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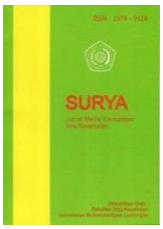

Hyperglycemia Management Using Progressive Muscle Therapy in Diabetes Mellitus Patients: Case Study

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ARTICLE INFORMATION

Article Process

Submission : July 5, 2024
Revision : November 29, 2024
Accepted : December 06, 2024

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Cite this as:

Rahma, N.W., Munika, E., Asmorosari, F., Maghfiroh, A., Fitrianti, R.I., Efendi, M.Z., Lestari, T.P., and Firdaus, A.W. (2024). Hyperglycemia Management Using Progressive Muscle Therapy in Diabetes Mellitus Patients: Case Study. *SURYA: J.Media Komunikasi Ilmu Kesehatan, 16 (3), 16(3), 93-100. https://doi.org/10.38040/js.v16i2.985*

ABSTRACT

Introduction: Diabetes Mellitus is a condition when blood sugar levels are in the high category or commonly called hyperglycemia, high blood sugar levels can cause several problems that often arise and can cause several complications that occur. The limited implementation of non-pharmacological progressive muscle relaxation therapy is the basis for the implementation of this research. The purpose of this study was to analyze the management of hyperglycemia in patients with Diabetes Mellitus.

Method: Case study design method was used in the study with three clients, namely patients with Diabetes Mellitus. The action given to overcome this with progressive muscle relaxation therapy given 3 times for 3 consecutive days t. This study was conducted at Aisyiyah Hospital Bojonegoro in September 2023. The analysis was carried out using the SMART method (specific, measurable, achievable, relevant and time-bound goals). The FIKes UMLA Medical Surgical Nursing Care format was used in the data collection process to action evaluation.

Results: The results of the case study showed that on the first day of the assessment of the three patients, blood glucose was found to be in the high category. After 3 days, nursing problem of blood glucose instability was resolved, blood glucose levels improved , drowsiness decreased sufficiently, dizziness decreased , fatigue/lethargy decreased sufficiently and complaints of hunger decreased .

Conclusion: Progressive Muscle Relaxation Therapy is effective in lowering blood glucose levels. This therapy can be combined with pharmacological therapy such as insulin and oral medications and other treatments needed by patients with diabetes mellitus so that it can help medical personnel in stabilizing blood sugar levels in patients with diabetes mellitus.

Keywords: diabetes mellitus, hyperglycemia management, progressive muscle relaxation

INTRODUCTION

Diabetes Mellitus is a condition where blood sugar levels are in the high category or commonly called hyperglycemia, which is characterized by a chronic absolute insulin condition that can affect carbohydrate , protein and fat metabolism . caused by an imbalance or lack of insulin or an imperfect cellular response to insulin characterized by irregular metabolism. Diabetes mellitus is a fairly common problem in Indonesia caused by either heredity or lifestyle. (Hamidah et al, 2023).

Data from the International Diabetes Federation (IDF) states that there were around 463 million people aged 20-79 years in the world who suffered from diabetes in 2019 with a prevalence of 9.3% of all residents of the same age. The prevalence of diabetes is estimated to increase with increasing population age to 19.9% or 111.2 million people aged 65-79 years. The number is estimated to continue to increase to reach 578 million in 2030 and 700 million in 2045. The Southeast Asia region is ranked 3rd with a prevalence of 11.3% (Ministry of Health, 2020). East Java Province is one of the provinces that ranks 6th with the highest prevalence of diabetes in Indonesia, where the number of diabetes mellitus sufferers in East Java Province in 2021 reached 929,535 cases (Ministry of Health, 2020)

Blood glucose is blood sugar derived from carbohydrates absorbed by food and stored in the liver and skeletal muscles in the form of glycogen. Glycogen is a substance that is beneficial to the body in the metabolism process. In medical science, measuring blood glucose levels in the form of blood glucose is used to diagnose diabetes mellitus. The process of increasing blood glucose levels in the body can be caused by several factors ranging from inappropriate diet therapy, diet, rarely doing physical activity, excess weight (obesity), non-compliance with treatment (oral or injection) to psychological factors such as anxiety and stress. In addition, genetic factors are also one of the factors that can trigger diabetes. where someone who has a lineage of diabetes sufferers is more at risk of developing diabetes. (Fitriyah. 2019).

One characteristic that is typical of this disease is high blood sugar levels when checked at a health service center or other. According to Wowor et al. (2023), In this case, high blood sugar levels in the body can certainly cause several complaints that occur such as: feeling tired quickly, feeling thirsty often, urinating frequently in the middle of the night, easily hungry, often feeling hungry, drastic weight loss, and wounds that do not heal and dry. (Simanjuntak et al, 2023)

Management of high blood sugar levels can be done pharmacologically and non-pharmacologically. Pharmacological blood sugar level management is in the form of insulin injections, and administration of drugs containing anti-diabetic substances. (Saraswati et al, 2022). In addition, general treatment for people with diabetes mellitus is diet, exercise, or physical exercise. For exercise or physical exercise that is recommended for people with diabetes mellitus, it includes light exercise that can be done in bed for. Patients in the hospital, this exercise does not require special preparation, just light movement on the bed for about 5 to 10 minutes, for example moving both hands, fingertips, feet and head. (Risfa, 2023). In addition, gymnastics can be done, this gymnastics must be accompanied by abilities that must be adjusted to the ability of the condition of the comorbid disease, and can also be done with progressive muscle relaxation. Progressive muscle relaxation techniques are relaxation therapies given to patients by combining deep breathing exercises and a series of contractions and relaxation of certain muscles with the aim of helping to lower blood sugar levels in patients with diabetes mellitus (Ilmi et al, 2017).

The purpose of this study was to analyze the implementation of hyperglycemia management using progressive muscle relaxation therapy to reduce blood sugar levels in patients with diabetes mellitus.

METHOD

This study used case study experiment research with the aim of exploring nursing problems in clients with Diabetes mellitus. The approach method used is the nursing care approach which includes five nursing processes, namely assessment, diagnosis, planning, implementation and ending with the nursing evaluation process. The research subjects in this case study used by the author were three clients suffering from Diabetes Mellitus in the Hospital who met the following criteria: 1) Clients with Diabetes Mellitus; 2) Clients with complaints of random blood sugar levels above or equal to 200

mg/dl ; 3) Composmentis awareness; 4) Willing to be study respondents and sign informed consent. Exclusion criteria were patients who were taking hyperglycemic drugs and insulin

This study was conducted at Aisyiyah Hospital, Bojonegoro in September 2023, with a sample of 3 patients with diabetes mellitus. The variables measured in this study were the patient's blood sugar levels before and after the intervention. Data collection in this application was carried out by observing the implementation of progressive muscle relaxation and measuring blood sugar levels using a glucometer before and after progressive muscle relaxation. Progressive muscle relaxation was carried out for 3 days with a frequency of 1 time a day, namely in the morning for 20 minutes, carried out by the researcher . The application was carried out on 3 patients with diabetes mellitus at Aisiyah Hospital, Bojonegoro. The intervention used is progressive muscle relaxation therapy, which is an intervention given to patients by combining deep breathing exercises and a series of contractions and relaxation of certain muscles with the aim of helping to lower blood sugar levels in patients with diabetes mellitus (Permatasari et al. 2022). The steps for performing progressive muscle relaxation therapy are 1) Training the hand muscles. The method is to clench both hands, tighten the biceps and forearms for 5-7 seconds. Encourage the client to think about how it feels and fully tense the muscles then relax for 15-20 seconds, 2) training the back of the hand muscles, by bending both arms back at the wrists so that the muscles in the back of the hands and forearms tense, fingers facing the ceiling. 3) training the biceps (large muscles at the top of the base of the arm), by clasping both hands into fists, then bringing both fists to the shoulders so that the biceps muscles will become tense. 4) training the shoulder muscles, Lift both shoulders as high as possible as if touching both ears. Focus on the top, and neck. (Putriarini, 2020).

Movements 5 and 6, relax the facial muscles (such as the forehead, eyes, jaw, and mouth). By wrinkling the forehead and eyebrows until the muscles are felt and the skin is wrinkled. Then close your eyes tightly so that it can be felt around the eyes and the muscles that control eye movement. 7) Jaw muscles, Closing the jaw, followed by biting the teeth so that there is tension around the jaw muscles. 8) muscles around the mouth. The lips are pursed as hard as possible so that tension will be felt around the mouth. 9) is intended to relax the front and back neck muscles. The movement begins with the back of the neck muscles and then the front of the neck muscles, place the head so that it can rest. Press the head on the surface of the chair cushion in such a way that you can feel the tension in the back of the neck and upper back (Putriarini, 2020).

Movement 10) to train the front neck muscles. The movement brings the head to the front, then bury the chin into the chest, so that you can feel the tension in the front neck area. 11) to train the back muscles. Lift the body from the back of the chair, arch the back, puff out the chest, hold the tense condition for 10 seconds, then relax. When relaxed, put the body back on the chair while letting the muscles become limp. 12) chest muscles. Take a deep breath to fill the lungs with as much air as possible then hold for a few moments, while feeling the tension in the chest down to the stomach, then release. 13) train the abdominal muscles. By pulling the stomach in tightly, hold it until it becomes tight and hard for 10 seconds, then release freely. Movements 14-15 train the leg muscles (such as the thighs and calves). Straighten both soles of the feet so that the thigh muscles feel tense. Continue by locking the knees in such a way that the tension moves to the calf muscles. Hold the tense position for 10 seconds, then release. (Putriarini, 2020)

Data collection in this study used the medical surgical nursing care format of FIKES Muhammadiyah University of Lamongan. The outcome and evaluation criteria were arranged based on the Indonesian Nursing Outcome Standards for blood glucose levels (L.03022) (SLKI, 2017). In compiling this study, it was analyzed using the SMART method (specific, measurable, achievable, rel evant and time-bound goals). (Doran , 2020)

RESULTS

Table 1Assessment of Type 2 Diabetes Mellitus Patients at Aisyiyah Hospital, Bojonegoro

No	Client Data	Patient 1	Patient 2	Patient 3
1	Name	Mrs. S	Mrs. T	Mr. A
2	Gender	Woman	Woman	Man
3	Age	43 years old	43 years old	51 years old
4	Address	Bubulan, Bojonegoro	Lamongan	Bojonegoro
5	Religion	Islam	Islam	Islam
6	Work	Housewife	Farmer	Self-employed
7	educational background	SENIOR HIGH SCHOOL	SD	SENIOR HIGH SCHOOL
8	Ethnic group	Java	Java	Java
9	Marital Status	Marry	Marry	Marry
10	Symtomps within one year	Unstable blood sugar, body feels weak and stomach pain extends to the back	Unstable blood sugar and right abdominal pain	High blood sugar, pain in DM wounds
11	Current Blood Sugar Level	301 mg/dl	200 mg/dl	291/dl
12	Efforts to overcome	Reduce sweet food intake	There isn't any	There isn't any
13	Past medical history	There isn't any	Diabetes mellitus	Diabetes mellitus

Table 2Nursing Diagnosis, Outcomes and Interventions (SDKI, SIKI, SLKI)

Nursing diagnosis	SLKI	SIKI
Instability of blood glucose levels (D.0027)	Objectives & Outcome Criteria Blood Glucose Stability Objective: After nursing actions are carried out for 3x24 hours, it is hoped that blood glucose levels will improve.	Hyperglycemia Management Observation 1. Identify possible causes of hyperglycemia. 2. Identify situations that cause increased insulin requirements (e.g. recurrent illness) 3. Monitor blood glucose levels, if necessary 4. Monitor for signs and symptoms of hyperglycemia (e.g. polyuria, polydipsia, polyphagia, weakness, malaise, blurred vision, headache) 5. Monitor fluid intake and output 6. Monitor urine ketones, blood gas analysis levels, electrolytes, orthostatic blood pressure and pulse rate. Therapeutic 1. Provide oral fluid intake 2. Consult a physician if signs and symptoms of hyperglycemia persist or worsen. 3. Facilitate ambulation if orthostatic

	hypotension is present. Education 1. Recommend avoiding exercise when blood glucose levels are greater than 250 mg/dl. 2. Recommend self-monitoring of blood glucose levels 3. Encourage adherence to diet and exercise 4. Teach the indications and importance of urine ketone testing, if appropriate. 5. Teach diabetes management with progressive muscle relaxation Collaboration 1. Collaboration in administering insulin, if necessary 2. Collaboration in administering IV fluids, if necessary Collaboration in administering potassium, if necessary

Table 3. Blood Glucose Stability in Patients

No	Indicator	Blood Glucose Stability														
		Day 1					Day 2					Day 3				
		1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
1	Blood Glucose Levels															
2	Sleepy															
3	Dizzy															
4	Tired/lethargic															
5	Complaints of hunger															

Description: Client 1 →; Client 2 →; Client 3 →

DISCUSSION

ASSESSMENT

The results of the assessment obtained through interviews and observations, the author found the problems complained of by the three clients as evidenced by client 1 GDA 301 mg/dl, client 2 GDA 200 mg/dl, client 3 GDA 291 mg/dl. The three clients have typical symptoms of Diabetes Mellitus and in line with the explanation, namely the body feels weak, accompanied by dizziness and feels hungry and sleepy often.

This is in line with the opinion of Hamidah et al. (2023) Excessive thirst means that your body is trying to replenish the lost fluids. Frequent urination and excessive thirst are the body's way of trying to manage high blood sugar. In Diabetes Mellitus clients, this occurs due to a bad lifestyle in the form of irregular eating patterns and lack of physical activity, resulting in unstable blood glucose levels. (Juniarti et al, 2021)

Based on research by Anisah et al. (2023), unstable blood glucose levels cause hyperglycemia and hypoglycemia which can result in fatigue, polyuria, polyphagia, polydipsia, poor diet. This condition

causes clients to experience obstacles when doing activities.

Analysis of patient data obtained from the nursing process collected by the author on the three clients is subjective and objective data that can support the determination of the nursing diagnosis of unstable blood glucose levels related to insulin resistance, characterized by increased blood glucose levels in the three clients that have been adjusted to the SDKI nursing diagnosis.

NURSING DIAGNOSIS

The results of the data analysis showed that clients 1, 2 and 3 experienced an increase in blood glucose levels , which means that one of the nursing problems of clients with diabetes mellitus is unstable blood glucose levels related to pancreatic dysfunction (D.0027). The major data found were: In hyperglycemia, random blood sugar levels were >200 mg/dl, Easily lethargic or easily tired, Dry mouth, Experienced increased thirst, and Increased urine output. In the third condition, clients experienced unstable blood glucose levels due to several factors that affect increased blood sugar.

According to Sari & Harmanto (2020), Hyperglycemia is a condition in which blood glucose levels increase or are excessive. inability to produce insulin because pancreatic beta cells have been destroyed by an autoimmune process. Fasting hyperglycemia occurs due to unmeasured glucose production by the liver. Glucose from food cannot be stored in the liver even though it remains in the blood and causes postprandial hyperglycemia (after eating). If the concentration of glucose in the blood is high enough, the kidneys cannot reabsorb all the glucose that is filtered out, as a result the glucose appears in the urine (glucosuria). (Ludiana & Pakarti, 2021).

So based on the description it can be concluded that the problem that occurs in the three clients is instability of blood glucose related to metabolic disorders, namely pancreatic dysfunction (D.0027). This occurs because excessive glucose is excreted into the urine, this excretion will be accompanied by excessive fluid and electrolyte discharge. This condition is called osmotic diuresis. As a result of excessive fluid loss, patients will experience increased urination (polyuria) and thirst (polydipsia). Of the three clients that the author observed, they were hyperglycemic patients, which means that blood glucose levels are in the high category, namely above 200mg/dl

NURSING INTERVENTION

Based on the nursing diagnosis above, where the instability of blood glucose levels is related to pancreatic dysfunction. With the Indonesian nursing outcome standard, namely blood glucose stability (L.03022) with the criteria for improved blood glucose levels, drowsiness, dizziness, fatigue and decreased hunger. (PPNI, 2018). The intervention was carried out with hyperglycemia management (I.03115) namely with progressive muscle relaxation therapy to lower blood sugar levels. (PPNI, 2018).

Relaxation is an effort to relieve emotional tension so that individuals can think more rationally. Thus, liver sugar production can be controlled properly, so that blood sugar can be stable and normal. One form of how to relieve emotional tension and shortness of breath that is quite easy to do is progressive muscle relaxation (Meilani et al., 2020). According to Ilmi et al. (2017), one example of complementary therapy is relaxation, because relaxation is a form of mind-body therapy (therapy of the mind and muscles of the body) in complementary and alternative therapy. Its implementation can be carried out together with medical therapy)

Based on the description, it can be concluded that the intervention chosen is hyperglycemia management using progressive muscle relaxation therapy. Progressive muscle relaxation is preferred considering that the treatment procedure with progressive muscle relaxation therapy is a type of relaxation that is cheap and easy to do independently. Progressive muscle relaxation techniques are superior to other relaxation techniques because they show the importance of holding back stress responses by trying to consciously relieve muscle tension.

NURSING IMPLEMENTATION

Nursing implementation is carried out according to the planned intervention, namely hyperglycemia management. Implementation of hyperglycemia management includes: identifying possible causes of hyperglycemia , monitoring blood glucose levels, providing oral fluid intake, teaching diabetes management with progressive muscle relaxation and collaborating on IV fluid administration.

Management of patients with unstable blood glucose levels, progressive muscle relaxation is carried out for 3 days with a frequency of 1 time a day, namely in the morning. The application was carried out on 3 patients with diabetes mellitus. with complementary therapy which is one of the non-pharmacological methods to overcome

unstable blood sugar levels.

Progressive muscle relaxation therapy is a type of complementary therapy that can be used as an adjunct to conventional/medical therapy (Ludiana & Pakarti, 2021). Research by Ilmi et al. (2017). states that muscle relaxation affects salivary cortisol levels and if done regularly will reduce the risk of complications of diabetes mellitus. Progressive muscle relaxation is a procedure to obtain muscle relaxation through two steps, namely applying tension to a muscle group and stopping the tension then focusing on how the muscles relax, feeling a sensation of relaxation and tension disappearing. Progressive muscle relaxation should be done 2 hours after eating to avoid drowsiness (Karokaro et al., 2019).

The results of this study are in line with Mutiawati (2017), with the title progressive muscle relaxation on decreasing blood sugar levels in patients with type 2 diabetes mellitus. There was a difference in blood sugar before and after being given progressive muscle relaxation with an average blood sugar level before being given progressive muscle relaxation of 234.47 mg/dl and blood sugar levels after being given progressive muscle relaxation of 155.73 mg/dl. So it can be concluded that progressive muscle relaxation has a significant effect on decreasing blood sugar in patients with diabetes mellitus.

In this case, the implementation of progressive muscle relaxation in DM patients is very useful in lowering blood glucose levels to normal. This therapy can be done independently by the patient. Handling of DM in the hospital is the responsibility of the health team. However, after the patient is discharged, the patient and family must be able to take over this responsibility by being able to carry out independent care so that the patient and family must be equipped with sufficient knowledge and skills to prevent the possibility of rehospitalization with worse conditions .

EVALUATION

Evaluation of nursing actions performed on patients with DM 1, 2 and 3 for 3 days by performing progressive muscle relaxation to significantly reduce blood sugar levels based on the SOAP technique. This shows that after being given intervention for 3 days, the three patients experienced a decrease in blood glucose levels within normal limits.

This is in line with Hidayanti's research (2018) entitled the effect of progressive muscle relaxation on blood sugar in patients with type 2 diabetes mellitus in pants social tresna werda sebai nan aluih sicincin. The average blood glucose level before exercise was 267.83 mg/dl and the average after progressive muscle relaxation therapy decreased to 208.33 mg/dl so it can be concluded that there was a decrease in blood glucose levels before and after progressive muscle relaxation therapy.

This shows that the application of progressive muscle relaxation therapy intervention shows a decrease in blood glucose levels in diabetes mellitus patients, so it is necessary to apply this therapy.

CONCLUSION

The results of our case study research show that the three clients have typical symptoms of Diabetes Mellitus and are in line with the explanation, namely feeling weak, accompanied by dizziness and feeling hungry and sleepy often. One of the nursing problems of diabetes mellitus clients is unstable blood glucose levels related to pancreatic dysfunction (D.0027), with the Indonesian nursing outcome standard, namely blood glucose stability (L.03022) with the criteria for improved blood glucose levels, drowsiness, dizziness, fatigue and decreased hunger. The intervention was carried out with hyperglycemia management (I.03115) namely with progressive muscle relaxation therapy to lower blood sugar levels. So that the evaluation in our case study research, the average initial blood sugar levels were still in the range that exceeded normal after the intervention was given, blood sugar levels decreased. so that the provision of progressive muscle relaxation therapy which is routinely carried out every day can be a solution so that blood sugar levels in DM patients can be controlled.

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