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Foot Sensitivity Increases in Diabetes Patients Who Are Given Range of Motion Exercise at Kabila Community Health Center : A Case Series

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ABSTRACT

Background: Diabetes mellitus is a disease that always increases from year to year. Diabetes mellitus sufferers can experience various kinds of complications which can result in decreased body function, one of which is decreased foot sensitivity. Various efforts can be made to overcome this problem, one of which is the active range of motion (ROM) of the legs. Active foot ROM is a basic movement to increase foot sensitivity in diabetes mellitus sufferers.
Purpose: Describe the effect of Range of Motion (ROM) in increasing foot sensitivity in diabetes mellitus sufferers.
Methods: The study using descriptive qualitative design with case study approach
Results: There was an increase in foot sensitivity score in the three informants. There was also reduction in neuropathy symptoms after undergoing range of motion therapy.

Conclusion: Range of motion can be applied to patient with decrease of foot sensitivity so that quality of life of diabetic patient can be improved.

Keywords:
Foot sensitivity, range of motion, diabetes mellitus.

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BACKGROUND

In the era of globalization, there has been a shift from infectious diseases to noncommunicable diseases, with more and more degenerative diseases, one of which is Diabetes Mellitus (Purnamawati et al., 2019a). Diabetes Mellitus is a disorder of glucose metabolism that causes problems with glucose control so that blood sugar levels become high (Fakhriatul et al., 2022). According to the International Diabetes Federation (IDF) (2019), diabetes mellitus is a major health problem. This is due to the increase in the number of diabetes mellitus sufferers from year to year (Manggasa et al., 2021). Diabetes mellitus is a disease that continues to increase every year in countries around the world. Diabetes is a metabolic disorder due to the effects of insulin secretion, insulin action or both resulting in an increase in glucose concentration in the blood (hyperglycemia). Hyperglycemia is associated with long-term damage, failure of several body organs, especially the eyes, kidneys, nerves, heart and blood vessels (Nur Hidayat et al., 2021).

The World Health Organization (WHO) predicts a significant increase in the number of people with diabetes in Indonesia, from 8.4 million in 2000 to around 21.3 million in 2030. In line with WHO, the International Diabetes Federation (IDF) also estimates an increase in diabetes sufferers to 12.0 million in 2030. Indonesia ranks 4th in terms of the number of Diabetes Mellitus sufferers in the world (Adam & Tomayahu, 2019). Based on the results of the 2018 Riskesdes, it shows that there is an increase in the prevalence of DM in Indonesia from 6.9% in 2015 to 8.5% in 2018. Gorontalo ranks 7th in the number of Diabetes Mellitus sufferers out of 35 provinces in Indonesia (Falah, 2024). The number of Diabetes Mellitus sufferers at Gorontalo in the last 3 years experienced an increase, namely in 2020 by 2.28%, in 2021 by 2.74% and in 2022 by 393%. One of the areas with relatively high diabetes mellitus sufferers in 2022 is Bone Bolango Regency with a total of 9,513 sufferers (393%) (Gorontalo Provincial Health Service 2022). From initial data collection at the Kabila Community Health Center, it was found that the number of Diabetes Mellitus sufferers was 516 people in 2022.

Type 2 Diabetes Mellitus is the most common, namely 95% of all DM cases. The high number of type 2 DM patients is partly due to changes in people's lifestyles, low levels of knowledge, and lack of awareness for early detection of DM. Unhealthy lifestyle changes such as excessive food (fatty and low fiber) will cause sugar levels to increase so that the feet experience tingling which will result in decreased foot sensitivity (Lukita et al., 2018). Decreased foot sensitivity can be an early sign of diabetic neuropathy and diabetic ulcers (Falah et al., n.d.). The presence of peripheral neuropathy will cause loss or decrease in the sensation of pain in the feet, so that the feet will experience trauma without feeling which results in ulcers on the feet (Purnamawati et al., 2019b).

Decreased foot sensitivity is characterized by tingling, thick feet, no sensationwhen the soles of the feet are touched, burning pain, cramps all over the body, especially at night and damage occurs to the nerve fibers of DM sufferers. The main goal of Diabetes Mellitus treatment is to prevent and minimize acute and chronic complications (Falah & Apriana, 2022) . One of the treatments for diabetes mellitus is to reduce nerve damage or peripheral neuropathy by using ROM exercises. Range of Motion

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(ROM) is an exercise used to maintain or improve the level of perfection of the ability to move joints normally and completely to increase muscle tone and muscle tone (Patriyani, 2017a).

The effectiveness of Range of Motion (ROM) therapy has been proven through various studies. Research (Purnamawati et al., 2019) found an increase in foot sensitivity in diabetes mellitus patients after being given Ranfe Of Motion (ROM) intervention. Another study by (Patriyani, 2017) showed that after active foot ROM, there was an increase in foot sensitivity and increased blood circulation in the lower extremities, thereby reducing the risk of diabetic foot ulcers in people with Type 2 Diabetes Mellitus. Active foot Range of Motion (ROM) exercise has the advantage that it can done alone, does not have to be in a group, the time required is short, easy to do independently by the patient at home (Purnamawati et al., 2019b). Most of diabetic patient in community complain of decreased sensitivity after suffering from diabetes, meanwhile foot exercises are still very rarely implemented as a routine intervention for diabetes patients in Gorontalo this is the reason why research is needed regarding the application of ROM in increasing foot sensitivity in diabetes patients.

OBJECTIVE

The aim of this study is to describe profile of foot sensitivity of diabetic patient who undergoing range of motion therapy.

METHODS

This research uses a qualitative descriptive design with a case study approach. The sample was obtained using a purposive sampling method with the number of subjects involving 3 Diabetes Mellitus patients in the Kabila Health Center Working Area. The inclusion criteria for informants were suffering from type 2 diabetes mellitus, female, aged 45-50 years, experienced decreased sensitivity in the feet, and had no obstacles in receiving information and communication. The exclusion criteria were patients with diabetic ulcers and patient who refused to be respondents. Before and after the intervention, foot sensitivity was measured using the 10 grams monofilament test which has gone through a validity test from (Milleniantary, 2021) research with sensitivity level 38,5 – 61, 5 % and specificity level 77, 5- 95,5 %.

RESULTS

The characteristics of the informants can be detailed as follows

Table 1.1
Characteristics of Informants Based on Age, Gender, Education, Occupation, Length of Suffering, Body Weight, Current Blood Glucose Levels

Characteristic	Informants Code

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	1	**2**	**3**
Age	50	45	48
Sex	Women	Women	Women
Education	Elementary School	Senior High School	Senior High School
Occupation	Housewife	Housewife	Housewife
Length of Suffering	5 years	5 years	4 years
Weight	65 kg	63 kg	56 kg
Blood Glucose	202 mg/dL	172 mg/dL	205/dL

Based on the characteristics table above, all subjects are female with an age range of 45-50 years. The duration of suffering for all subjects was 4 - 5 years . Most of the informant have controlled blood sugar.

Table 1.2

Foot Sensitivity Before and After Therapy

Informant Code	**1st Week**		**2nd Week**		**3rd Week**	
	Right Foot	**Left Foot**	**Right Foot**	**Left Foot**	**Right Foot**	**Left Foot**
1	5	2	5	2	5	3
2	2	5	3	5	4	5
3	3	5	3	5	4	5

Based on the table aboved it can be seen there was an improvement of sensitivity score on lower extremity of the patient. For the 1st informant it can be seen on the left foot, and the other informant can be seen on the rigt foot. The increase obtained in three informants are 1- 2 score.

DISCUSSION

Based on table 1.2, it can be concluded that there was an increase in foot sensitivity in the three informants. Informant 1 increased from score 2 to score 3, informant 2 increased from score 2 to score 4, and informant 3 increased from score 3 to score 4. The results of measuring foot sensitivity are in line with the results of interviews conducted with the three informants. Before the intervention was given, informant 1 said his left leg often cramped when he sat too much, informant 2 said his right leg often tingled, and informant 3 said his right leg often cramped. Then, after being given ROM intervention, the three informants said that the cramps they felt in their legs had begun to decrease

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Modt of the subject have controlled blood sugar. Based on the results of observations of blood glucose levels during the three informants. Informant 1 in week 1 and week 2 experienced an increase in blood glucose levels at any time, which means that in week 1 when it was measured it was 204 mg/dL and in week 2 when it was measured it was 207 mg/dL. Then in week 3 there was a decrease of 172 mg/dL. Informant 2 at week 1 experienced an increase of 202 mg/dL. Then in the 2nd and 3rd weeks there was a decrease in blood glucose levels, which means that in the 2nd week when it was measured it was 160 mg/dL and in the 3rd week when it was measured it was 125 mg/dL. Informant 3 in weeks 1 and 2 experienced an increase in blood glucose levels, which means that in week 1 when it was measured it was 208 mg/dL and in week 2 when it was measured it was 2018 mg/dL. Then in the 3rd week the blood glucose level decreased when it was measured to 135 mg/dL

Of the three informants, the most significant increase in foot sensitivity was found in informant 2, because informant 2 routinely takes medication regularly, always carries out checks, does a lot of activities at home, and regularly carries out ROM procedures independently. Compared with informants 1 and 3, informant 1 did less activity, the informant admitted to stopping his medication if he felt healthy and the lack of information meant that the informant did not know that there were any dangers in stopping the medication. Informant 3 said that he often forgot to take his medicine because he was too busy, rarely had examinations, and admitted that he lacked attention from his family regarding the illness he was suffering from

In line with theory form (Simanjuntak & Simamora, 2020) factors that influence decreased foot sensitivity are lifestyle, lack of physical activity, long suffering from type 2 DM and poor diet which is difficult to control. Suffering from DM for a long time with high blood glucose levels can weaken and damage the capillary walls, resulting in decreased sensitivity in the respondent's feet. Low foot sensitivity will increase the risk of diabetic peripheral neuropathy in people with type 2 DM. The age factor in DM according to (Usia et al., 2018) as you get older, physical changes and a decrease in body function will affect the consumption and absorption of nutrients. Various studies show that nutritional problems in old age are mostly problems of excess nutrition and overweight/obesity which trigger the emergence of disease.

The educational factor in DM is the high risk of developing type 2 diabetes mellitus in low education, possibly due to a lack of knowledge in patients with low education regarding health and difficulty or slow acceptance of information (counseling) provided by officers so that it has an impact on behavior/lifestyle Healthy (Jayanti et al., 2019). The level of knowledge factor has a positive and significant effect on medication adherence for DM patients in Indonesia. DM patients who have a high level of knowledge tend to be more compliant with their treatment ((Nugraha et al., 2020). Although in this research most of the subject have lower education level, before the intervention , patient were educated patients are given health education about self-management of diabetes mellitus patients.

The employment status factor according to menurut (Ilham et al., 2021) was studied by five studies and two of them concluded that the employment status of a DM patient will influence medication adherence. Patients who do not work tend to be more compliant

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than patients who work. DM patients at community health centers who do not work tend to be more focused on their treatment because they are not distracted by busy work which can take up time, causing patients to miss their treatment. However, other research conducted on diabetes mellitus patients in hospitals stated that diabetes mellitus patients who did not work were at greater risk of non-compliance with their treatment. The employment status factor is associated with the income factor, where diabetes mellitus patients who work will earn income, making it easier for patients to access better treatment. In this research, several other countries also found this variation. Research in India, Ethiopia and Brazil concluded that employment factors influence medication adherence in diabetes mellitus patients. However, research in Saudi Arabia states that this factor has no influence on this behavior.

An increase in blood sugar levels causes decreased foot sensitivity. Blood sugar levels in the legs are not smooth, characterized by tingling, a thick feeling on the soles of the feet, and not feeling sensations when the feet are in pain. The soles of the feet do not feel the sensation when the feet are touched; reducing these signs and symptoms can be done by exercise. To reduce these signs and symptoms, active ROM foot exercises. Active ROM of the foot can improve blood circulation and reduce blood sugar levels. Improve blood circulation and reduce blood sugar levels to increase foot sensitivity(Asih et al., 2024) . (Patriyani, 2017) eexposed that active ROM leg training is a form of physical activity that is useful for smoothing and facilitating blood flow into cells, especially in the legs, as well as improving nerve function and preventing neuropathy

The results of this study show that there is an influence of active Range of Motion (ROM) of the feet on reducing foot sensitivity in diabetes mellitus patients. Range of Motion (ROM) has proven to be effective in increasing foot sensitivity so that there is a difference before and after the ROM intervention is given. The results of this study are in line with research (Wahyuningsih & Kusumanningrum, 2021) that there is an effect of giving Range of Motion on the level of foot sensitivity. Judging from before giving ROM, some respondents were found to have decreased foot sensitivity, namely 65%, which means 25 people out of 80 respondents experienced a decrease in foot sensitivity. After being given ROM, there was an increase in foot sensitivity, namely 48 people out of 80 respondents experienced an increase in foot sensitivity. This research was carried out 3 times a week for 1 month with a frequency of 30 minutes. Compared with research conducted by researchers, there was an increase after being given ROM 3 times a week for 3 weeks with a frequency of 15 minutes. However, this increase was not significant because the research time relatively short , therefore for further research the length of research must be increase for significant result.

CONCLUSION

Based on the research that has been carried out, it can be concluded that there are differences in the level of foot sensitivity before and after being given active foot ROM intervention. Informants 1 and 3 experienced an increase of 1 level, while informant 2

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experienced an increase of 2 levels
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