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Therapy acupressure (point SP.3, SP.6, KI.3, LV. 3) and foot exercise effective on sensoric improvement of periferic neuropathy in type II DM patients

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ABSTRACT

Background

Type II diabetes mellitus is a disease that causes metabolic disorders characterized by an increase in blood sugar levels due to decreased insulin secretion by the pancreatic beta cells or causing impaired insulin function. Diabetes mellitus has become an epidemic and a global health problem, this is evidenced by the increase in the incidence of diabetes 2-3 times within 10 years terakhir. Diabetic neuropathy is one of the long-term complications that can occur as a result of DM disease, which will cause disruption in small blood vessels (microangiopathy). One non-pharmacological treatment with the provision of therapy Acupressure and Foot Exercise.

Method

The type research used Quasy Experimental with a pre-test and post-test non equivalent control group design. This study arranged two groups, namely the Acupresure group and the group foot exercise. Technique non probability sampling with method was consecutive sampling used to get 30 respondents divided into 2 groups.

Results

The results of the test Mann Withney show p value 0.001 which means that therapy Acupresure (Point SP.3, SP.6, KI.3, LV.3) and Foot Exercise is effective in significantly increasing the sensory sensitivity of peripheral neuropathy between the Acupresure group and the foot exercise group.

Conclusion

The results of the study after being given an intervention increased sensory sensitivity of peripheral neuropathy patients who received Acupresure and Foot Exercise therapy, so that the therapy was effectively implemented to patients to prevent complications of diabetic ulcers, especially those with type II diabetes mellitus.

Keywords: *Acupresure (Tititk SP.3, SP.6, KI.3, LV.3), Foot Exercise, Sensory Sensitivity Peripheral Neuropathy, Type II Diabetes Mellitus.*

INTRODUCTION

Diabetes mellitus (DM) is a metabolic disorder that is genetically and clinically including heterogeneous with manifestations of loss of insulin tolerance, if clinically fully developed will have an impact characterized by hyperglycemia, atherosclerosis and microangiopathic vascular disease. [1, 2]. Long-term hyperglycemia can play a role in the process of diabetes mellitus and cause chronic microvascular complications that can occur in the kidneys and eyes and cause neuropathic complications [3], DM is also known as the silent killer, where the disease is often not realized by the patient, when it is known that DM disease has occurred and has been accompanied by complications. [4] Diabetes mellitus can also attack all vital organs of the body [1, 5]

DM has become an epidemic disease and has become a global health problem, this is evidenced by an increase in the incidence of diabetes 2-3 times in the last 10 years. This can generally be caused by epochal developments that have an impact on people's habits and lifestyle. According to the World Health Organization (WHO) one of the causes of non-communicable disease deaths is diabetes mellitus, in 2016 an estimated 41 million deaths were due todisease non-communicable (NCD). Counting 71% of the total 57 million deaths. Most of the deaths were caused by 4 main NCDs, namely cardiovascular disease 17.9 million deaths (44%), cancer 9.0 million deaths (22%), chronic respiratory disease 3.8 million deaths (9%), and diabetes 1.6 million deaths (4%). [6] The estimated number of diabetic patients throughout the world in 2015 is 415 million people, this number is expected to experience a significant increase from 108 million in the 1980s [7].

The results of a survey conducted by the International Diabetes Federation (IDF) state that the prevalence will continue to increase if there is no appropriate treatment for DM patients. Diabetes occurs 10 years faster in the regional region of Southeast Asia than people from the European region, more often in productive age. Based on the results of the survey, International Diabetes Federation (IDF) Indonesia is included in the country with the highest prevalence of Diabetes sufferers with an estimated amount of 10 million in 2015 and ranked seventh in the world. Estimates of the estimated prevalence of diabetes by IDF are estimated that in 2017 there will be 451 million (ages 18-99 years) of diabetics in the world, this figure is expected to increase to 693 million in 2045. [8] Indonesia in 2018, based on the results of 2018 Basic Health Research (Riskesdas), the prevalence of people with diabetes increases, from 6.9% in 2013 to 8.5% in 2018.[8] Diabetes accompanied by complications is the third highest cause of death in Indonesia [9, 10].

In Central Java, in 2016 the prevalence of diabetes mellitus was second only to hypertension, at 16.42%. 2017 in the city of Semarang, diabetes mellitus, including the highest cases of non-communicable diseases (PTM) with 17.037 cases. Based on previous research in 2017 the prevalence of DM patients in the work area of Srondol health center was 661 people with diabetes, with an average monthly visit ranging from 55 people. Where as in 2018 the number of people with diabetes increased to 1143 not insulin dependent and 7 insulin dependent. Type II DM is second only to hypertension from the top 5 non-communicable diseases in the Srondol health center area [11-13].

According to the 2015 Indonesian Endocrinology Association (PARKENI), which includes chronic complications are macroangiopathy, mikroangiopati and neuropati. Diabetic neuropathy is one of the long-term complications that can occur as a result of DM disease, which will cause disruption in small blood vessels (microangiopathy). Peripheral neuropathy is one of the microvascular complications in people with diabetes due to neurological disorders caused by an increase in persistent blood sugar levels in the body. Sensory neuropathy will cause a decrease in sensitivity, protection sensations include pain, temperature, touch and vibration so that people with diabetes will experience trauma without noticeable continuing in the event of diabetic ulcers. [14] This is what causes the initial symptoms of diabetic foot. Of the total prevalence of DM patients, there are around 60-70% experiencing neuropathy, and the risk of occurrence can increase with increasing age and duration of suffering from DM. [15, 16]

Diabetic neuropathy is divided into peripheral neuropathy, autonomic neuropathy, proximal neuropathy and focal neuropathy. Common symptoms that arise in peripheral neuropathy include distal paresthesias, symptoms that are felt are pain such as pain or burning, or like being punctured and the foot is felt cold. The impact of the presence of diabetic peripheral neuropathy, one

of which is a decrease in sensory sensation which will cause DM patients to have a chance to experience injury to the leg area [17]. Another manifestation of peripheral neuropathy is that the patient will experience a disturbance or reduced sensation of protection, this symptom will be felt more by the sufferer, especially at night. The symptoms that appear in patients with diabetic neuropathy also vary as there are patients with complaints of pain and there are also no complaints of pain even some that can only be detected through electrophysiology [4, 18].

Foot exercise is one of the recommended exercises for people with DM, which aims to reduce the complications of diabetic injuries and help blood circulation in the leg area. Nurses as a health team, besides having a role in providing health education can also play a role in guiding DM patients to exercise until patients are able to do it independently. The function of this leg exercise exercise can also improve blood circulation, strengthen leg muscles and facilitate the movement of the foot joint [5]. Another benefit of foot exercise is that it can increase the strength of the calf muscles, thigh muscles and can also overcome the limitations of joint movements. Seeing the benefits of this foot gymnastics, so many benefits to prevent complications of peripheral neuropathy in DM patients, by itself this can improve the quality of life for people with DM [19].

In addition to foot exercise,techniques acupressure can also prevent the occurrence of neuropathy. The technique of acupressure is one of the therapies that can be done which aims to restore the function of foot sensitivity.technique Accupressure is a non-invasive method whose working principle is based on the principle of acupuncture [20]. Acupressure is one therapy that can activate neurons in the nervous system, this stimulates the endocrine glands and the results can activate the troubled organs. Acupressure is one of the independent nursing interventions in Nursing Interventions Classification (NIC) [21]. therapy Acupressure has been recognized by the World Health Organization (WHO). [22]

Therapy Acupressure and foot exercise is one of the interventions that aims to treat neuropathy complications in patients with type II diabetes mellitus.therapy acupressure and foot exercises are therapies by stimulating the acupoint points in the body's meridian lines to free up stagnation or blockages in the meridian and collateral channels so that blood flow can reach the peripheral parts of the body. Then for the foot exercise itself is a physical exercise consisting ofmovements foot exercise that can facilitate circulation in the leg area.

METHODS

This type of research uses Quasy Experimental with pre test and post test non equivalent control group design. The researcher arranged two groups, namely the group given therapy Acupresure (Tititk SP.3, SP.6, KI.3, LV.3) and those who were given therapy Foot Exercise. Assessment of the sensitivity of the point of neuropathy using the 10 gdevice Semmes-Weinstein Monofilament (SWM)before and after the therapeutic procedure.

The population in this study were type II DM patients who suffered from DM more than one year in the work area Banyumanik Srondol Health Center Semarang. Determination of the minimum number of samples using technique sampling non-probability with method consecutive sampling and based on inclusion and exclusion criteria as many as 30 respondents divided into 2 groups with each of the 15 respondents in the group Acupresure and 15 respondents in the group foot exercise.

In this study researchers conducted data collection by observing, identifying, interviewing and filling out the questionnaire. The collected data was analyzed through the IBM SPSS version 24.0, and continued with a different test, namely the non-parametric(Wilcoxon Test and Mann Withney test). The processed data is used as the basis for discussing problem statements, which are then presented in table form so conclusions can be drawn.

RESULTS

Table 1 Frequency Distribution of Respondent Characteristics in Acupressure andGroups Foot Exercise Based on Characteristics Demographics

Characteristics	Acupressure Group		Foot Exercise Group		*p
	N	%	N	%	
Age					0.237
Mean±SD	48.73±8.004		55.40±5.124		
Min-Max	38-60		44-60		
Gender					0.344
Male	6	40.0	4	26.7	
Female	9	60.0	11	73.3	
Smoking Habit					
No	8	53.3	11	73.3	0.088
Yes	7	46.7	4	26.7	
DFU History					0.038
No	14	93.9	14	93.9	
Yes	1	6.7	1	6.7	
History of Comorbidities					0.152
Hypertension, PJK	1	6.7	-	-	
Hypertension	5	33.3	10	66.7	
No History	9	60.0	5	33.3	
Education					0.890
Up to	3	20.0	6	40.0	
Junior Hight School	2	6.7	3	20.0	
High School	5	33.3	5	33.3	
College	6	40.0	1	6.7	
When Blood Sugar					0.133
Mean±SD	205.60±16.991		212.47±26.712		
Min-Max	180-241		180-272		
Long DM					0.232
Mean±SD	4.8±2.783		7.60±3.019		
	2-10		3-12		

*homogenity of variance

Based on table 1, the data shows that the mean age in the acupressure intervention group is 48 years with a minimum age of 38 years and the maximum age of 60 years, while for the control group the foot exercise is an average age of 55 years with a minimum age of 44 years and a maximum age of 60 years. In the intervention group and the control group, the average age of the respondents was in the age range of the elderly. For sex in the acupressure intervention group there were 6 (40.0%) male respondents and 9 (60.0%) female respondents, while in the foot exercise control group there were 4 (26.7%) male respondents and 11 (73.3%) female respondents. Most respondents both in the intervention group and in the control group did not have smoking habits (63.3%). Likewise with the history of the DFU, the majority of respondents from all the respondents in the 2 groups did not have a history of DFU (99.3%). In addition, half of the respondents from both groups had a history of hypertensive comorbidities (50%). For education, most of the respondents have vulnerable primary education (30%) and high school (33.3%). Most of the respondents included categorical sugar levels above normal (> 200 mg / dL). For a long time suffering from diabetes mellitus, most of the respondents had diabetes> 5 years. Normal data homogeneity test results (p> 0.05), except for DFU history (p <0.05).

Table 2 Difference Value SWMT Before And After Cast Intervention In Each group

Pengukuran	Acupresure Group		Foot Exercise Group	
	Mean Difference	p	Mean Difference	p
Left Foot				
Pre test – Post test	1.73	0.001	1.47	0.001
Right Foot				
Pre test – post test	1.33	0.001	1.60	0.001

*Wilcoxon test

From table 2 above it can be concluded that in each group there were differences in the value of SWMT on the right foot and left foot before and after the intervention was given. From the data above, it can also be seen that both groups, both the acupressure intervention group and the foot exercise control group, had a significant increase in sensory sensitivity of peripheral neuropathy. With values for the left foot acupressure group 1.73 (p=0.001) right foot 1.33 (p=0.001) while in the left foot foot exercise group 1.47 (p=0.001) and right foot 1.60 (p=0.001).

Table 3 Analysis of SWMT values to see differences between thegroup Acupressure and the Foot Exercise

Measurement	Research Group	N	Mean±SD (min-max)	p
Pre Test Left Foot	Group 1 (acupressure)	15	0.53±0.734 (0-2)	0.865
	Group 2 (foot exercise)	15	0.53±0.834 (0-2)	
Pre Test Right Foot	Group 1 (acupressure)	15	0.73±0.884 (0-2)	0.602
	Group 2 (foot exercise)	15	0.60±0.910 (0-2)	
Post Test Left Foot	Group 1 (acupressure)	15	2.27±0.458 (2-3)	0.231
	Group 2 (foot exercise)	15	2±0.655 (1-3)	
Post Test Right Foot	Group 1 (acupressure)	15	2.07±0.884 (1-3)	0.720
	Group 2 (foot exercise)	15	2.20±0.561 (1-3)	
Delta Left Foot	Group 1 (acupressure)	15	1.73±0.594 (1-3)	0.218
	Group (foot exercise)	15	1.47±0.516 (1-2)	
Delta Right Foot	Group 1 (acupressure)	15	1.33±0.167 (0-3)	0.185
	Group 2 (foot exercise)	15	1.60±0.507 (1-2)	

*Mann Whitney test

From table 3 above it can be seen that in the measurement of the left foot pre test and right foot pre test there were no differences in SWMT values between the two treatment groups (p=>0.05). At the time of measurement of post left foot and right foot post test also showed no difference in the value of SMWT between treatment groups (p> 0.05)

DISCUSSION

Differences in SWMT Values Before and After Intervention in Each Group

From the results of statistical tests, especially in groups thattherapy was given for the Acupressure value of the left foot pre test 0.53 and post test 2.27 with an average increase of 1.73 (p = 0.001) while in the right foot pre test 0.73 and post test 2.07 with an average increase of 1.33 (p = 0.001), which means that there is an increase in sensory sensitivity aftertherapy acupressure at acupoint SP.3, SP.6, LV.3, KI.3 with 12 times of therapy for 21 days. Whereas in thegroup foot exercise the left foot pre test results were 0.53 and left foot 2 post test with an average increase of 1.47 (0.001) while the right foot pre test was 0.60 and the right foot post test was 2.20 with an increase of 1 average, 60 (p = 0.001), which means that there is an increase in sensory sensitivity on both feet after foot exercises.

Analysis of differences in SWMT values before and after the intervention was given in each group, using the Wilcoxon test showed that in each group there were differences in the value of SWMT values on the left and right foot before and after the intervention was concluded. that of the two treatment groups, there was a significant increase in sensory sensitivity in both legs.

Peripheral neuropathy is a condition that is associated with showing impaired peripheral nerve function and structure. Peripheral neuropathy is the most common complication of diabetic patients and causes loss of plantar vascular sensation, perception of movement and body balance [23]. This study aims to provide an alternative non-pharmacological therapy for the treatment of diabetes mellitus patients with peripheral neuropathy. The interventions given are complementarytherapy acupressure (point SP.3, SP.6, KI.3, LV.3) and exercise or leg exercises on sensory sensitivity of peripheral neuropathy in type II diabetes mellitus patients.

Basicallytherapy acupressure stimulates the activities of the body's mechanism, restoring disturbed homeostasis. In accordance with the Pavlop conditional reflex, stimuli need to be repeated in order to successfully achieve recovery.therapy acupressure Thisneeds to be repeated every day, every other day, every three days depending on the condition of the disease. The therapy series also depends on the state of the disease, a maximum of 2 sessions in one cycle of therapy, which are determined 10-12 times as a series of therapies. Among the 2 series of therapy clients can take 3-5 days to rest. [24]. In this studytherapy was acupressure only given in 1 session, namely 12 times therapy, both in the intervention group and in the control group.

Foot exercise can increase mitochondrial volume density and oxidative capacity in leg muscle tissue, peripheral oxygen extraction, peripheral vasodilator, muscle capacity [25]. Foot exercise can be given to all diabetics in both type I DM and type II DM and should be given foot exercisesfoot exercises orsince the patient is diagnosed with diabetes mellitus as an early preventive measure. Therefore the foot exercises are highly recommended for diabetics who experience blood circulation disorders and neuropathy.

In another relevant theory, stating that the goal obtained from foot exercises or foot exercises in patients with diabetes mellitus is to improve blood circulation in the legs, so that nutrients smoothly into the network. And also can reduce complaints from sensory neuropathy such as feeling sore, tingling in the legs and numbness. This makes more nets of capillaries open so that more insulin receptors are available and active. This condition will greatly help and make it easier for nerves to receive nutrients and oxygen so that it can improve nerve function and can make contractions of the muscles that cause the opening of ion channels, especially positive ions which can facilitate the flow of nerve impulse delivery [26, 27].

The results of this study are in line with previous research. From previous studies conducted on 30 respondents with the results of the study showed p value= 0.001 ($p < 0.05$) which means there is a significant difference between the average level of sensitivity of the feet after being giventherapy acupressure. Then other studies suggest that the administration oftherapy acupressure with massage aims to restore the balance that is in the body, by providing stimulation so that the flow of life energy can flow smoothly. The benefits oftherapy acupressure are to increase endurance and strength, prevent disease, overcome complaints and minor ailments and restore body condition. Stimulation given from a reflexology session that is good will relax and improve blood circulation. The smooth circulation because massage allows blood to deliver more oxygen and nutrients to the body's cells.therapy Acupressure is performed on the soles of the feet, especially in the area of the organ that is problematic, will provide stimulation to the nerve points associated with the pancreas to become active so as to produce insulin through nerve points located on the soles of the feet [20, 28].

In addition, other studies stated that after being given foot gym intervention there was a significant difference in mean foot sensitivity between before and after the intervention (p value <0.05). Likewise with other studies which explain that the results of statistical tests on these studies show that foot exercises significantly influence the sensitivity of the feet of diabetic neuropathy ($p = 0{,}000$, $\alpha = 0.05$). The results of this study are in line with the theory which states that the impact of sports can be to make muscle cells become active and function like insulin so that glucose can enter muscle cells without the help of insulin which is then oxidized to CO2 and water. Exercise can also increase muscle sensitivity to insulin due to an increase in Glut-4 in the muscle cell membrane, sensitivity increases for several hours after exercise, regular exercise can also increase prolonged insulin sensitivity, resulting in a lot of glucose entering the cell. Exercise can also increase the number and affinity of insulin receptors in cells [25, 26].

Analysis SWMT to see differences between Acupressure Group and Foot Exercise Group

From the Mann Whitney test results showed that there were no differences in the SWMT values of the left foot and pre test of the right leg between the two treatment groups (p=>0.05). At the time of measurement of post left foot and right post test also showed no difference in the value of SMWT between treatment groups (p=>0.05).

The purpose of this study was to analyze the effect of givingtherapy acupressure and foot exercise for 21 days to increase sensory sensitivity in the leg area to peripheral neuropathy in type II diabetic patients. So from the results of the test it can be concluded that there is a change in the value of SWMT which shows the level of sensory sensitivity in the leg area to peripheral neuropathy of type II diabetes mellitus patients before and after being given intervention for 21 days. These results also prove that administration of therapy acupressure (SP.3 points, SP.6, KI.3, LV.3) and exercise foot as complementary therapy and physical exercise in type II diabetes mellitus patients can increase sensory sensitivity in the foot area of diabetic patients mellitus with peripheral neuropathy.

In this study, therapy acupressure and foot exercise were equally effective in increasing sensory sensitivity of peripheral neuropathy. Where acupressure with massage techniques to stimulate acupoint SP. 3, SP. 6, LV. 3, K. 3 with pressure on the meridian of the body is to improve stagnation or blockage in the body's meridians and blood channels so that blood flow can reach the meridians of the body . Then for the foot exercise itself aremovements foot exercise that function to facilitate circulation of blood in the leg area [29, 30]. In this study,therapy acupressure and foot exercise performed for 21 days effectively helped increase the sensory sensitivity of the foot to peripheral neuropathy in patients with type II diabetes mellitus.

People with diabetes need comprehensive and continuous management of health services throughout their lives, in order to prevent complications caused by diabetes which will result in a decrease in quality of life. According to the relevant theory in previous studies stated that epidemiologically diabetes mellitus is often not detected and said onset or the onset of diabetes mellitus is 5 years before the diagnosis is made, so that early morbidity and mortality occur in undetected cases. So that it really requires proper and structured management.[13] Nurses in this case as health care providers must have the ability to provide independent action nursing care and collaboration or collaboration with other health teams [31].

Therapy Acupressure and foot exercise can not be separated from the pillars of the management of type II diabetes mellitus, which includes long-term goals that are prevented and hampered the progression of complications, especially for diabetic neropathy. Which is wheretherapy acupressure and foot exercises are included in the pillars of education and physical activity. To achieve this goal, it is necessary to prevent complications through non-pharmacological interventions by managing patients holistically or complementary by teaching care and behavior change.

From other studies stated that the behavior change process needed to change the target is not solely because of the addition of knowledge, but it is also expected that there will be changes in attitudes and skills that lead to better, more productive and profitable actions or work. Manifestations of attitudes cannot be seen directly, but can only be interpreted in advance of closed behavior. Attitude is still a closed reaction, not an open reaction or open behavior. [32].

In the world of health, especially nursing, nurses as one of the health workers will certainly be faced with the issue of decision making in providing professional health services to patients, especially people with type II diabetes mellitus.

Based on previous research, which states that knowledge is very important in underlying the formation of action, because a behavior is formed from knowledge. then from the study also states that the ease of obtaining good information can help to increase one's knowledge to obtain good knowledge and will bring good perceptions [33].

In the process of this research also applies Orem's nursing theory, which emphasizes the concept of self care. the concept of self care is very suitable to be applied to people with diabetes mellitus, because in Orem's theory more emphasis on the importance of intervention to meet one's needs independently and continuous efforts to maintain their health, recover from illness and trauma and overcome the effects or complications caused by the disease , and to improve the quality of life. [34, 35].

Other studies also state that education is important so that patients have good knowledge and the ability to undergo treatment programs in order to overcome the problem of the disease. Coping ability is measured by how well the patient's ability to deal with problems. Support from various parties is also very influential to improve patient health and quality of life for their survival. The patient's personal status is very influential in increasing his confidence, Increased personal status is expected to help patients to recover their condition gradually and overcome and prevent possible health problems that will occur [36].

The two interventions in this study were complementary therapy and physical exercise in this case acupressure and exercisefoot exercises or. So that these two interventions can help respondents to meet the therapeutic self care demand and self care agency.

The results of this study support the research hypothesis that there are differences in sensory sensitivity between the intervention group and the control group before and after acupressure and exercise treatment and answer the effectiveness oftherapy acupressure and foot exercise on increasing sensory sensitivity of peripheral neuropathy in patients with type II diabetes mellitus.

CONCLUSION

Based on the results of the study it was concluded that Acupresure (Point SP.3, SP.6, KI.3, LV.3) and foot exercise were effective in increasing sensory sensitivity of peripheral neuropathy in patients with type II diabetes mellitus as evidenced by:

1. From the results of the analysis it can be seen that from both groups there was a significant increase in sensory sensitivity of both legs peripheral neuropathy in patients with type II diabetes mellitus.intervention group acupressure left foot1.73 (p=0.001) right foot 1.33 (p=0.001) and in thecontrol group foot exercise left foot 1.47 (p=0.001) right foot 1.60 (p=0.001).
2. Therapy Acupressure and Foot Exercise can be applied in the management of prevention of complications of type II diabetes mellitus patients with peripheral neuropathy. And in nursing services nurses are expected to be able to provide nursing care holistically with non-pharmacological alternative interventions in an effort to prevent complications of peripheral neuropathy in patients with type II diabetes mellitus.

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