weight reduction (9). Effective diabetes management for blood glucose control encompasses five major components: education, medical nutrition therapy, physical exercise, pharmacological treatment, and regular blood glucose monitoring (12). Successful diabetes management requires active participation from both patients and their families. Therefore, providing health education to family members is essential for creating a supportive environment and improving patients' quality of life (13). Families with adequate knowledge about diabetes are more likely to assist patients in maintaining blood glucose levels within the normal range. This indicates a positive relationship between family knowledge and blood glucose control among patients with diabetes mellitus. Family understanding of blood glucose management influences their ability to provide appropriate support, including assisting patients in meal planning, adherence to diabetic dietary recommendations, encouraging regular physical activity, and ensuring compliance with prescribed medications (14).

Although previous studies have demonstrated the importance of family knowledge in supporting blood glucose control among patients with diabetes mellitus, several research gaps remain. Previous studies have predominantly focused on describing the level of family knowledge or examining the relationship between family support, family knowledge, and diabetes management outcomes. For example, However, limited studies have specifically examined the effect of structured health education on improving family knowledge regarding blood glucose control among families of hospitalized patients with diabetes mellitus. In addition, studies conducted in the inpatient setting, particularly among families

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of patients hospitalized in the Raflesia Ward of Dr. Soedomo Regional General Hospital, Trenggalek, remain limited. Therefore, there is a gap between the recognized importance of family knowledge and the availability of evidence regarding the effectiveness of a structured health education intervention specifically designed to improve such knowledge.

The novelty of this study lies in its focus on health education as an intervention to improve family knowledge regarding blood glucose control among patients with diabetes mellitus in an inpatient setting. Rather than merely describing family knowledge or assessing its relationship with diabetes management, this study will evaluate changes in family knowledge before and after the provision of health education. The intervention is directed specifically at family members because they constitute an important support system for patients in maintaining diabetes management, including dietary regulation, medication adherence, physical activity, and blood glucose monitoring. Furthermore, the study is conducted specifically among families of patients in the Raflesia Ward of Dr. Soedomo Regional General Hospital, Trenggalek, providing contextual evidence that may be useful for developing family-centered health education in hospital services. Thus, the study is expected to provide additional empirical evidence regarding the role of structured health education in strengthening family knowledge as an important component of diabetes management.

Methods

The study was conducted from February 20 to April 8, 2025. This study employed a quantitative descriptive research design. A pre-experimental approach using a one-group pretest–posttest design was applied. The study population consisted of all family members of patients with Diabetes Mellitus admitted to the Raflesia Ward of Dr. Soedomo Regional General Hospital, Trenggalek. The population comprised 92 family members based on the 2024 hospital records. A total of 20 participants were selected using a purposive sampling technique. The sample size in this study was determined using the Slovin formula with a tolerable error margin of 20% (e = 0.2). With a population of 92 people, the calculation was: $n = N / (1 + N(e^2))$. $n = 92 / (1 + 92(0.2^2)) = 19.66 \approx 20$ participants Thus, the sample size in this study was 20 respondents.

The independent variable was health education on blood glucose control, while the dependent variable was family knowledge regarding blood glucose control among patients with Diabetes Mellitus. Data collection in this study was conducted using a questionnaire measuring family knowledge regarding blood glucose control among patients with Diabetes Mellitus. A pre-test was administered before the health education intervention, followed by a post-test after the intervention. The questionnaire was adapted from a previous study by (15). The original questionnaire was in Indonesian and consisted of 24 modified questions that had been tested for validity. The questions used in the pre-test were the same as those used in the post-test. Respondents completed the questionnaire based on their own understanding, and the completed questionnaires were returned on the same day. The data were processed through editing, coding, scoring, and tabulation using frequency distribution analysis and were subsequently analyzed using the Wilcoxon signed-rank test.

Results

Tabel 1 Frequency Distribution of Respondent Characteristics

Respondent Characteristics	Frequency (f)	Percentage (%)
Age (years)		
17-20	2	10
21-30	4	20
31-40	4	20
41-50	6	30
51-60	4	20
Sex		
Male	13	65
Female	7	35
Highest Education Level		
Did not complete elementary school	1	5

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Respondent Characteristics	Frequency (f)	Percentage (%)
Elementary school	5	25
Junior high school	6	30
Senior high school	7	35
Higher education	1	5
Occupation		
Trader	1	5
Entrepreneur	6	30
Housewife	4	20
Farmer	5	25
Unemployed	1	5
Other	3	15
Relationship with the Patient		
Husband	3	15
Wife	0	0
Child	13	65
Other	4	20
History of Diabetes Mellitus (DM)		
Yes	9	45
No	11	55
Duration Since DM Diagnosis		
<1 year	6	30
>5 year	9	45
>10 year	5	25

Based on Table 1, which presents the frequency distribution of respondents' characteristics, it can be seen that 30% of the respondents were aged 41–50 years. The majority of the respondents (65%) were male. Approximately 35% had completed senior high school as their highest level of education, while 30% were self-employed. Most respondents (65%) were the patients' children. More than half of the respondents (55%) reported that the patients had no family history of Diabetes Mellitus, and nearly half (45%) stated that the patients had been diagnosed with Diabetes Mellitus for more than five years.

Table 2. Frequency distribution of family knowledge regarding blood glucose control among patients with Diabetes Mellitus before (pre-test) and after (post test) the health education intervention

Knowledge Level	Pre test		Post test	
	Frekuensi (f)	Persentase (%)	Frekuensi (f)	Persentase (%)
Good	4	20	20	100
Moderate	11	55	0	0
Poor	5	25	0	0
Total	**20**	**100%**	**20**	**100%**
Wilcoxon signed-rank test p= 0.001 (p < 0.05)				

Based on Table 2, the frequency distribution showed that the majority of respondents (55%) had a moderate level of knowledge regarding blood glucose control among patients with Diabetes Mellitus before receiving the health education intervention (pre-test). The results showed that all respondents (100%) achieved a good level of knowledge regarding blood glucose control among patients with Diabetes Mellitus after receiving the health education intervention (post-test). The Wilcoxon signed-rank test showed an improvement in knowledge, while no respondents experienced either no change or a decline in knowledge following the health education intervention. The statistical analysis p-value of 0.001, indicating a statistically significant difference between pre-test and post-test knowledge scores ($p < 0.05$). These findings demonstrate that health education had a significant effect on improving family knowledge regarding blood glucose control among patients with Diabetes Mellitus.

Discussion

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The results obtained from 20 respondents showed that most respondents had a moderate level of knowledge before the intervention (pre-test). Following the intervention (post-test), all respondents demonstrated a good level of knowledge. Based on the Wilcoxon signed-rank test, the analysis yielded a p-value of 0.001 at a significance level of $\alpha = 0.05$. These findings indicate that health education significantly improved the knowledge of family members regarding blood glucose control among patients with Diabetes Mellitus. These findings are consistent with the study which investigated the effect of video-based health education on the knowledge of patients with Diabetes Mellitus and reported a significant improvement in knowledge ($p = 0.000$) (16).

Diabetes Mellitus management is based on five key pillars: education, physical activity, pharmacological management, self-monitoring of blood glucose, and meal planning (17). Health education as a process of promoting healthy behavioral change based on individual, group, or community awareness to systematically and continuously maintain and improve health. Health education is considered one of the essential pillars in Diabetes Mellitus management because it enhances individuals' knowledge regarding disease management and self-care (18). Similarly, health education can improve knowledge by enabling individuals to gain new understanding through sensory perception and learning experiences (19). Specifically, education on the use of injectable insulin is a vital component of the five pillars of health education for patients with Diabetes Mellitus, and it is essential for ensuring the accuracy and long-term success of their treatment (20).

The researcher concludes that providing health education to family members of patients with Diabetes Mellitus effectively improved their understanding of blood glucose control. Therefore, health education, particularly as part of discharge planning, is essential to enhance family knowledge and empower family members to assist patients in managing blood glucose levels at home, thereby reducing the risk of complications and disease recurrence. Health education plays a crucial role in transforming individuals from having limited knowledge to becoming well informed. Moreover, the one-on-one lecture method supported by leaflet media was highly effective in facilitating respondents' understanding of blood glucose control, as they were able to review the educational material independently using the leaflets provided.

Conclusions and Recommendations

There is an increase in family members' knowledge regarding blood sugar control in individuals with diabetes mellitus (DM). Consequently, health education on blood sugar control based on the five pillars of DM care is of great importance for both patients and their families.

Ethical Consideration and Competing Interest

In terms of research ethics, this study adhered to fundamental ethical principles, including informed consent, confidentiality, and voluntary participation. All participants were informed about the purpose and procedures of the study prior to data collection, and their consent was obtained before conducting interviews. The anonymity of participants was maintained by ensuring that personal identities were not disclosed in the reporting of findings. Furthermore, all data collected were used solely for research purposes, ensuring respect for participants' right and maintaining the integrity of the research process. There is no conflict of interest related to this publication

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