Implementation of Nutrition Education Toward Controlling Blood Glucose Levels of Diabates Mellitus (DM) Patients

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ABSTRACT

Background: Diabetes mellitus (DM) is a metabolic disorder with multiple etiologies characterized by blood sugar levels exceeding normal limits. The prevalence of DM continues to increase globally, nationally, and locally, including in the working area of the Cigembor Community Health Center, Ciamis Regency. The primary issue identified is non-compliance with dietary recommendations due to low nutritional literacy and the absence of effective and sustained education. The intervention implemented is structured nutritional education aimed at fostering healthy eating behaviors to control blood glucose levels and prevent complications.

Objective: This study aims to implement the nursing process with a focus on the structured, continuous, and patient-centered implementation of nutrition education in controlling blood glucose levels in DM patients.

Method: This study used a descriptive method with a case study design through a nursing care approach, starting from assessment, formulating diagnoses, planning, implementing nutrition education to control blood glucose levels in patients with diabetes mellitus, and evaluation.

Results: After three days of education, it was found that patients with diabetes mellitus who complained of dizziness, fatigue, decreased appetite, and high blood glucose levels were diagnosed with unstable blood glucose levels, with a focus on the implementation of nutrition education. Evaluation results showed a decrease in blood glucose levels to 213 mg/dL, improved appetite, and reduced complaints of dizziness.

Conclusion: The implementation of nutrition education has proven effective in controlling blood glucose levels and improving patients' nutritional status.

Keywords: diabetes mellitus, nutrition education, blood glucose instability

Introduction

Diabates Mellitus (DM) merupakan penyakit dengan gangguan metabolik dengan multi etiologi yang ditandai dengan kadar gula darah melebihi batas normal (Sulastri & Harjati, 2022). Normal blood sugar levels are between 70-110 mg/dL (Vioneery & Ns, 2020). This metabolic disorder is often accompanied by carbohydrate, lipid, and protein metabolism disorders as a result of insufficient insulin function (Irawan, 2020). Insulin insufficiency can be caused by a disorder or deficiency in insulin production by the beta cells of the Langerhans islets in the pancreas, or by a lack of responsiveness of the body's cells to insulin (Dewi et al., 2022).

This disease shows a significant upward trend from year to year. Based on data from the International Diabetes Federation (IDF) in 2023, there are more than 537 million people with DM worldwide, and this number is predicted to increase to 643 million in 2030 and 783 million in 2045 (Sudayasa et al., 2024). In Indonesia, Riskesdas data shows a surge in the prevalence of DM from 6.9% (2013) to 10.9% (2018), and this trend continues to rise to this day (Astuti, 2024). West Java Province, as one of the most densely populated regions, recorded 2.2 million cases of diabetes mellitus in 2022, an increase from the previous year (Jaelani et al., 2024). In Ciamis Regency, the 2025 P2PTM report recorded 12,340 diabetes mellitus patients, with the Cigembor Community Health Center recording 1,178 active patients. Ironically, over 60% of patients do not regularly participate in nutrition education, and 47% are unaware of the glycemic index of the foods they consume. This gap indicates a disconnect between theory and practice in diabetes management (Mardiana et al., 2025).

The increase in the prevalence of diabetes mellitus (DM) globally, nationally, and locally indicates the need for more comprehensive and structured treatment (Syokumawena et al., 2024). One important aspect of DM management is nutrition education, which aims to promote healthy eating habits to help control blood glucose levels. However, in practice, nutrition education is still not a top priority in many healthcare facilities (Sudayasa et al., 2024). The education provided is often inconsistent, not tailored to the patient's socio-cultural background, and lacks evaluation of the understanding that has been received. As a result, many patients still do not understand the effects of certain foods, such as high intake of simple sugars or irregular meal times, on blood glucose spikes (Fatarona et al., 2025).

This lack of knowledge then developed into a more complex problem. One-way education without feedback led to low patient understanding, which resulted in non-compliance with the recommended diet (Jnauarti et al., 2024). This noncompliance causes blood glucose levels to remain high, and in the long term triggers serious complications such as neuropathy, retinopathy, diabetic wounds, and even the risk of lower limb amputation or death (Mardiana et al., 2025). In the context of health promotion theory, changing eating behaviors is not something that happens instantly. Rather, it requires a structured, gradual, and repetitive educational process so that the message conveyed is truly understood and implemented by patients (Sumarni et al., 2024).

As a solution to this problem, systematic and continuous nutrition education is needed. This educational approach must be collaborative and tailored to the needs and level of understanding of patients, through methods such as group counseling, individual counseling,

the use of visual modules, and digital media (Budiyasa et al., 2024). In this case, nurses play a central role as educators, motivators, and evaluators who are tasked with identifying educational needs, delivering material effectively, and monitoring changes in patients' eating behaviors and their impact on blood glucose levels (Andriani & Handayani, 2024). Therefore, this case study is expected to provide a deeper understanding of the importance of nutrition education in DM control and serve as a basis for developing more targeted educational nursing interventions.

Previous studies have shown the success of implementing nutrition education in lowering blood glucose levels. Research conducted by (Gortzi et al., 2024), found that a 4-week leaflet-based education program significantly reduced fasting blood glucose levels in patients with type 2 diabetes at the Wonosobo Community Health Center. The study was conducted by (Gebreyesus et al., 2024) also noted that group nutrition education with weekly reminders was able to improve diet compliance and reduce HbA1c levels by 1.3% in three months. Research by (Nanda & Rosyid, 2024) shows that the use of mobile applications for nutrition education is effective in improving patient understanding and reducing the frequency of hyperglycemia. However, there are also studies that show the failure of nutrition education due to inappropriate delivery methods. A study conducted by (Dahliana et al., 2025) found that one-time education without follow-up was ineffective in changing patients' eating patterns. Research by (Zhang et al., 2024) also adds that education using visual media that is not appropriate for the patient's literacy level results in low understanding, and research by (Cusquisibán-Alcantara et al., 2024) found that education without family involvement does not have a significant impact on lowering blood glucose levels. This gap indicates that the success of nutrition education is highly dependent on the approach used, the frequency of meetings, and the communication skills of nurses.

The conditions in the Cigembor area reflect the urgency of implementing systematic and targeted nutrition education. Nutrition education is not merely about conveying information but also about fostering patients' awareness and commitment to following a healthy diet. This implementation requires various strategies, including individual counseling, group education sessions, the use of digital media, and family involvement. Nurses play a crucial role throughout this process, from assessing educational needs, delivering educational materials, to monitoring the sustainability of patients' behaviors (Andriani & Handayani, 2024).

This case study was conducted to evaluate how nutrition education contributes to blood glucose control in patients with DM. With the increasing incidence of DM, low patient understanding of dietary patterns, and suboptimal educational interventions, this study is important to deepen the role of nutrition education as a patient-empowered nursing intervention. The title of this study, "The Implementation of Nutrition Education on Blood Glucose Control in Diabetes Mellitus Patients," was chosen because it is believed to provide practical contributions to the development of effective and applicable nutrition education models, particularly in the context of primary healthcare services. This study is expected to provide a comprehensive overview of educational strategies tailored to patient needs, while strengthening the role of nurses as agents of change in health promotion and chronic disease management.

Objective

This study aims to implement the nursing process with a focus on the implementation of nutrition education in controlling blood glucose levels in DM patients in a structured, sustainable, and patient-centered manner.

Method

Design and setting

This study used a case study design with an Evidence-Based Nursing (EBN) approach. This design was chosen to explore nursing issues in patients with diabetes mellitus (DM) and to analyze the effectiveness of nutritional education interventions in helping to control blood glucose levels. The study was conducted at the patient's residence in Cigembor Village, Ciamis District, Ciamis Regency, within the context of community nursing practice. The intervention was implemented over three visits on May 29, May 31, and June 2, 2025.

Population and sampling

The population in this study consisted of individuals diagnosed with diabetes mellitus (DM) who experienced hyperglycemia. Inclusion criteria included patients who were cooperative, able to read and write, and willing to participate by signing an informed consent form. Exclusion criteria included patients who suddenly refused to participate or experienced a deterioration in their health that made it impossible for them to undergo the intervention.

The sample in this study was one patient (Mrs. D) who met all inclusion criteria. Sample selection was conducted purposively, based on specific considerations aligned with the study objectives. This patient was an appropriate subject to illustrate the implementation process of nutrition education in evidence-based nursing practice.

Instrument and measurement

The instruments used in this study included a blood glucose meter, a daily diet monitoring sheet, and a nutrition education leaflet. Blood glucose measurements were taken before and after the implementation of nutrition education to monitor changes that occurred. The leaflet was used as an educational tool to explain the principles of a diabetes diet, types of foods with a low glycemic index, portion sizes, and the importance of regular meals. The reliability and validity of the measuring instruments were supported by the use of standard nursing practice instruments and educational materials based on the latest scientific literature.

Data collection and analysis

Data collection was conducted through in-depth interviews with patients, direct observation of eating habits and daily behavior, and physical examinations in the form of blood glucose level measurements. In addition, the entire nursing care implementation process was systematically documented. Nutrition education was provided directly at each visit, accompanied by discussion sessions and recording of daily consumption by patients.

Data was analyzed qualitatively using a descriptive approach. The analysis process was conducted in four stages: data collection, data reduction (selecting and focusing on important information), data presentation (in narrative form), and drawing conclusions. This analysis aimed to describe the impact of nutrition education interventions on patients' blood glucose control and changes in healthy behavior within the community context.

Result

The assessment was conducted on a female patient named Mrs. D, aged 43 years, Muslim, Sundanese ethnicity, with a junior high school education level, and working as a housewife. The patient resides in Sinar Mawar Neighborhood, Cigembor Village, Ciamis. The patient was accompanied by her husband, Mr. H (59 years old), who works as a daily laborer. The assessment was conducted on May 29, 2025, with a medical diagnosis of Diabetes Mellitus.

The patient's primary complaint was frequent dizziness, especially after performing light activities such as walking or cooking. The dizziness was felt in the forehead and temples with moderate intensity (scale 5 out of 10) and lasted for 15–30 minutes several times a day, improving after rest. The patient has no history of chronic illnesses and reports no family history of diabetes or other metabolic disorders.

In terms of health habits, prior to the illness, the patient consumed three meals a day with normal portions and drank one pitcher of water per day. After becoming ill, the patient restricted their meal portions to three spoonfuls of rice, one piece of tofu, and one piece of tempeh, but often felt hungry. Fluid intake decreased drastically to only two glasses per day because the patient avoided drinking to prevent frequent urination (BAK). Elimination patterns showed that before becoming ill, the patient had two bowel movements per day with normal consistency and urinated four times per day. After falling ill, the frequency of urination increased with a paler urine color, and the patient required assistance for elimination. Sleep patterns also changed; previously sleeping 7 hours at night and 3 hours during the day, it decreased to only 6 hours at night and 1 hour during the day after falling ill.

Physical examination showed that the patient was conscious with a Glasgow Coma Scale (GCS) score of E4V5M6. Vital signs were stable with blood pressure 110/90 mmHg, pulse rate 82 beats per minute, respiratory rate 20 breaths per minute, and temperature 36°C. The respiratory and cardiovascular systems were within normal limits. Neurological examination showed no abnormalities, with all twelve cranial nerves functioning normally. Vision and hearing were normal with no complaints. In the endocrine system, the patient's blood sugar level was recorded at 305 mg/dL.

Examination of the musculoskeletal system revealed an open wound on the right heel (regio pedis dextra) classified as a stage 4 diabetic ulcer, measuring 23 cm x 10 cm with a depth of 5 cm. The wound appears red and yellow, accompanied by granulation tissue and an unpleasant odor, and shows signs of infection. The patient complains of a burning sensation and itching around the wound, as well as muscle weakness in the right lower extremity, while the upper extremities are in normal condition. Examination of the integumentary system shows a dark brown skin color, CRT <3 seconds, and an increase in local temperature in the wound area. The urinary system showed no significant abnormalities; the patient was able to urinate spontaneously, although the urine was slightly pale. The reproductive system was also normal, with no tenderness, lumps, or lesions.

Table 1. Drug Therapy

Types of Medicines	Dosage	How to Administer
Sansulin rapid	3x12 units per day before meals (morning, afternoon, evening)	Intramuscular
Sansulin Log-G	1x18 units per day before meals (evening)	Intramuscular
Paracetamol	3x1	Oral
Clindydamycin	2x1	Oral
Levofloxacin	1x1	Oral

Based on the analysis of data obtained for nursing diagnosis using the Indonesian Nursing Diagnosis Classification (SDKI) PPNI Indonesia 2017 edition 1, third revised edition, nursing diagnoses will be identified.

Table 2. Nursing Diagnosis

Signs and symptoms	Etiology	Nursing Issues	No.SDKI	Page
Subjective Data: 1. The patient reports feeling dizzy frequently over the past few days. 2. The dizziness is felt after light activities such as walking or cooking. 3. The patient describes the dizziness as a lightheaded feeling and slight spinning, especially in the forehead and temple areas. 4. The patient rates the intensity of the dizziness as 5 out of 10. 5. The patient reports feeling easily fatigued and lethargic during activities. **Objective Data:** 1. Random blood sugar (RBS): 305 mg/dL 2. The skin appears dry. 3. GCS 15 (E4V5M6). 4. Insulin therapy: 18 units at night, and 13 units twice daily (morning, afternoon, evening) 5. BP: 110/90 mmHg HR: 82 beats per minute RR: 20 breaths per minute T: 36°C	Decreased insulin sensitivity ↓ Decreased glucose transport into cells ↓ Glucose cannot be used by cells as an energy source ↓ Increased glucose levels in the blood (accumulation of glucose in the circulation) ↓ Hyperglycemia	Hyperglycemia is associated with insulin resistance.	D.0027	71

After analyzing the data from the nursing diagnosis, the interventions provided were taken from the Indonesian Nursing Intervention Standards (SIKI) PPNI edition I, second printing, 2018..

Table 3. Nursing Interventions

Nursing Diagnosis (Goals, Outcome Criteria)	Interventions
Hyperglycemia is associated with decreased insulin sensitivity After nursing intervention for 3 x 24 hours, blood glucose stability improved, with the following outcome criteria: 1. Dizziness decreased 2. Blood glucose levels improved	**Hyperglycemia Management (I.03115)** **Observation** 1. Identify possible causes of hyperglycemia 2. Monitor blood glucose levels, if necessary 3. Monitor signs and symptoms of hyperglycemia 4. Monitor fluid intake and output **Therapeutic** 5. Administer oral fluid intake **Education** 6. Advise against exercise when blood glucose levels exceed 250 mg/dL 7. Advise self-monitoring of blood glucose levels 8. Advise adherence to diet and exercise 9. 9.Provide nutritional education on: Types of high-glycemic-index foods to avoid (e.g., simple sugars, sweetened beverages), the importance of regular meals, small but frequent portions, and healthy food choices for diabetes.

The nursing intervention for patients diagnosed with hyperglycemia associated with decreased insulin sensitivity was implemented over three days: May 29, May 31, and June 2, 2025. The interventions included identifying the causes of hyperglycemia, monitoring random blood glucose levels (RBG), monitoring symptoms of dizziness and fatigue, and monitoring fluid intake and output. Additionally, patients were provided with oral fluid intake of 200–300 ml as needed daily. Education was a key focus, including recommendations to avoid physical activity or exercise if GDS exceeds 250 mg/dL, the importance of self-monitoring GDS, and nutritional education focusing on high-glycemic index foods and the importance of regular meal patterns. Patients are gradually guided to record GDS results and understand the connection between diet, activity, and blood sugar control in daily life.
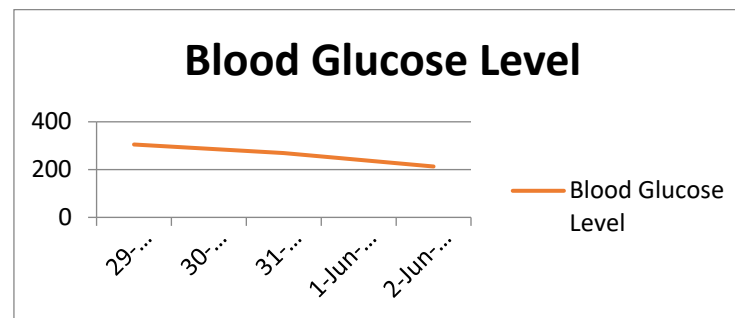
Figure 1. Blood Glucose Levels Over 3 Days

Figure 1. The graph above shows the values before and after the implementation of nutrition education. At the beginning of the evaluation (May 29), the patient still complained of dizziness with a score of 5 out of 10, felt tired, and was confused about the appropriate diet. Fasting blood sugar (FBS) was recorded as high at 305 mg/dL, blood pressure was 100/70 mmHg, and the patient's fluid intake was low. The patient was given interventions including nutrition education, blood glucose monitoring, and increased fluid intake. At the second evaluation (May 31), there was an improvement in symptoms. The dizziness scale decreased to 2 out of 10, and the patient appeared more comfortable after replacing rice with boiled potatoes. The GDS also decreased to 269 mg/dL, and fluid intake increased. Blood pressure rose to 110/90 mmHg, and fluid output was normal. The patient began actively recording GDS results independently. At the final evaluation (June 2), dizziness complaints had completely resolved (scale 0), and GDS further decreased to 213 mg/dL. Vital signs were within normal limits, and the patient felt more energetic and reported improved condition. Intervention was discontinued as the nursing issue of hyperglycemia was deemed resolved.

Discussion

This study aims to explore the effectiveness of nutrition education interventions based on the Evidence-Based Nursing (EBN) approach in lowering blood glucose levels in patients with diabetes mellitus (DM) undergoing treatment in the surgical ward and diagnosed with hyperglycemia nursing problems due to decreased insulin sensitivity. The intervention was conducted through three visits involving educational activities, clinical monitoring, and patient compliance training regarding dietary management.

Restate the Key Findings

A 43-year-old female patient, Mrs. D, presented with complaints of dizziness after performing light activities such as walking or cooking. A random blood sugar test showed a reading of 305 mg/dL, indicating hyperglycemia. Subjective and objective data indicated reduced insulin sensitivity as the etiology of the condition. Through nursing interventions conducted over three days, including nutritional education, blood glucose monitoring, increased fluid intake, and encouragement for self-monitoring of blood sugar levels, significant improvements were achieved.

After education on the importance of a healthy diet and hydration, the patient began to change his eating habits from consuming rice to boiled potatoes and increased his daily fluid

intake. As a result, blood sugar levels gradually decreased to 269 mg/dL on the second day and 213 mg/dL on the third day. The dizziness complaint, which initially scored 5 out of 10, gradually improved and completely resolved by the last day of the intervention. The patient also demonstrated increased independence in recording blood glucose levels and began to understand the connection between diet, hydration, and glucose control.

The changes observed were not only in physiological parameters but also in the patient's behavior and understanding, indicating that an educational and collaborative nursing approach effectively improves the quality of life and metabolic control of patients with DM. The nursing diagnosis SDKI D.0027 (Hyperglycemia related to insulin resistance) was found to be appropriate for intervention planning.

Interpret the Results

This finding underscores the importance of a holistic and patient-centered nursing approach in managing chronic diseases such as DM, especially in surgical medical care settings where complications such as diabetic ulcers are also commonly encountered. Hyperglycemia is not solely a pharmacological issue but also requires active patient involvement in managing their lifestyle. The patient's fear of polyuria, which led them to restrict fluid intake, actually worsened their metabolic status. After gaining a proper understanding, the patient's condition improved significantly.

This aligns with the pathophysiological pathway of insulin resistance, where glucose cannot enter cells and remains in the bloodstream, causing various systemic symptoms such as fatigue, dizziness, and impaired wound healing (Juhartini & Rasid, 2024). Nursing interventions such as nutrition education and increased hydration are in line with the theory and practice recommended in the SIKI standards (Fatimah, 2024).

Compare with Previous Studies

The results of this study are in line with a number of previous studies that emphasize the importance of nutrition education in DM management. (Fatimah, 2024) shows that providing nutrition education based on leaflets for four weeks can significantly lower fasting blood sugar levels. Although the education in Mrs. D's case only lasted three days, the results of the decrease in blood sugar levels show promising effectiveness. This indicates that brief but intensive education can also have a significant impact.

Research conducted by (Paradisa et al., 2025) found that a weekly group education approach accompanied by reminders significantly improved diet compliance and lowered HbA1c levels. A study by Nanda & Rosyid (2024) showed that the use of digital educational applications is effective in improving patients' understanding of DM management. In this context, the approach used with Mrs. D, which involved direct, visual, and verbal communication, was highly appropriate for the patient's educational level (junior high school) and literacy level.

Research conducted by (Eliza et al., 2024) also states that the effectiveness of education is greatly influenced by the suitability of the media to the patient's literacy level. In this case, education was carried out in a simple and easy-to-understand manner, reinforcing their findings. Furthermore, (Aristia & Intan, 2024) emphasize that family involvement in education

can enhance the success of interventions. Although in this case the family's role (husband) was more passive, their presence and support still had a positive impact.

These studies were generally conducted in community settings, whereas this study was conducted in a medical-surgical setting, which has higher complexity such as the presence of stage 4 diabetic ulcers. This strengthens the validity that educational interventions are also effective in patients with complicated conditions in the hospital.

Highlight the Implications

This case presents several important implications for nursing practice in medical-surgical wards. First, the use of SDKI and SIKI is essential in establishing accurate nursing diagnoses and designing targeted interventions. Second, patient education should be prioritized, especially for patients with low health literacy and those who hold misconceptions regarding disease management. Third, interdisciplinary collaboration with the medical team is crucial in managing DM patients, particularly those undergoing insulin and antibiotic therapy.

From a hospital management perspective, the development of diabetes education modules based on SIKI that can be used in both inpatient and outpatient settings may improve care effectiveness. Regular training for nurses on how to deliver education that aligns with the patient's background is also highly recommended.

Discuss the Limitations

Despite the positive results obtained, this study has several limitations. First, as a single-case study, the findings cannot be generalized to a wider population. Second, the intervention lasted only three days, limiting the ability to measure long-term effects on HbA1c, dietary adherence, and wound healing. Third, the absence of direct collaboration with a clinical nutritionist or dietitian made the nutritional intervention less structured. Fourth, the influence of other therapies, such as antibiotics and paracetamol, on the patient's improvement was not fully controlled. Fifth, the study did not include direct measurements of psychosocial impact or patient quality of life, which are also important indicators in evaluating intervention success.

Suggest Future Research

Future research should employ quasi-experimental designs or randomized controlled trials (RCTs) with larger sample sizes to improve generalizability. Further studies could also compare the effectiveness of various educational methods (leaflets, educational videos, or mobile apps) in enhancing patient understanding and adherence. Additionally, extending the duration of the intervention to at least 2-4 weeks is recommended to evaluate the consistency of blood glucose changes and sustainability of behavioral modifications. Additional variables such as nutritional status, medication adherence, and family involvement should also be considered to provide a more comprehensive picture of the effectiveness of nutritional education in diabetes management.

Overall, this study highlights that EBN-based nutritional education can be an effective nursing intervention for managing hyperglycemia in DM patients admitted to medical-surgical wards. Properly delivered and personalized interventions can encourage patients to take a more active role in managing their condition, increase self-control, and prevent long-term

complications. Therefore, empowering patients through education should be a central approach in modern, evidence-based nursing care.

Conclusion

This case study demonstrates that the implementation of structured and repeated nutritional education has a significant positive impact on blood glucose control in patients with Diabetes Mellitus (DM). The three-day educational intervention focusing on healthy eating habits, avoidance of high glycemic index foods, sufficient fluid intake, and self-monitoring of glucose levels effectively reduced random blood glucose from 305 mg/dL to 213 mg/dL.

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Author Contribution

The primary author was responsible for all aspects of the research, including case study planning, data collection, implementation of nutritional education, result documentation, data analysis, and the writing of the final report and scientific article. No other individuals contributed as co-authors.

Conflict of Interest

The author declares no conflict of interest financial, professional, or personal that could influence the results or interpretation of this case study.

Ethical Clearance

This research received ethical approval from the Health Research Ethics Committee of STIKes Muhammadiyah Ciamis. All research procedures were conducted in accordance with ethical principles, and written informed consent was obtained from the patient prior to the assessment and intervention.

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