

The Effect of Foot Exercise on Foot Sensitivity in Type II Diabetes Mellitus Patients in Environment IV of Dataran Tinggi Village, Binjai in 2024

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ABSTRACT

Indonesia is a country with a fairly high incidence rate. Data found that type 2 DM sufferers in Indonesia reached 1.5% or around 4.1 million people from the total population, then one of the complications that arises from diabetes mellitus sufferers is decreased sensitivity in the feet, this phenomenon if left unchecked will become diabetic ulcers. Objective: To determine foot sensitivity before and after implementing diabetes foot exercises. Knowing the differences before and after the implementation of diabetes mellitus foot exercises on foot sensitivity in diabetes mellitus sufferers. This type of research is descriptive research. This implementation was carried out for 7 days with 3 meetings. The respondents used in this study were diabetes mellitus sufferers who experienced decreased sensitivity in their feet, which was characterized by frequent tingling sensations and decreased stimulation. After applying diabetic foot exercises, it showed an increase in foot sensitivity in diabetes mellitus sufferers. Applying diabetic foot exercises can increase foot sensitivity in people with diabetes mellitus.

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INTRODUCTION

Diabetes Mellitus is a disease characterized by the occurrence of hyperglycemia and impaired metabolism of carbohydrates, fats, and proteins associated with an absolute or relative deficiency of insulin work and/or secretion. Symptoms complained of in people with Diabetes Mellitus are polydipsia, polyuria, polyphagia, weight loss and tingling.

According to the World Health Organization (WHO), in 2020 it is estimated that there are around 422 million people worldwide suffering from diabetes mellitus, and most of them are from low- and middle-income countries. The number of cases and prevalence of diabetes continues to increase every year due to diabetes and there are 1.6 million deaths directly linked to diabetes itself (WHO, 2020)

Diabetes Mellitus is a metabolic disorder caused by the failure of the pancreatic organs to produce the hormone insulin adequately. This disease can be said to be a chronic disease because it can occur chronically. Based on the cause, diabetes mellitus is classified into three types, including type 1, type 2 diabetes mellitus and gestational diabetes mellitus (Ministry of Health of the Republic of Indonesia, 2020)

According to the Data and Information Center of the Ministry of Health of the Republic of Indonesia (InfoDATIN) in 2020, almost all provinces in Indonesia showed an increase in the prevalence of diabetes mellitus from 2013 to 2018. The province with the highest prevalence of diabetes mellitus in Indonesia in 2018 is still the same as in 2013, namely DI Yogyakarta Province followed by DKI Jakarta, North Sulawesi, and East Kalimantan.

Type 2 diabetes mellitus occurs due to insulin resistance where cells in the body are unable to fully respond to insulin. Gestational diabetes is caused by rising levels of various hormones during pregnancy that can inhibit insulin action (International Diabetes Federation, 2019)

North Sumatra Province is one of the urban areas that has a high number of people with diabetes mellitus and every year it is increasing. The prevalence of diabetes mellitus in North Sumatra Province based on Riskesdas data in 2018 is at the level of 10 regions with the highest prevalence reaching 1.9%. The highest prevalence of >15-year-old diabetes mellitus diagnosed in North Sumatra Province.

In Binjai City, it is around 2.04% and the lowest prevalence is found in Humbang Hasundutan which is around 0%. The high prevalence of diabetes mellitus is caused by several factors, namely factors that cannot be changed such as gender, age, and factors that can be changed such as smoking habits, education level, occupation, physical activity, smoking habits, and body mass index (BMI). The prevalence of diabetes mellitus is also greatly influenced by factors such as knowledge, education, income, the length of suffering from diabetes, and family support, including the treatment of diabetes mellitus which will affect the complications caused.

If the increase in blood sugar levels is not quickly addressed, it can cause many problems. Such as complications of type 2 diabetes mellitus which are chronic and acute. Chronic complications are divided into two, namely macrovascular and microvascular. Macrovascular complications such as heart disease, cerebrovascular disease, and peripheral vascular disease. Meanwhile, microvascular complications such as retinopathy, kidney disease, and neuropathy (Mildawati et al., 2019)

Diabetic foot exercises are exercises or movements performed by both legs alternately or simultaneously which are useful for strengthening or flexing the muscles in the lower limb area, especially in both ankles and toes, improving blood circulation in the foot area (Damayanti, 2020)

METHOD

Research design is a very important part of research, allowing maximum control of several factors that can affect the accuracy of a result in identifying the structure of the research to be carried out (Nursalam, 2013). The research on the administration of diabetes mellitus exercises on changes in foot sensitivity in patients with type 2 diabetes mellitus used a case study research design. This case study research is carried out by providing intervention or treatment and then seeing the effect (aziz, et, al 2019)

RESULTS AND DISCUSSION

Table 1. Characteristics of Foot Sensitivity before Doing Foot Exercises Using Newspapers in Patients with Type 2 Diabetes Mellitus

Respondent	Age	Data Response		
		GDA	Long Suffering	Sensitivity Before
Ny. M	59 thn	258 mg/dL	7 Years	1
Ny. N	57 thn	284 mg/dL	5 Years	2

From table 1 above, it shows that there is 1 respondent who is 57 years old and 1 respondent who is 59 years old. The average blood sugar level was >200 mg/dL, while the duration of suffering was 3-5 years as many as 2 respondents and the sensitivity value of 1-2 was 2 respondents.

Table 2. Characteristics of Foot Sensitivity Before and After Foot Exercises in Patients With Type 2 Diabetes Mellitus

Respondent	1st meeting		
	Before	After	Information
Ny. M	1	1	No sensitivity changes less
Ny. N	2	2	No moderate sensitivity change

From the table in 2 above, it shows that both respondents did not experience any changes in foot sensitivity.

Table 3. Characteristics of Foot Sensitivity Before and After Foot Exercises in Patients With Type 2 Diabetes Mellitus

Respondent	2nd meeting		
	Before	After	Information
Ny. M	1	1	No sensitivity changes less
Ny. N	2	2	No moderate sensitivity change

From the table in 3 above, it shows that the two respondents did not experience any changes in foot sensitivity.

Table 4. Characteristics of Foot Sensitivity Before and After Foot Exercises in Patients With Type 2 Diabetes Mellitus

Respondent	3rd meeting		
	Before	After	Information
Ny. M	1	1	No sensitivity changes less
Ny. N	2	2	No moderate sensitivity change

From the table in 4 above, it shows that both respondents did not experience any changes in foot sensitivity.

Table 5. Characteristics of Foot Sensitivity Before and After Foot Exercises in Patients With Type 2 Diabetes Mellitus

Respondent	4th meeting		
	Before	After	Information
Ny. M	1	1	No sensitivity changes less
Ny. N	2	3	There is a change in sensitivity both

From the table in 5, it shows that Mrs. M did not change while Mrs. M at the 4th meeting experienced a change from moderate to good sensitivity.

Table 6. Characteristics of Foot Sensitivity Before and After Foot Exercises in Patients With Type 2 Diabetes Mellitus

Respondent	5th meeting		
	Before	After	Information
Ny. M	1	2	There is a change in moderate sensitivity
Ny. N	3	3	There is a change in sensitivity both

Table 6 shows that Mrs. M at the 5th meeting experienced a change from less to moderate sensitivity, while Mrs. N did not experience a change.

Table 7. Characteristics of Foot Sensitivity Before and After Foot Exercises in Patients With Type 2 Diabetes Mellitus

Respondent	6th meeting		
	Before	After	Information
Ny. M	2	2	No moderate sensitivity change
Ny. N	3	3	No change in sensitivity either

From the table in 7, it shows that the two respondents did not experience a change in sensitivity. From the table above, the number of sensitivity changes from 1-3 at the 1st meeting to the 3rd meeting

has no sensitivity changes. Furthermore, at the 3rd meeting, there was no change in sensitivity. Furthermore, in the 4th meeting, Mrs. N experienced a change in sensitivity from 2 (moderate) to 3 (good). At the 5th meeting, Mrs. M experienced sensitivity from 1 (less) to 2 (moderate). And at the 6th meeting there was no change in sensitivity.

Discussion

Foot Sensitivity Before *Foot Exercise* (foot exercises)

Based on the results of the study, the results of foot sensitivity before doing diabetic foot exercises were found that Mrs. M and Mrs. N both experienced tingling or numbness in the legs and thick pain on both legs, but Mrs. M showed a low sensitivity category (sensitivity 1), while Mrs. N showed a moderate sensitivity category (sensitivity 2).

Based on the above research, it can be concluded that before doing foot exercises, the sensitivity is lacking. This is because respondents aged 57-59 years old, the older a person gets, the lower the blood circulation will decrease and experience changes in the sensitivity of a person's feet. Meanwhile, from physical activity, it shows that respondents work as housewives or do not have activities outside the home. So that physical activity and age can affect the increase in foot sensitivity and have a direct effect on reducing blood sugar levels.

Patient Response During *Foot Exercise*

The application of diabetic foot exercises was carried out in the East Binjai Dataran Tinggi Village for 7 consecutive days, carried out 1 time a day for 30 minutes. The patient's response during diabetic foot exercises is as follows:

1. On the first day, Mrs. M and Mrs. N's response when giving diabetic foot exercises using coconut was able to follow the researcher's movements according to the procedure. In the first movement, both respondents were able to sit upright with their feet touching the floor. Mrs. N's second movement was a little confused to hug the movement at the same time while Mrs. M was able to do it. The third movement of the two respondents was able to do it easily. The fourth movement of the two respondents was able to move the legs in a twist with movements on the ankles. At the time of the fifth movement, both respondents had difficulty following the researcher's movements, namely when lifting the heel and making a circular movement with movements on the ankle. In the sixth movement, both respondents were able to straighten their legs forward, but it was difficult to write in the air with their feet from 0 to 10. The seventh movement of the two was able to step on the newspaper and make a circular movement. Both respondents said they did not feel pain during the implementation of foot exercises.
2. The second day when the implementation of diabetic foot exercises using coconut for both respondents was still the same as the first day, where there were still some difficulties in following the movements given by the researchers. GDA Mrs. N = 284 mg/dL while Mrs. M = 258 mg/dL.
3. On the third day when the implementation of diabetic foot exercises using coconuts has progressed, where they have been able to recognize the movements given by the researcher and are able to do it themselves. Both respondents said there was no pain during the exercise
4. On the fourth day, the two respondents were able to do diabetic foot exercises using newspapers independently. Both respondents said they were happy during the gymnastics, during gymnastics the two respondents did not feel dizzy or sleepy. Mrs. N's GDA = 284 mg/dL while Mrs. M = 254 mg/dL.
5. On the fifth day, the two respondents were able to do diabetic foot exercises using coconut well and earnestly. Both respondents said that they had started to rarely feel tingling and thick legs so they were numb.

6. On the sixth day, the two respondents were able to do well and both said that they felt more relaxed and rarely felt tingling or felt thick in the legs by doing diabetic foot exercises using newspapers every day. Mrs. N = 280 mg/dL while Mrs. M = 251 mg/dL.

Based on the results of significant changes, based on the results of observations made by researchers after being given diabetic foot exercises using coconut to increase foot sensitivity in diabetics, some of the complaints felt by respondents began to decrease, including feeling frequent tingling and feeling thick legs so that they became numb

Foot sensitivity after doing foot exercises.

Based on Table 2, the results of the study on the administration of diabetic mellitus foot exercises in patients with type 2 diabetes mellitus in the highlands. In the first and second meetings, the respondents were still taught leg exercises using newspapers, while in the third meeting, the respondents began to do foot exercises using newspapers independently, but the change in foot sensitivity was faster for Mrs. N, this is because Mrs. N was very enthusiastic and happy with the holding of diabetic foot exercises using newspapers because it could change the sensitivity of the feet and facilitate blood flow to the feet. Mrs. M experienced a change on the fifth day because Mrs. M was older than Mrs. N.

The research conducted for 6 days obtained the conclusion that the average sensitivity value of respondents increased after doing foot exercises using newspapers

Table 8. Average value of change in respondent sensitivity

Respondent	Value (Before)	Value (After)	Difference
Ny. M	1,2	1,3	0,1
Ny.N	2,3	2,5	0,2

The average sensitivity value of Mrs. M before gymnastics was 1.2, while the average value after gymnastics was 1.3, so there was a change of 0.1 after gymnastics. Meanwhile, in Mrs. N before doing gymnastics it was 2.3 and after doing gymnastics the result was 2.5 so there was a change of 0.2 after gymnastics.

The difference before and after doing foot exercises, namely on the first, second and third days, is 0 because there has been no change. on the fourth day, Mrs. N got a score of 0 because there was no change but Mrs. M got a difference value of 1 because there had been a change in the sensitivity of her feet. On the fifth day, Mrs. N had a value of 1 because there was a change, while Mrs. M had a value of 0 because there was no change. On the sixth day, the two respondents scored 0 because there was no change.

Respondents who adhered to a good diet, did not excessive physical activity that could injure the feet, and used shoes that were not narrow were the keys to success in improving foot sensitivity in type 2 DM patients. This is because diabetics are very susceptible to wounds on the legs, where the healing process of the wound also takes a long time. So if everyone wants to take good care of their feet, it will reduce the risk of complications in the feet.

CONCLUSION

Based on the results of the study, foot sensitivity was obtained in patients with type 2 diabetes mellitus before foot exercise was carried out on Mrs. M 1 (less) and Mrs. N 2 (moderate). In addition, the response of patients with type 2 diabetes mellitus when given foot exercise therapy using newspapers, both respondents felt relaxed and experienced changes in the sensitivity of their feet. After being treated with foot exercises, there was an increase in both respondents. In Mrs. M 1 (less) becomes 2 (moderate) and Mrs. N 2 (moderate) becomes 3 (good). The results of this study showed a significant increase in foot sensitivity in both respondents. It is recommended to respondents to be

able to carry out foot exercises independently at home to increase the sensitivity of the feet. The results of this study are also expected to be a useful picture for health services in increasing the knowledge of health workers. In addition, this research can be used by educational institutions as evidence-based practice that is useful for the development of knowledge in the field of health and nursing, especially in treating patients with type 2 diabetes mellitus by providing foot exercise therapy on foot sensitivity. This research is also expected to add insight, motivation, and experience in applying knowledge about the effect of foot exercises on foot sensitivity in patients with diabetes mellitus.

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