proseeding 2.pdf

by Universitas Aufa Royhan

Effectiveness of Diabetic Foot Exercise on Foot Pain Level in Diabetic Patients

Febrina Angraini Simamora[1](✉), Adi Antoni[1], Sukhri Herianto Ritonga[2], Arinil Hidayah[1], and Nanda Masraini Daulay[1]

[1] Nursing Department, Universitas Aufa Royhan, Kota Padang Sidempuan, Indonesia
febrina.angraini@yahoo.com

[2] Public Health Department, Universitas Aufa Royhan, Kota Padang Sidempuan, Indonesia

Abstract. Introduction Many diabetic patients experience circulatory disorders, especially in the legs. People with DM will feel pain in their legs after traveling long distances. Diabetic foot exercise is an activity or exercise that is done by moving the muscles and joints of the feet. Foot exercise can help improve impaired blood circulation and strengthen the small muscles of the feet in diabetic patients. **Objective**: The purpose of this study was to determine the effectiveness of diabetic foot exercises on foot pain level in patients with type 2 diabetes mellitus. **Methode**: The design of this study used a quasi-experimental design with pre and post test group design with control group. The number of research samples was 44 respondents in the intervention group and control group. Data analysis used independent t test and paired t test. **Result**: The results showed that diabetic foot exercise was effective in reducing leg pain in patients with type 2 diabetes mellitus with $p = 0.000$ ($p < 0.05$). **Conclusion**: The results of this study can be used as an independent nursing intervention in physical exercise to reduce foot pain and increase leg blood circulation in patients with type 2 DM.

Keywords: Diabetic Foot Exercise · Foot Pain Level

1 Introduction

Diabetes mellitus (DM) is a group of metabolic disorders characterized by high blood glucose levels. a person with diabetes has an increased risk of experiencing a number of serious, life-threatening health problems that require high medical care costs, decreased quality of life and increased mortality [1].

Based on data from the International Diabetes Federation [2] the countries with the highest number of adults with diabetes aged 20–79 years in 2021 are China with 140.9 million people, India with 74.2 million people, Pakistan with 33 million people, United States as many as 32.2 million people, and Indonesia as many as 19.5 million people. They are expected to remain so by 2045. Countries that have the highest number of people with diabetes do not necessarily have the highest prevalence. The highest comparative diabetes prevalence rates in 2021 were reported in Pakistan (30.8%), French Polynesia (25.2%) and Kuwait (24.9%). The country is also predicted to have the highest overall

S. H. Ritonga et al. (Eds.): TIHC 2022, AHSR 50, pp. 54–59, 2023.
https://doi.org/10.2991/978-94-6463-032-9_9

prevalence of comparative diabetes by 2045, with rates in Pakistan reaching 33.6%, Kuwait 29.8% and French Polynesia 28.2%.

According to the results of the Basic Health Research (Riskesdas), it was found that the prevalence of diabetes mellitus (DM) in Riskesdas 2018 increased by 2.6% compared to 2013. Riskesdas (2018) estimates that the number of DM sufferers aged over 15 years is 8.5% of the Indonesian population, or about 14 million people. Based on the distribution of people with diabetes mellitus in North Sumatra Province, the regions with the highest prevalence of DM sufferers were Binjai (2.04%), Deli Serdang (1.90%), and Gunung Sitoli (1.89%). Meanwhile, for Padangsidimpuan City, the prevalence of DM sufferers is 0.61% or around 1,055 people [3].

Diabetes mellitus can cause various complications, namely hypoglycemia, hyperglycemia, macrovascular disease affecting large blood vessels, coronary heart disease, microvascular disease affecting small blood vessels, retinopathy and nephropathy, sensory nerve neuropathy or affecting the extremities [4]. Other complications are also frequent pathological changes in the lower limbs called diabetic foot or diabetic foot. In these conditions, the diabetic foot conditions that occur are structural changes, skin protrusions, skin and nail changes, wounds to the feet, infections, abnormalities in blood vessels, and neuropathic innervation disorders that can cause diabetic patients to experience decreased sensitivity, and loss of sensation is one of the causes of diabetes mellitus. The main risk factor for diabetic ulcers [5].

Effective treatment will reduce the rate of complications so that there are no further complications that harm patients with mellitus. Treatment actions carried out by the health/medical team include: pharmacological treatment, namely the administration of drugs and non-pharmacological treatment such as routine metabolic control, vascular control, evaluation of ulcers, foot care, as well as other exercise measures such as foot gymnastics [6].

Patients with diabetes mellitus are recommended to do foot exercises. This action is very suitable for clients with diabetic neuropathy because it is easy to do by everyone, and this exercise aims to help improve blood circulation and strengthen the small muscles of the feet and prevent foot deformities [7].

Based on the description above, there are problems related to physical exercise that need to be developed to reduce neuropathy in DM clients, so that it can reduce the pain felt by patients in the leg area. In this case, researchers are interested in researching the effectiveness of diabetic foot exercise on the level of foot pain in patients with Type 2 Diabetes Mellitus.

The purpose of this study was to determine the effectiveness of diabetic foot exercises on foot pain level in patients with type 2 diabetes mellitus.

2 Method

This research used a quasi-experimental research design with pre and post test group design with control group. The research was conducted in the working area of Puskesmas Sidangkal Padangsidimpuan City, Indonesia with 44 groups of respondents divided into 2 groups, namely 22 respondents in the intervention group and 22 respondents in the control group.

Data collection tools used were observation with Numerical Rating Scale (NRS) to identify foot pain level on diabetes mellitus clients. The data collection procedure was carried out by conducting a pretest by assessing the foot pain level of respondents in both groups. Then performed diabetic foot exercises in both groups for 3 times a week. Then after a week a post test was carried out to reassess the foot pain level in the two groups after diabetic foot exercise. After that, data analysis was performed to compare the foot pain level in the two groups after diabetic foot exercise.

Sampling used consecutive sampling by determining inclusion criteria and exclusion criteria and data analysis using statistical tests paired t-test and independent t-test.

3 Result

Table 1 shows that in the intervention group, there were 3 people aged 21–35 years (13.6%), 8 people aged 36–45 years (36.4%), and 11 people aged 46–60 years (50%).). Whereas in the control group, there were 2 people aged 21–35 years (9.1%), 8 people aged 36–45 years (36.4%), ages 46–60 years as many as 8 people (36.4%) and aged > 60 years as many as 4 people (18.2%). In the control group, there were 7 (31.8%) male respondents and 15 female respondents (68.2%) then in the intervention group 2 respondents were male (9%) and as many as female 20 (91%).

Table 2 shows that the mean pretest foot pain level was 6.32 and the mean posttest foot pain level was 4.22. After a significant test was carried out using the paired t-test on the comparison of the foot pain level in pretest and posttest in type 2 DM patient after

Table 1. Characteristics of Respondents by Age and Gender of Respondents

variable	Control		Intervention	
	n	%	n	%
Age 21–35 36–45 46–60 > 60	2 8 8 4	9,1% 36,4% 36,4% 18,2%	3 8 11 0	13,6% 36,4% 50% 0
Gender Male Female	7 15	31,8% 68,2%	2 20	9% 91%

Table 2. The difference between the mean level of foot pain the pretest and posttest of Type 2 DM patients in the intervention group

Variabel	N	Mean	pValue
Pretest	22	6,32	0,000*
Posttest		4,22	

Table 3. The difference between the mean level of foot pain of the pre-intervention and post-intervention in the control group.

Variabel	N	Mean	p Value
Pre	22	5,36	0,213*
Post		5,55	

Table 4. The difference between the mean level of foot pain of the pre-intervention and post-intervention in the control group

Group	N	Mean	pValue
Intervention	22	6,14	0,000*
Control	22	5,55	

doing diabetic foot exercises in the intervention group, there was a significant change with a value of $p = 0.000$ ($p < 0,05$). This indicates an decrease in foot pain level after diabetic foot exercises.

Table 3 shows that the mean pretest foot pain level was 5.36 and the mean posttest foot pain level was 5.55. After a significant test was carried out using the paired t-test on the comparison of the foot pain level pretest and posttest of the type 2 DM patient after doing diabetic foot exercises in the control group, there was no significant change with p value $= 0.213$ ($p > 0,05$). This shows that there was no significant change between the level of foot pain before and after in the control group.

Table 4 shows that the mean posttest foot pain level in intervention group was 6, 14 and the mean posttest foot pain level in control group was 5.55. After a significant test was carried out using the independent t-test on the comparison of the foot pain level posttest between intervention and control group in the type 2 DM patient after doing diabetic foot exercises, there was a significant change with p value $= 0.000$ ($p < 0,05$). This shows that there was a significant change between the level of foot pain between intervention and control group.

4 Discussion

The results showed that most of the age characteristics of respondents in the intervention group were mostly (50%) aged 40–60 years. The same thing was also found in other study that the age characteristics of respondents in the study of Type 2 DM clients were mostly (87.5%) aged 46–60 years [8]. The type 2 of DM with the most number, which is around 90–95% of all DM sufferers and many are experienced by adults over 40 years. This is because insulin resistance in type 2 diabetes tends to increase in the elderly (40–65 years), in addition to a history of obesity and the presence of heredity. Age affects the risk and incidence of type 2 diabetes. Age is closely related to an increase in blood sugar levels, so that the increasing age, the higher the prevalence of type 2 diabetes [5].

The relevant study state that physiological age affects changes in the condition of blood vessels in connection with atherosclerosis. Atherosclerosis will result in obstructed blood flow, so that it will have an impact on tissue hypoxia which will affect the function of nerve cells. Decreased nerve cell function can reduce foot sensation in the elderly [9].

The results showed that the majority of respondents' gender was female, as many as 12 respondents (75%). This is in accordance with the theory which states that neuropathy in women with diabetes is more common than in men. This is associated with the presence of the hormone estrogen. Hormonally, estrogen will cause women to have more neuropathy due to impaired absorption of iodine in the intestine so that the process of forming nerve myelin fibers does not occur [6].

The result shows that there was a significant change between the level of foot pain between intervention and control group. It is same with the study that Diabetic foot exercise is an effective intervention to improve peripheral Neuropathy symptoms because it brings contribution to decrease neuropathy symptoms even not statistically significant. The variables of gender and BMI have good correlation with the symptoms of neuropathy [10].

Other study result showed that diabetic foot exercises using sponges and newspapers have significant effects on foot sensitivity. Sensitivity is the ability to feel various stimulations such as pain, pressure, and movements that activate receptors to respond. The increase of minimum-maximal value after foot exercises showed that diabetic foot exercises using sponge and newspaper are useful for increasing foot sensitivity [11].

In this study, it can be concluded that diabetic foot gymnastics can decrease the foot pain level of Type 2 DM patients. The foot exercises relax and improve blood circulation. The circulation of the blood due to the massage allows the blood to deliver more oxygen and nutrients to the body cells, as well as to carry more toxins to be excreted. Reflexology such as diabetic foot gymnastics which is performed on the soles of the feet, especially in the area of the problematic organs, will stimulate the nerve points associated with the pancreas to become active so as to produce insulin through the nerve points in the soles of the feet and this will prevent complications in the legs. Therefore, doing diabetic foot exercises is effective in decreasing the foot pain level in Type 2 DM patients.

Acknowledgments. There are no obstacles and obstacles that interfere with the research process. It's just that because the research was carried out during a pandemic, some respondents did not follow the health protocol when doing diabetic foot exercises so researchers must always remind them to always follow the health protocol during a pandemic.

Authors' Contributions. In accordance with the results of the study obtained, it is expected that all patients with type 2 diabetes mellitus always strive to do physical exercise in the form of diabetic foot exercises to reduce the risk of neuropathy in patients with type 2 diabetes mellitus and to reduce the pain felt by the patient so that they can carry out their activities as usual. Thank you to all respondents who have been willing to participate in this research, and thank you to all parties that I cannot mention one by one. Hopefully this research can provide great benefits for all of us.

References

1. J. M. Baena-Díez *et al.*, "Risk of cause-specific death in individuals with diabetes: A competing risks analysis," *Diabetes Care*, vol. 39, no. 11, pp. 1987–1995, 2016, doi: https://doi.org/10.2337/dc16-0614.
2. International Diabetes Federation, *IDF Diabetes Atlas: Global estimates of diabetes prevalence for 2021 and projections for 2045*, vol. 10. 2021.
3. Riskesdas, *Laporan Provinsi Sumatera Utara Riskesdas 2018.* 2018.
4. F. A. Simamora, H. R. Siregar, and A. Hidayah, "Pengaruh Senam Kaki Diabetik terhadap Penurunan Neuropati pada Penderita Diabetes Mellitus Tipe 2," *Educ. Dev.*, vol. 8, no. 4, 2020, [Online]. Available: http://journal.ipts.ac.id/index.php/ED/article/view/2164.
5. K. H. Smeltzer, S.C., Bare, B. G., Hinkle, J. L., & Cheever, *Brunner & Suddart's Textbook of Medical Surgical Nursing (12th),* 12th ed. Philadelphia: Wolters Kluwer Health/Lippincott Williams & Wilkins, 2010.
6. rita fitri Yulita, A. Waluyo, and R. Azzam, "Pengaruh senam kaki terhadap penurunan skor neuropati dan kadar gula darah pada pasien DM tipe 2," *J. Chem. Inf. Model.*, vol. 53, no. 9, pp. 1689–1699, 2019.
7. F. A. Simamora, H. R. Siregar, and A. Hidayah, "The Effect of Diabetic Foot Exercise On Neuropathy Scores Based On The Length Of Time Suffering From Type 2 Diabetes Mellitus Clients," *Int. J. Curr. Res.*, vol. 12, no. 12, pp. 15182–15185, 2020.
8. F. A. Simamora and H. R. Siregar, "EFEKTIVITAS MODEL PEMBERDAYAAN DIRI TERHADAP AKTIVITAS PERAWATAN DIRI KLIEN DIABETES MELITUS TIPE 2 Jurnal Education and development Institut Pendidikan Tapanuli Selatan," vol. 7, no. 4, pp. 6–9, 2019.
9. Suyanto and A. Susanto, "Faktor-Faktor yang Berhubungan dengan Kejadian Neuropati Perifer Diabetik," *J. Keperawatan dan Pemikir. Ilm.*, vol. 2, no. 6, pp. 1–7, 2016.
10. V. Graciella and D. Prabawati, "The Effectiveness of Diabetic Foot Exercise to Peripheral Neuropathy Symptoms and Fasting Blood Glucose in Type 2 Diabetes Patients," *Adv. Heal. Sci. Res.*, vol. 30, pp. 45–49, 2020.
11. S. Fadlilah, A. Sucipto, and N. H. Rahil, "ORIGINAL RESEARCH EFFECTIVENESS OF DIABETIC FOOT EXERCISES USING SPONGES AND NEWSPAPERS ON FOOT SENSITIVITY IN PATIENTS WITH DIABETES MELLITUS," *Belitung Nurs. J.*, vol. 5, no. 6, pp. 234–238, 2019.

proseeding 2.pdf

ORIGINALITY REPORT

0%	0%	0%	0%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

Exclude quotes	Off	Exclude matches	< 100%
Exclude bibliography	Off		