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Progressive Muscle Relaxation for Anxiety and Hyperglycemia in Diabetes Mellitus Type 2 Patient: A Case-Study

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ABSTRACT

Hyperglycemia is the main symptom in patients with diabetes mellitus. One of the risk factors that can increase blood sugar levels in diabetes mellitus (DM) patients is anxiety and stress, as a result of diabetes mellitus sufferers who experience anxiety, their physical condition does not improve, and their blood sugar levels are always high. Progressive muscle relaxation therapy (PMR) is a therapy that aims to focus the patient's attention so that they can differentiate the feelings that occur when the muscles are relaxed or relaxed from when they are contracting so that the patient can manage their body condition against their anxiety. This study aims to analyze the provision of progressive muscle relaxation therapy to control anxiety levels and blood sugar levels in patients with type 2 diabetes mellitus in the Gardena medical ward of Dr. Soebandi Hospital Jember. This research uses descriptive methods in the form of case studies on a patient with Type 2 DM. Therapy was given once a day for 20-30 minutes. Anxiety levels were measured using the DASS questionnaire, and blood sugar measurements were made using a blood sugar stick. After being given PMR therapy for 3 x 24 hours, the patients experienced a decrease in anxiety levels and blood sugar levels. Providing PMR therapy is effective in treating unstable blood glucose levels and anxiety for patient with Type 2 DM.

Keywords: Progresive Muscle Relaxation, Hyperglicemia, Anxiety, Diabtes Mellitus

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1. INTRODUCTION

Hyperglycemia is the main symptom of diabetes mellitus (DM). Diabetes mellitus sufferers often feel anxious about their condition. Based on research conducted by Rokhman et al, (2018), DM sufferers experience anxiety and decreased quality of life. The fact that DM is a disease

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that cannot be completely cured and can only be controlled is one of the factors causing anxiety that occurs in DM sufferers (Rokhman et al, 2018). One of the risk factors that can increase blood sugar levels in diabetes mellitus patients is stress. Diabetes mellitus sufferers who experience prolonged anxiety will experience stress, which can result in their physical condition not improving and their blood sugar levels always being high (Herlambang et al, 2019).

The incidence of diabetes mellitus in the world is relatively high; there are 422 million diabetes sufferers spread throughout the world, and deaths from this disease are around 1.5 million cases every year. In the last decade, the number and frequency of diabetes cases have continued to increase (WHO, 2023). Meanwhile, in Indonesia, based on doctors' diagnoses in people aged over 15 years, the data increased by 1.5% in 2013 to 2.0% in 2018. The number of Diabetes Mellitus (DM) sufferers in East Java is 2.6 of the total residents aged 15 years and over. Health services for diabetes mellitus sufferers at FKTP (First Level Health Facilities) in 38 districts/cities throughout East Java have reached 867,257 cases (93.3% of the estimated existing DM sufferers). Then, the prevalence of DM cases in the Jember district reached 92% (East Java Provincial Health Service, 2021), according to data at RSD, dr. Soebandi Jember, for January-December 2021, there were 1,513 DM patients and diabetes mellitus patients hospitalized at Dr. Hospital. Soebandi Jember as many as 180 people, outpatients as many as 425 people, and visiting patients as many as 908 people.

Insulin is a hormone produced by pancreatic beta cells, which regulates blood sugar metabolism by transferring glucose to body cells. If this hormone is missing or not produced, glucose cannot enter the cells. As a result, there is a buildup of blood sugar or hyperglycemia (Fatimah, 2015). Apart from the physical impact, there is also a psychological impact in the form of anxiety, which often occurs in DM sufferers. Anxiety in diabetes mellitus patients can cause uncontrolled blood glucose levels, which will make it even more difficult to treat diabetes mellitus patients. Under stressful conditions, many hormones are released that can inhibit the effects of insulin. One of the hormones that plays a role is the hormone cortisol, which opposes the effects of insulin and causes high blood glucose levels, which can cause complications in sufferers (Nur and Anggraini, 2022). One physical activity therapy to control blood glucose levels is Progressive Muscle Relaxation (PMR)

therapy. This therapy is a relaxation therapy that can reduce HbA1C levels (Meilani et al, 2020).

Progressive Muscle Relaxation (PMR) is a muscle relaxation technique by tensing the muscles throughout the body. In managing PMR, the aim is to focus the client's attention on differentiating the sensations of muscle groups when they are relaxing/relaxing from when they are tense/contracting so that it is hoped that the client will be able to regulate their body condition in response to stress. Relaxation can reduce subjective tension and influence other physiological processes. (Trimurthula et al, 2020). According to Wahyudi et al (2019), autogenic relaxation is thought to work by regulating the hormone cortisol and other stress hormones so that it can reduce blood sugar levels and blood pressure in people with diabetes mellitus and hypertension (Wahyudi and Arlita, 2019). Based on these problems, it is very necessary to implement Progressive Muscle Relaxation (PMR) Therapy Intervention to Overcome Anxiety and Instability of Blood Glucose Levels in Clients with Type 2 Diabetes Mellitus.

2. METHODS

Design and sample

This type of research is a case study using nursing care methods. The sample in the study was one DM type 2 patient in the Gardena Room of Dr. Soebandi Hospital Jember with hyperglycemia and anxiety. Data sources in the study were obtained from primary data, namely by taking action, observing, and answering questions from patients and families. Secondary data was obtained through patients' medical record data. The inclusion criteria in this sample were DM patients, cooperative, high blood sugar levels, anxiety, inability to sleep, and feeling dizzy.

Variable and Analysis

The variables of this study were progressive muscle relaxation, hyperglycemia, anxiety, and diabetes mellitus. The analysis in this study uses the nursing care process, which consists of nursing assessment, diagnosis, intervention, implementation, and evaluation.

Setting and Strategy

Patients are given nursing intervention in progressive muscle relaxation for 15-20 minutes for three days, from January 30 to February 01, 2023. The evaluation was conducted after therapy, reviewing the respondent's response about her feelings, measuring anxiety using DASS, and measuring blood sugar level using a blood sugar stick. Nursing

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intervention is given through the nursing process by directly teaching patients and families the right and appropriate techniques for adjusting the patient's condition. The evaluation was conducted after therapy, reviewing the respondent's response about her feelings and, measuring anxiety using DASS and measuring blood sugar level using a blood sugar stick.

3. RESULTS

The patient is female, 48 years old, with complaints of weakness, abdominal pain, nausea and vomiting, and shortness of breath. The patient said she had diabetes mellitus two years ago. The patient has no appetite. The patient's glucose level is 221 mg/dl. Physical examination obtained patient's condition is composmentis, the general condition of the client appears weak, the results of examination of vital signs obtained BP: 140/80 mmHg, temperature: 36.5 oC, Pulse: 70 times/minute and breathing 20x/minute. SPO2 95%, CRT more than 2 seconds, no cyanosis. Patients are given oxygen via nasal cannula 3 L/min. The upper and lower extremities function normally, and muscle strength 5. Moist skin, anasarca edema with pitting edema examination was 1+ degree, no lesions. Chest radiology examination shows Cardiomegaly (LV), Pulmonary edema, bilateral pleural adduction (heavier right), Heart failure, and mildly reduced ejection fraction.

The client's psychological data says he is afraid and worried about heart disease which is a complication of DM, the client says he does not understand his illness, the client looks anxious, the client says he has difficulty sleeping, the client says he often wakes up from sleep at night, the client often asks about the disease, the client also asks if the disease can still be cured, the client looks restless, the client complains of weakness. Based on these data, it can be concluded that the diagnosis that appears is blood glucose instability. Another problem that arises is anxiety related to changes in health status marked by the client saying he is afraid of DM and heart disease, the client saying he does not understand the disease, the client's difficulty sleeping, the client seems restless and says his chest feels pounding. The client receives pharmacological therapy in the form of Aspilet, CPG, atorvastatin, and valsartan to treat his heart disease, the client also receives drugs to lower blood pressure in the form of Lasix and amlodipine, as well as drugs to lower the patient's blood glucose levels, namely injections of insulin sansulin and novorapid when the patient's blood sugar rises.

Interventions to address nursing problems are adjusted to SIKI (The standard intervention of Indonesian nursing) which refers to the right outcome goals to address existing patient problems and adapt to SLKI (The standard outcome of Indonesian nursing). The interventions include observation, therapeutic, education, and collaboration with other medical personnel. Nursing problem interventions also apply Evidence-based Nursing, which is by research journals. Interventions to address the problem of unstable blood sugar levels and anxiety apply PMR therapy. Progressive Muscle Relaxation therapy is carried out daily for 20-30 minutes for three days. Patients feel more relaxed after doing PMR therapy; clients can sleep soundly, anxiety decreases, and feelings of boredom while in the hospital can be forgotten when doing PMR therapy. As well as for the problem of instability of blood sugar levels after the PMR therapy the patient's blood sugar gradually decreased.

Table 1. monitoring of implementation

Day	Anxiety*		Blood Glucose	
	Before	After	Before	After
Day-1 (31-Jan-2023: 18.00 pm)	16	15	221 mg/dL	200 mg/dL
Day-2 (1-Feb-2023: 20.00 pm)	14	12	150 mg/dL	133 mg/dL
Day-3 (2-Feb-2023: 06.00 am)	8	6	150 mg/dL	147 mg/dL

**Anxiety levels using Depression Anxiety Stress Scale (DASS)*

4. DISCUSSIONS

Progressive muscle relaxation (PMR) is a series of contraction and relaxation therapies for muscles. Management of PMR aims to focus the patient's attention so that he can distinguish the feelings that occur in muscles that are relaxed or relaxed from when they are in a contracted condition so that the patient is expected to be able to manage the body's condition against stress (Wahyuni et al, 2018). Research conducted by Nur and Anggraini (2022) found that PMR therapy can reduce blood sugar levels and stress levels in patients with type 2 diabetes mellitus. Stress is a risk factor for type 2 diabetes mellitus. In stressful conditions, many hormones are released, which can inhibit the effects of insulin. One of the hormones that plays a role is the hormone cortisol, which counteracts the effects of insulin and causes high blood glucose levels, which can cause complications in sufferers (Nur and Anggraini, 2022).

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The choice of progressive muscle relaxation therapy to treat anxiety and hyperglycemia is the lack of physical activity that DM patients can do in the hospital. Physical activity can help lower blood sugar levels. With this relaxation therapy, it is hoped that patients can manage their stress while opening their muscles. Based on research conducted by Koniyo et al (2021) PMR therapy was carried out once a day for five days, and the results obtained were a decrease in blood sugar in 11 respondents who received PMR therapy. Progressive muscle relaxation is one of the developer interventions for DM patients to increase relaxation and self-management abilities. This exercise can help reduce muscle tension and stress, lower blood pressure, increase tolerance for daily activities, and increase immunity to improve functional status and quality of life (Koniyo et al, 2021).

The results of a study conducted by Tabari et al (2015) stated that there was an effect of physical exercise on lowering blood glucose levels in type 2 DM patients by doing stretching and flexibility exercises for 10 minutes, then walking for 30 minutes with a maximum increase in heart rate intensity of 60%, then stretching in a sitting position for 10 minutes, all of which was done three times a week for eight weeks. So, the selection of PMR therapy for DM patients, besides aiming to increase physical activity, also serves to manage stress. Implementation of therapy is carried out once a day because the patient still feels weak and lethargic.

Implementation is carried out by the interventions that have been prepared. The primary implementation given to patients is PMR therapy to control blood sugar levels and anxiety. PMR is applied while prohibiting patients and families so that patients and families can apply it independently. During implementation, the client and family cooperated to do PMR therapy. Apart from PMR therapy, pharmacological therapy in collaboration with doctors is also still given, along with non-pharmacological therapy. Non-pharmacological therapy is carried out as a complement to medical management to address client problems.

Based on the implementation and evaluation of the patients when they were given PMR therapy, the results of the evaluation showed the effectiveness of giving PMR therapy to overcome anxiety problems and control blood sugar levels. Patients can perform therapy independently. Patients feel more relaxed after doing PMR therapy; clients can sleep soundly, anxiety decreases, and feelings of boredom while in the hospital can be forgotten when doing PMR therapy. As

well as for the problem of unstable blood sugar levels after the PMR therapy, the patient's blood sugar gradually decreased; besides the PMR therapy the patient also received pharmacological therapy in the form of insulin injections, and the patient also strictly adhered to the advice of his health workers to watch over his diet, the patient only ate the menu from the hospital and was very careful not to consume sugar.

Progressive muscle relaxation is a technique for reducing muscle tension by tightening the muscles and then relaxing a group of muscles, starting with the facial muscles and ending with the leg muscles. Progressive Muscle Relaxation Therapy triggers the release of endorphins and enkephalin chemicals, which respond to brain signals that cause muscles to relax and increase blood flow to the brain. (Manggasa et al. 2021) Herlambang et al.'s research (2019) showed that PMR therapy can reduce stress levels and lower blood sugar levels. PMR can lower blood sugar in DM patients by creating a relaxing space. In this state, there is a change in afferent nerve impulses to the brain, where activation becomes inhibition. This change in nerve impulses causes physically and mentally calm emotions and lowers the heart rate. In this case, the body's metabolic rate prevents blood sugar from rising. The anterior pituitary gland is also inhibited so that the effect of ACTH Cortisol secretion decreases Gluconeogenesis, protein, and fat catabolism, which increases blood sugar reduction (Ungkas, 2019).

Progressive muscle relaxation can lower blood sugar in people with type 2 diabetes by preventing the release of hormones that can trigger an increase in blood sugar, namely the hormones adrenaline, cortisol, glucagon, corticosteroids, thyroid, and adrenocorticotropic hormone (ACHT). The sympathetic nervous system is vital when a person is relaxed and calm. The sympathetic nervous system stimulates the hypothalamus to reduce the release of a corticotropin-releasing hormone (CRH). Decreased release of corticotropin-releasing hormone (CRH) can affect the adenohypophysis and reduce the release of adrenocorticotropic hormone (ACHT), which is transported to the adrenal cortex via the bloodstream. This condition can prevent the adrenal cortex from releasing the hormone cortisol.

The limitation of this study has confounding factors that influenced the results of the study, namely while in the hospital the client received pharmacological therapy to reduce and control blood sugar levels in the form of insulin injections, and the client received sansulin injections. This makes the effects

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of PMR therapy less noticeable. PMR therapy is implemented when the patient is receiving insulin therapy so that the decrease in the patient's blood sugar level can be caused by pharmacological therapy. However, PMR therapy to reduce stress and anxiety is quite adequate; clients feel more comfortable and not bored after doing therapy. Clients feel calm, and they can forget the burden of their thoughts.

In future research, it is possible to evaluate the benefits of progressive muscle relaxation therapy in diabetes mellitus patients in reducing blood sugar levels without pharmacological therapy.

5. CONCLUSIONS

Progressive muscle relaxation (PMR) is effective in reducing patient anxiety and controlling blood sugar. Patients and their families received the implementation of the intervention quite well. In this study, the results showed that respondents experienced a decrease in anxiety from a score of 16 to 6 after being given PMR therapy. Patients also said they could be more relax and calm, and their sleep became sounder after receiving therapy. Patients and families can carry out therapy themselves after being taught. The patient's blood sugar level also decreased from 221 to 147. However, in this case, the patient was still receiving pharmacological therapy, so the effect of PMR therapy on reducing blood sugar levels still needed to be clarified.

This research also proves that progressive muscle relaxation therapy can be a non-pharmacological therapy that nurses can apply to overcome nursing problems of anxiety and unstable blood sugar levels in diabetes mellitus patients.

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AUTHOR CONTRIBUTIONS

Substantial contributions to conception, data collection, and analysis: Faiqotul Himmah, Ana Nistiandani, Mulia Hakam and Sulis Setyowati. Writing manuscript and revisions: Faiqotul Himmah.

CONFLICT OF INTEREST

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

DATA AVAILABILITY STATEMENT

Several data are not publicly available due to ethical restrictions.

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