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The Application of Diabetes Foot Exercise to Mr. A With Type 2 Diabetes Mellitus as an Improvement of Leg Blood Circulation in the Anturium Room of dr. Soebandi Hospital: Case Study

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Abstract:
Diabetes mellitus is a metabolic disease characterized by hyperglycemia due to pancreatic cell damage. Diabetes mellitus can lead to various complications such as nephrotic disease, retinopathy, heart disease and stroke, and nerve damage or peripheral neuropathy and other complications, which are also often called diabetic foot. This scientific work uses a case report method that describes the case of Mr. A with the main nursing problem of ineffectiveness. A with the main nursing problem of ineffective peripheral perfusion in the Anturium Room of Dr. RSD. The approach taken is to use comprehensive nursing care for 3 days starting on December 23-25, 2023. In this scientific paper, diabetic foot exercises were applied to Mr. A which can be done for 3 - 4 days. A which can be done for 3 - 4 / week within 15 - 30 minutes with 10 kinds of movements that aim to improve blood circulation in the foot area with the results of research measuring the value of the Ankle Brachial Index (ABI) in Mr. A patient categorized as mild. Mr. A is categorized as mild. Mr. A is categorized as mild with minimal grafting. The application of diabetes mellitus foot exercises is related to improving blood circulation in the feet to prevent diabetes complications.

Keywords:
type 2 diabetes mellitus; foot exercises; ankle brachial index; peripheral perfusion; complication

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INTRODUCTION

Diabetes mellitus is a metabolic disease characterized by hyperglycemia due to damage to pancreatic cells. Diabetes mellitus can cause various complications such as nephrotic, retinopathy, heart disease and stroke, and nerve damage or peripheral neuropathy, as well as other complications, also often called a diabetic foot (Diabetes Canada Association, 2023). This disease is chronic, and the number of sufferers is increasing worldwide (Eltrikanawati and Tampubolon, 2020). In the last 3 years, the increase in cases of type 2 diabetes mellitus has increased dramatically worldwide (WHO, 2023). The results of the preliminary study found that in the Anturium room of Dr. Soebandi Jember Hospital, patients with diabetes mellitus can be at risk for diabetic foot ulcers. In addition, the ward nurse has not yet applied diabetic foot exercise therapy to overcome the nursing problem of ineffective peripheral perfusion.

The International Diabetes Federation (IDF) Diabetes Atlas 10th edition increased the global prevalence of diabetes by 537 million adults aged 20-79 years. The number of predictions will increase to 643 million in 2030 and 783 million in 2045, with death data in 2021 of 6.7 million every second (International Diabetes Federation, 2022). The WHO organization predicts a considerable

increase in the number of patients with type 2 diabetes in the coming years. Based on the 2018 Basic Health Research (RISKESDAS) report by the Ministry of Health, the prevalence of DM is 10.9%. The International Diabetes Federation (IDF) in 2019 ranked Indonesia as the 6th country in the number of DM patients reaching 10.3 million. The World Health Organization predicts an increase in type 2 DM patients in Indonesia from 8.4 million in 2000 to 21.3 million in 2030. The International Diabetes Federation (IDF) prediction also shows that in 2019 - 2030, there will be an increase in the number of DM patients from 10.7 million to 13.7 in 2030 (Indonesian Endocrinology Society, 2021). Based on a preliminary study conducted on December 23, 2023, in the Anturium Room of dr. Soebandi Hospital, the number of patients treated with diabetes mellitus was 3 out of 16 beds.

Type 2 diabetes mellitus can cause various complications and cause death. One complication that often occurs is a disturbance in the peripheral blood vessels of the lower extremities or parts of the feet so that nursing problems will arise from ineffective peripheral perfusion caused by neuropathy disorders (Liao et al., 2018; Purwaningsih et al., 2024). This occurs due to a decrease in oxygen levels in the blood, leading to nerve fibers so that the delivery of implants to the nerves decreases so that there is a decrease in sensitivity and diabetic ulcers or wounds due to hyperglycemia (Simamora, Siregar et al., 2020; Kurniyawan et al., 2023). High glucose in the blood results in decreased vasodilation of blood vessels to the nerves so that signs of capillary filling > 2 seconds appear, decreased peripheral pulse, cold palpable acral, pale skin color, skin turgor, tingling sensation, numbness, and burning (Setiawan, 2021).

To overcome the nursing problem of ineffective peripheral perfusion in diabetes mellitus, nurses can perform non-pharmacological management, namely diabetic foot exercises (Yang et al., 2021). Diabetic foot exercise is one way to reduce complications in patients with type 2 diabetes mellitus, which aims to improve blood circulation, strengthen small muscles, prevent foot shape changes, and overcome joint motion limitations (Mi et al., 2019). The peripheral vascularization disorders that occur in patients with diabetes mellitus can be determined by measuring the ankle-brachial index (ABI), which aims to determine the presence of vascular disorders in the feet so that an increase in complications from diabetic ulcers can be prevented (Prabawati, Sari and Neonbeni, 2021).

Based on the description above, the researcher is interested in carrying out nursing care, which will be poured in the form of Ners Final Scientific Work with the title Application of Diabetes Foot Gymnastics on Mr. A with Diabetes Mellitus Type II as an Improvement in Blood Circulation in the Anturium Room RSD dr.Soebandi Jember. A with Type II Diabetes Mellitus as an Improvement in Blood Circulation in the Anturium Room of dr. Soebandi Hospital of Jember.

STUDY DESIGN

The research method used a quasi-experimental design that focused on nursing care for patients with diabetes mellitus located in the Anturium room of RSD dr. Soebandi Jember, which began on December 23-25, 2023. The samples used in the study were patients with a medical diagnosis of Diabetes Mellitus who met the characteristics of the inclusion and exclusion criteria. This method uses Evidence-Based Nursing (EBN) following Standard Operating Procedures (SOP) diabetic foot exercises and standard observation sheet procedures (SOP) Ankle Brachial Index (ABI) measurements to determine the strength of peripheral blood circulation by comparing dorsalis pedis systolic blood pressure with brachial systolic pressure, before and after being given diabetic foot exercise therapy.

PATIENT INFORMATION

Assessment of the patient on December 23, 2023, the patient said he had suffered from Diabetes Mellitus for ± 5 years, and 2 years later, the patient suffered from heart disease. During the assessment, the patient has a bad habit pattern, such as frequent consumption of coffee, coconut milk food, and drinks high in sugar. Composmentis examination, blood pressure 140/100 mmHg, respiration rate (RR) 20/min, SpO2 98%, no chest wall retraction, no shortness of breath. Heart rate (HR) Mr. A 72 x/min, regular rhythm, single S1 and S2 heart sounds, no additional heart sounds, cold acral, capillary refill time (CRT) > 2 seconds, temperature 36.9^{o}C. GCS 456, light reflex pupils: isochor, mental status, and speech are good; there is a dry wound on the back of the right leg. The laboratory results were obtained on December 23, 2023, with hemoglobin 14.2 g/dl, leukocytes 10x103/uL, Hematocrit 42.0%, platelets 377 x103/uL, Eosinophils 5%, Lymphocytes 23%, Monocytes 9%, Sodium 137.4 mmol/L, Potassium 3.22 mmol/L, Chloride 100.4 mmol/L, Serum creatinine 1.2 mg/dL, BUN 16 mg/dL, GDA 278 mg/dL.

THERAPEUTIC INTERVENTION

One of the complications that often occurs is a disturbance in the peripheral blood vessels of the lower extremities or parts of the legs so that there will be a nursing diagnosis problem of ineffective peripheral perfusion b.d hyperglycemia d.d patient weakness, decreased skin turgor, dry wounds on the back of the right leg, cold acral, CRT> 3 seconds, ABI value 0.78, GDA 278 mg/dL. Diabetic foot exercises can be done by sitting, standing, and sleeping. Diabetic foot exercise movements can be in the form of bending, straightening, lifting, turning out or in, and gripping movements with 10 kinds of movements that are densely packed for 3 - 4 / week with 15 - 30 minutes in one session.

CLINICAL FINDINGS

The results of the implementation of diabetic foot exercises are described in the following table.

Table 1. EBN Implementation Results

Day	Date	Time	Pretest/ posttest	Ankle		Brachial		Right ABI	Left ABI	Ankle Brachial Index Interpretation
				Right	Left	Right	Left			
Day 1	23/12/2023	10.00 AM	Pretest	110	100	140	135	0.78	0.71	Mild Obstruction
		12.00 PM	Posttest	120	110	130	120	0.92	0.84	Mild Obstruction
Day 2	24/12/2023	10.00 AM	Pretest	110	100	135	120	0.81	0.74	Mild Obstruction
		12.00 PM	Posttest	115	100	130	130	0.88	0.76	Mild Obstruction
Day 3	25/12/2023	10.00 AM	Pretest	115	100	140	130	0.82	0.71	Mild Obstruction
		12.00 PM	Posttest	120	120	140	135	0.85	0.85	Mild Obstruction

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The results of observations carried out for 3 days (December 23-25, 2023) at the time of the posttest can be seen as an increase in ABI values with minimal occlusion interpretation. Diabetic foot exercises performed <3 times/week for 30 minutes will be at risk of peripheral neuropathy complications compared to those who do diabetic foot exercises 3 or more times/week for 30 minutes in patients with diabetes mellitus. An ABI value of <0.09 is the limit for diagnosing lower extremity PPE. A decrease in ABI .0.15 can effectively detect the development of significant PAD; if there is a difference between 15 - 20 mmHg in brachial pressure, it indicates the presence of subclavian cyanosis. A difference of 20 - 30 mmHg in ankle pressure indicates obstruction of the lower leg with lower pressure.

DISCUSSION

The observations made for 3 days (23-25 December 2023) showed that the patient's assessment obtained a GDA value of 278 mg/dL with a normal limit of > 200 mg/dL. The patient had Diabetes Mellitus for ± 5 years, and for the next 2 years, the patient suffered from heart disease. This is in line with the opinion (Aziza and Istiqoma, 2024) that glycemic imbalance in the blood causes increased oxidative stress and tissue damage, which results in decreased sensorimotor function so that the duration of Diabetes Mellitus has a relationship with the emergence of complications. A healthy diet for patients with diabetes mellitus is a diet with 3J planning, namely the amount, type, and regular meal schedule (Lindberg, Møller, and Kirketerp-møller, 2018).

The assessment showed that before the patient was sick, he often consumed coffee in the morning, drank ice syrup every time he returned from farming activities, and liked coconut milk. According to Azizah and Yulita (2023), a diet that is high in carbohydrates and unhealthy causes the sugar content in the body to be high so that glucose in the body exceeds the work capacity of the pancreas and causes insulin retention. The application of diabetic foot exercises to the nursing problem of ineffective peripheral perfusion is carried out for 3 - 4 / week with a time of 15 - 30 minutes with 10 movements that aim to improve blood circulation in the foot area. This aligns with the opinion (Rondhianto and Nistiandani, 2023) that foot care behavior is the first step in preventing complications in Diabetes Mellitus patients from improving peripheral blood circulation. Diabetic foot exercises aim to flex and strengthen the muscles of the lower limbs in both ankles and toes with the principle of moving all foot joints according to the patient's ability (Nuriya and Taufik, 2022).

Implementation of diabetic foot gymnastics on Mr. A times in 3 days with a duration of 15 - 30 minutes each session. The process of measuring peripheral circulation includes decreased pale skin color, improved acral, improved skin turgor, capillary refill time (CRT) < 3 seconds, and Ankle-brachial index measurement values within normal limits (0.90-1.30), which are carried out before and after therapy. This aligns with previous research (Faizah and Efendi, 2021). The time of application of diabetic foot gymnastics on Mr. A was given at 10.00 WIB. Mr. A is given at 10.00 WIB, which can provide effectiveness.

This research is in line with (Gomez et al., 2015) that physical activity of diabetic foot exercises in the morning results in a lower risk of hypoglycemia than afternoon exercise and improves metabolic control the following day. In this study, Mr. A showed improvement after therapy on the second day, including decreased pale skin color, improved acral, improved skin turgor, capillary refill time (CRT) < 3 seconds, Ankle-brachial index measurement values within normal limits (0.90-1.30) during the second day. Blood circulation in the legs can be assessed by the results of the Ankle Brachial Index (ABI) examination, which functions to detect early signs and

symptoms of ischemia and decreased peripheral perfusion, which can result in angiopathy and diabetic neuropathy (Faizah and Efendi, 2021). The results of the research measurement of the Ankle Brachial Index (ABI) value in patient Mr. A are categorized as minimal grafting. A is categorized as minimal grafting. This happened because Mr. A has controlled diabetes millitus by taking anti-diabetic drugs regularly.

CONCLUSION

The results of nursing diagnoses in patients with complications that often occur in patients with diabetes mellitus are disorders of the peripheral blood vessels of the lower extremities or parts of the feet so that nursing problems will arise ineffective peripheral perfusion caused by neuropathy disorders. Diabetic foot exercises can be done as much as 3 - 4 / week with 15 - 30 minutes and 10 movements that improve blood circulation in the foot area to prevent complications.

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