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Research Article

The Implementation of Hands and Feet Exercise Towards Pain Management Among DM Type II Patients with Peripheral Neuropathy in Indonesia

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Abstract

Aims: The prevalence of diabetes mellitus (DM) worldwide increased significantly every year, including Indonesia. The most common complication among patients with Type II DM was DPN (Diabetic Peripheral Neuropathy) with the severe symptom being pain. However, only limited studies discussed related topics about intervention to reduce pain. Aim. This research objective was to measure the effectiveness of hand and foot exercises toward pain among patients with Type II DM.

Method: A quasi-experiment of pre-post test design with a control and intervention group was applied in this study. To obtain respondents, this research used convenience sampling. This study is located in the inpatient ward of two hospitals in Indonesia located in suburban areas. Two questionnaires used in this study are Michigan Neuropathy Screening Instrument (MNSI) and Visual Analog Score (VAS). The Visual Analog Score (VAS).

Results: A total of 38 respondents were divided into the same number of intervention and control groups with each of them 19 respondents. The average pain scale in the 1st to 8th week of measurement has decreased gradually in both group. Based on the results of the Friedman Test there was an effect of applying hand and foot exercises in reducing patient pain and diabetic peripheral neuropathy among the intervention group ($p < 0.00$) but no statistically significant decreased in the control group ($p > 0.000$). These results are in line with the reference journal in the assessment of pain response in both groups. These exercise increase blood vessel circulation and muscle strength.

Conclusion: This intervention can be implemented among patients with Type II DM as one of the pain management in clinical settings. The standard operational procedures with structured training must be done to implement this intervention.

Keywords:

Diabetes, exercise, neuropathy, pain

INTRODUCTION

Indonesia's current health development is directed at the realization of a good quality of life, healthy and optimal lifestyle. There are many risks that can interfere with a person's quality of life by following trends

and technology so that they are able to change healthy living habits and lifestyles. One of these factors is at risk of causing an increase in the prevalence of diseases such as diabetes mellitus (Diabetes Mellitus). The American Diabetes Association (1) explains that Diabetes mellitus is a group of

metabolic diseases characterized by increased blood glucose levels (hyperglycemia) caused by abnormalities in insulin secretion, insulin action disorders, or both. This requires continuous medical supervision, education, and self-care as a precaution against complications (2). The World Health Organization (3) explains that one of the most feared complications caused by diabetes mellitus is foot disease characterized by sensory, autonomic neuropathy, and macrovascular and microvascular disorders (4).

Data showed that the prevalence of DM patients in the world in 2020 is 463 million or around 9.3% of adults aged 20-79 years. Indonesia ranks 7th as the highest number of adult diabetics in the world with a total of more than 10.7 million people. This population is predicted to continue to increase and reach 16.7 million in 2045 (5).

In Indonesia, the prevalence of diabetes has also increased significantly over the last 5 years. In 2013 reached 6.9% and in 2018 it increased to 8.5% with the highest prevalence in DKI Jakarta Province, which is 2.6%, while the lowest prevalence is in East Nusa Tenggara Province, which is 0.6% ,and the prevalence of Diabetes Mellitus in West Java Province is 1.3% (6).

Diabetes is a chronic disease that will be suffered for a lifetime so that the progression of the disease will continue to run, at some point, it can cause various kinds of complications. Diabetic Peripheral Neuropathy (DPN) is one of the microvascular complications characterized by tingling, pain, or numbness. Although it can occur in nerves in any part of the body, diabetic neuropathy more often attacks nerves in peripheral areas, especially in the hands and feet when blood sugar levels increase (7). Acute hyperglycemia reduces nerve function, while chronic hyperglycemia is associated with the loss of myelinated and unmyelinated nerve fibers, Wallerian degeneration, and blunted reproduction of nerve fibers.

The symptoms caused are very diverse, depending on the location of the nerves that are affected. In some cases, symptoms such as tingling, cramping, or pain in the peripheral areas are found, especially in the upper extremities (hands) and lower extremities (legs). If not treated properly, this part will slowly develop neuropathy, this condition often causes diabetics to be unaware of the injury. Wounds that occur in the peripheral area if not handled properly will spread widely, causing infection and tissue death. (8). This issue is important to note that nurses need to do prevention or treatment of extremities that have Diabetic Peripheral Neuropathy (DPN).

Based on a reference study from (8) data were obtained that one of the Diabetic Peripheral Neuropathy (DPN) measures that can assist in the prevention and treatment of Hand and foot exercises for diabetic peripheral neuropathy shows results that Hand and foot exercises for diabetic peripheral neuropathy can improve circulation in the peripheral area thereby reducing pain in the peripheral area. Hand and foot exercises for diabetic peripheral neuropathy also improve hand strength in Diabetic Peripheral Neuropathy (DPN). In addition, actions that can help in the problem of Diabetic Peripheral Neuropathy (DPN) in the upper and lower extremities can be carried out with intensity training by doing intensive range of motion exercises (9).

Action Exercise on the hands and feet, This exercise is done for 2-3 days a week and not done for 2 days in a row (preferably there is a break in the day to do the exercise). length of doing Exercise 10-15 minutes including 8 exercises such as (wrist stretching, finger tapping, ball grasping, wrist twisting and finger stretching, flexion, extension and hyperextension, finger gripping without a ball, and thumb twisting) Foot exercises there are four exercises, namely (for both feet (patting the feet, making a V shape, twisting the ankles, and twisting), as well as doing dose flexion and plantar flexion

slowly and strongly. This exercise can increase circulation to the periphery where circulation smoothly can increase metabolism in cells and reduce blood glucose levels so that it can reduce the risk of developing Diabetic Peripheral Neuropathy (DPN) and will also reduce pain in diabetic patients, this can impact increasing patient activity so that the quality of life can improve in diabetic patients. Exercise is an alternative therapy safe, acceptable, and effective (10).

From the data above, the authors interviewed patients and nurses regarding what interventions were given by nurses and patients received in overcoming the problem of Diabetic Peripheral Neuropathy (DPN), 10 out of 24 nurses said that in providing interventions to Diabetic Peripheral Neuropathy (DPN) patients. only providing education related to preventing increased blood sugar levels such as medication adherence, diabetes diet compliance, and hygiene and use of footwear as well as to treat patient pain. This is also in line with the results of interviews with 15 patients with diabetes mellitus, while if the patient experiences pain, the patient is only given analgesic drugs. From the explanation above, researcher interest to measure the effectiveness of hands and feet exercise toward pain among patient with Type II DM.

METHODS

This research used a quasi-experiment of pre-post test design with a control and intervention group. A total of 38 respondents agreed to be involved in this study during the period of February-June 2022 at the inpatient ward of two hospitals in Indonesia located in suburban areas. Inclusion criteria are patients older than 40 years old, diagnosed with *Peripheral Neuropathy Diabetic* (DPN), and had normal hemodynamics. Exclusion criteria are respondents who have neurological disorders but not from diabetes mellitus, for example, patients with stroke, meningitis, etc. Before conducting the research, ethical clearance was gained.

The process of this intervention starts with an explanation of the procedure from the purpose, benefits, techniques, and time duration. Patients are given videos of hand and foot exercises, and patients are advised to do hand and foot exercises based on the video. This exercise activity will last for 8 weeks and followed up at the end of time. Two questionnaires used in this study are *Michigan Neuropathy Screening Instrument* (MNSI) and *Visual Analog Score* (VAS). The Visual Analog Score (VAS) is a self-report rating scale method to measure pain developed by (11). In this study, data analyzed used SPSS Version 23 with univariate and bivariate formulas (*Friedman Test*).

RESULTS

Table1. Demographic Characteristics and pain level among patients with DM Type II (n=38)

Variables	Intervention (n=19)	Min-Max	Control (n=19)	Min-Max
Age (years old) (mean±SD)	56.42 ±6.06	47-65	55±5.18	46-61
Gender n(%)				
Male	11(57.9)		11(57.9)	
Female	8 (42.1)		8 (42.1)	
Pain Level				

(mean±SD)				
Week 1	5.74±0.45	5-6	5.68±0.48	5-6
Week 2	5.68±0.48	5-6	5.68±0.48	5-6
Week 3	5.68±0.48	5-6	5.78±0.45	5-6
Week 4	5.63±0.49	5-6	5.68±0.48	5-6
Week 5	5.58±0.76	4-6	5.58±0.76	4-6
Week 6	5.26±0.73	4-6	5.58±0.51	5-6
Week 7	5 ±0.58	4-6	5.47±0.51	5-6
Week 8	4.58±1.21	2-6	5.47±0,51	5-6

Table 2. The effect of Hand and Feet Exercise among patients with DM Type II (n=38)

Variables	Intervention			Control		
	Mean Rank	95% CI	p-value	Mean Rank	95% CI	p-value
Pain Level (mean±SD)						
Week 1	5.66	5.52 - 5,95	0.00*	4.79	5.45 - 5.91	0.31
Week 2	5.47	5.45 - 5.91		4.79	5.45 - 5.91	
Week 3	5.42	5.45 - 5,91		5.00	5.52 - 5.95	
Week 4	5.24	5.39 - 5.87		4.79	5.45 - 5.91	
Week 5	5.11	5.21 - 5.95		4.37	5.21 - 5.95	
Week 6	3.92	4.72 - 5,28		4.37	5.33 - 5.82	
Week 7	2.87	4.72 - 5.28		3.95	5.23 - 5.72	
Week 8	2.32	3.99 - 5.17		3.95	5.23 - 5.72	

*Correlation is significant at p value < 0.000

A total of 38 respondents agreed to participate in this study and divided into the same number of intervention and control groups with each of them being 19 respondents. The average age in the intervention group was 56.42 years old (SD ±6.06), while the control group was 55 years old (SD ±5.18). In both groups, gender was distributed in the same number among females and males with most respondents being female (n: 11, 57.9%) (Table 1).

The average pain scale in the 1st to 8th week of measurement has decreased gradually from the beginning to the end among the intervention group. The average pain scale in the control group was the same in the 1st & 2nd-week measurements and rose in 3rd week than in subsequent measurements it decreased slowly in the 4th measurement and so on (Table 1) Based on the results of the *Friedman Test* on pair groups there was an effect of applying hand

and foot exercise in the process of reducing patient pain diabetic peripheral neuropathy among intervention group ($p < 0.00$), while there was no effect in the control group (Table 2).

DISCUSSION

The results from this study showed that the average pain scale in the intervention group at week 1 until 8 measurements decreased gradually from the start of the measurement to the end of the measurement. While the average pain scale in the control group did not decrease between the 1st and 2nd-week measurements, then in subsequent measurements it decreased slowly in the 3rd measurement and so on. But the mean value in the 5th and 6th measurements has the same value, and the 7th and 8th measurements also do not decrease. However, other factor example adherence

to medicine (insulin) also influence the result.

These results are in line with the reference journal that in the assessment of pain response in both groups it was found that both groups experienced a decrease in pain in the VAS and BRS during data collection. Although there were no significant differences between and within the groups, the exercise group experienced a greater reduction in pain in the VAS compared to the control with a p-value > 0.05. Management of chronic pain can combine both pharmacological and nonpharmacological and this intervention is one technique to prevent complications for patients with Type II DM.

By doing hand and foot movement exercises in DM patients with DPN, there will be vasodilation of blood vessels so that the process of transporting nutrients, and oxygen needed by cells to carry out metabolism will be fulfilled (if nutrients and oxygen do not reach the cells, the cells will carry out aerobic metabolism where the rest of the metabolism is lactic acid, it is this acid that stimulates the pain nerve endings.

CONCLUSION

This intervention can be implemented among patients with Type II DM as one of pain management in clinical settings. Healthcare professionals need to develop structured standard operational procedures and increase knowledge and practice among them therefore, this innovative action will be effectively applied. Discharge planning needs to emphasize patient and family to aware of any kind of severe symptoms or issue about DPN.

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