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The Effectiveness of Neuromuscular Taping (NMT) And Foot Exercise in Improving Microsirculations in Diabetes Mellitus Patients

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A B S T R A C T

Background: Diabetes mellitus is a chronic disease characterized by abnormal glucose due to disturbances in the pancreas. Neuromuscular Taping (NMT) is a non-pharmacological intervention to prevent decreased peripheral blood circulation of the lower extremities. Prevention of complications in patients with diabetes mellitus can also be done by improving the vascularization of the feet by doing foot exercises. Objective: This study aims to compare the effectiveness of Neuromuscular Taping (NMT) and foot exercise on the improvement of the Ankle Brachial Index (ABI) value. Methods: Quantitative research design with quasi-experimental methods pre-test and post-test with control group design. The population in this study was 356 patients, a sample of 66 respondents. The sampling technique used was purposive sampling with inclusion and exclusion criteria. Results: there is an effect on changes in the value of the Ankle Brachial Index (ABI) before and after the intervention of Neuromuscular Taping (NMT) and diabetic foot exercise. There was a significant difference between the intervention group and the control group on changes in the value of the Ankle Brachial Index (ABI). Conclusions and suggestions: there is an effect on changes in the value of the Ankle Brachial Index (ABI) before and after being given Neuromuscular Taping (NMT) and diabetic foot exercises. There was a significant difference between the intervention group and the control group on changes in the value of the Ankle Brachial Index (ABI). Suggestion: Neuromuscular Taping (NMT) and diabetic foot exercise can be a reference in providing education and nursing interventions to be applied in hospitals as a preventive measure to prevent microvascular complications, especially in patients with diabetes mellitus.

Kata kunci:

diabetes mellitus
neuromuscular taping
senam kaki diabetes
mikrosirkulasi

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A B S T R A K

Latar Belakang: Diabetes mellitus merupakan suatu penyakit kronis yang ditandai dengan glukosa yang abnormal karena terjadi gangguan pada pankreas. Neuromuscular Taping (NMT) adalah salah satu intervensi non farmakologi untuk mencegah pernurunan sirkulasi darah perifer ekstremitas bawah. Pencegahan komplikasi pada pasien diabetes mellitus dapat juga dilakukan dengan memperbaiki vaskularisasi kaki dengan melakukan senam kaki. Tujuan: Penelitian ini bertujuan untuk membandingkan efektivitas Neuromuscular Taping (NMT) dan senam kaki terhadap perbaikan nilai Ankle Bracial Indeks (ABI). Metode: Desain penelitian kuantitatif metode quasi eksperimental pre-test and post-test with control group design. Populasi dalam penelitian ini sebanyak 356 pasien, sampel 66 responden. Teknik pengambilan sampel dalam menggunakan purposive sampling dengan kriteria inklusi dan eklusi. Hasil:

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ada pengaruh terhadap perubahan nilai Ankle Brachial Index (ABI) sebelum dan sesudah diberikan intervensi Neuromuscular Taping (NMT) dan senam kaki diabetes. Terdapat perbedaan yang signifikan antara kelompok intervensi dan kelompok kontrol terhadap perubahan nilai Ankle Brachial Index (ABI). Kesimpulan dan saran: ada pengaruh terhadap perubahan nilai Ankle Brachial Index (ABI) sebelum dan sesudah diberikan intervensi Neuromuscular Taping (NMT) dan senam kaki diabetes. Terdapat perbedaan yang signifikan antara kelompok intervensi dan kelompok kontrol terhadap perubahan nilai Ankle Brachial Index (ABI). Saran: Neuromuscular Taping (NMT) dan senam kaki diabetes dapat menjadi referensi dalam pemberian edukasi maupun intervensi keperawatan untuk diaplikasikan di rumah sakit sebagai tindakan preventif pencegahan komplikasi mikrovaskular khususnya pada pasien diabetes mellitus.

INTRODUCTION

Diabetes mellitus is a disease marked chronic with abnormal glucose due to occur disorders of the pancreas (Nair, Tzanakakis, and Hebrok 2020). Data on the prevalence of diabetes in Indonesia in 2017 was ranked 10.3 million people (Indrahadi, Wardana, and Pierewan 2021). The highest prevalence in Indonesia is in DI Yogyakarta at 2.6%, DKI Jakarta at 2.5%, North Sulawesi at 2.4% and East Kalimantan at 2.3% (Amarta, O. R, Chalidyanto, D, and Laksono, A. L 2021). Based on data from the International Diabetes Federation As many as 87% of patients with diabetes mellitus have extremity problems _ lower or feet, and as many as 35% had a risk tall for leg amputation (Faizah, Efendi, and Suprajitno 2021). Other complications that become trigger amputation are polyneuropathy diabetes, infection, ischemia, ulceration, occur disturbance in circulation occurs infection, gangrene, decreased sensation, and loss of function of nerve Sensory and Peripheral Artery Disease (PAD) (Zamaa, Pawenrusi, and Pratama 2021). Atherothrombosis of the vessels blood that can result in a happening drop in circulation Genre blood or perfusion to extremity marked bottom with existence drop score Ankle Brachial Index (ABI) (Esa, D. F, Prahasary, A. N, and Tahapary, D. L 2019; Sirait and Mustofa 2021).

Circulation Genre blood that doesn't adequately influence nutrition It causes a drop in perfusion circulation blood to the extremities lower for bringing nutrition along with oxygen to so that risky happening ulcer diabetes and amputation (Ibrahim, Sofiani, and Irawati 2020; Widiastuti 2020). Ankle Brachial Index (ABI) assessment is required to evaluate circulation Genre abnormal blood. ABI is inspection non-invasive for measuring the circulation of blood in the extremities lower (Hijriana, Suza, and Ariani 2016; Suwisno and Hasanah 2021). ABI is a method of measurement of pressure blood in the area extremity lower ankle or legs and extremities on the brachial or hand (Putra et al. 2020).

Complementary therapy management needs to be done to prevent injuries to the diabetic foot due to changes in peripheral blood circulation. Neuromuscular Taping (NMT) is a non-pharmacological intervention used to prevent a decrease in peripheral blood circulation in the lower extremities (Kristianto, Waluyo, and Gayatri 2021). Neuromuscular Taping (NMT) is a non-invasive method by placing a tape on the skin which can give an eccentric effect on the muscles thereby reducing pressure on the tissue under the skin (Suci, Q. 2019). NMT is used to increase blood circulation, reduce edema in the lower extremities, provide stimulation to muscles and skin, reduce pain, and can reduce symptoms that arise due to disruption of the vascular nervous system (Kristianto et al. 2021; Randy, W. G. 2019; Wulandari, T. S. 2018).

Prevention of complications in patients with diabetes mellitus can also be done by improving the vascularization of the feet, namely by doing regular foot exercises (Astrie and Sugiharto 2021). Foot gymnastics is a physical activity carried out by moving the muscles and joints of the legs (Sanjaya, P. B, Yanti, N, and Puspita, L. 2019). The benefits of foot exercise are increasing blood flow, improving blood circulation, and increasing sensitivity in the feet (Nur and Tahir 2021).

METHOD

Research design this using design study quantitative with method q experimental pre-test and post-test with control group design. The population in a study whole patient with diabetes mellitus who were routinely treated at the health center Gangbang Yogyakarta city as many as 356 patients. The sample in this study amounted to 22 respondents per group, a total sample totaling 66 respondents. The sampling technique in this study used purposive sampling. Criteria in a study this namely: a) Criteria Inclusion: 1) Patients cooperative, compos mentis awareness, 2) Patient is sufferer regular diabetes mellitus check at the public health center, 3) Diabetic patients with age above 40-75 years, 4) Longer suffering from diabetes mellitus than 3 years, 5) Patients with diabetes mellitus who received therapy drug antidiabetic, 6) Patients with diabetes mellitus have not once experience wound ulcer diabetic, 7) Patient diabetes mellitus patient ready Becomes respondent with sign letter agreement or informed consent, the patient diabetes mellitus patients with score Ankle Brachial Index (ABI) >1.1 – 1.4 mmHg microcirculation normal limit, 0.9-1.0 mmHg microcirculation mild, and 0.6-0.8 mmHg microcirculation medium. b. Criteria Exclusion: 1) Patient diabetes mellitus patients who do not ready to become respondents, 2) Patient diabetes mellitus patients who have complications cardiovascular like disease heart, 3) Patient diabetes mellitus patients with diabetic foot ulcers. The study this conducted from April 25 to June 4, 2022, at the Mergangsan public health center Yogyakarta.

Table 1. Characteristics diabetes mellitus patients based on age, gender, education, occupation and length of suffering from diabetes mellitus.

Characteristics Respondent	Control		NMT Intervention		Diabetic Foot Exercise	
	F	%	F	%	F	%
Age						
– 46-55 Years	2	9.1	3	13.6%	4	18.2%
– 56-65 Years	11	50.0%	11	50.0%	10	45.5%
– > 65 Years	9	40.9%	8	36.4%	8	36.4%
Gender						
– Man	7	31.8%	13	59.1%	9	40.9%
– Woman	15	68.2%	9	40.9%	13	59.1%
Education						
– Elementary School	1	4.5%	1	4.5%	1	4.5%
– Junior High School	4	18.2%	5	22.7%	6	27.3%
– Senior High School	14	63.6%	13	59.1%	14	63.6%
– College	3	13.6%	3	13.6%	1	4.5%
Work						
– Employee Private	8	36.4%	11	50.0%	9	40.9%
– Entrepreneur	5	22.7%	4	18.2%	5	22.7%
– Not Working	9	40.9%	7	31.8%	8	36.4%
Duration of DM						
– 1-5 Year	10	45.5 %	6	27.3 %	8	36.4 %
– 6-10 Years	8	36.4 %	7	31.8 %	11	50.0 %
– > 10 Years	4	18.2%	9	40.9%	3	13.6%
Blood Pressure						
– 110-129 mmHg	10	45.5%	12	54.5%	10	45.5%
– 130-139 mmHg	8	36.4%	5	22.7%	9	40.9%
– 140-159 mmHg	4	18.2%	5	22.7%	3	13.6%

RESULTS AND DISCUSSION

Characteristics of Respondent

Based on table 1 characteristics patient could is known that the majority characteristics respondents diabetes mellitus patients based on age group control 50.0%, group 50.0% NMT intervention, and the group 45.5% diabetic foot exercise intervention, namely age 56-65 years (Late elderly), based on type sex majority group control 68.2% and diabetic foot exercise intervention 59.1% female, while group NMT intervention majority 59.1% , namely men. Based on education majority group control 63.6%, group NMT intervention was 59.1%, and the diabetic foot exercise group was 63.6%, namely SMA. Based on profession group control 40.0% no work, group 50.0% NMT intervention and 40.9% leg exercise group, namely employee private that is employee privacy. Based on long time suffering from diabetes mellitus group control majority 1-5 years n 45.5 %, group intervention NMT majority >10 years 40.9%, and group the majority of diabetic foot exercise intervention is 6-10 years 50.0 %. Based on pressure blood group control 45.5%, group NMT intervention 54.5%, and the group 45.5% foot exercise intervention is 110-129 mmHg.

Table 2. Normality test results to repair microcirculation diabetes mellitus patients group NMT intervention, group diabetes foot exercise intervention, and group control.

Variable	Group	Kolmogorov-Smirnov		Conclusion
		Statistics	Sig	
Diabetes mellitus	Pre ABI NMT	0.169	0.103	Not Normal
	Post ABI NMT	0.192	0.035	Normal
	Pre ABI Diabetic Foot Exercise	0.220	0.007	Not Normal
	Post ABI Diabetic Foot Exercise	0.182	0.056	Not Normal
	Pre ABI Control	0.172	0.090	Normal
	Post ABI Control	0.226	0.005	Normal

Normality Test

Based on table 2 normality test results to repair microcirculation group of diabetes mellitus patients ABI pre-post control, group NMT intervention pre-post ABI and group ABI post-test diabetes foot exercise intervention have score significance > 0.05 then could conclude that the 3 data groups distribute not normal.

Table 3. Homogeneity test results to repair microcirculation diabetes mellitus patients group NMT intervention, group diabetic foot exercise and group interventions control.

Variable	Levene's Test for Equality of Variances		Information
	F	Sig.	
Pre ABI NMT, Diabetic Foot Exercise, Control	1,272	0.655	Not Homogeneous
ost ABI NMT, Diabetic Foot Exercise, Control	4,170	0.563	Not Homogeneous

Homogeneity Test

Based on table 3 homogeneity test results to repair microcirculation known diabetes mellitus patient homogeneity test results in the group NMT intervention, group diabetic foot exercise intervention and groups control on variable *pre-test* ABI with score significant 0.655 with score *p*=< 0.05. Whereas variable *post* ABI on the group NMT intervention, group diabetic foot exetrcise intervention and groups control with score significant 0.563 value *p*=< 0.05 (no homogeneous), then could concluded that the data is not normal.

Table 4. Wilcoxon test results against repair microcirculation patients with diabetes mellitus in pada pre-post test group ABI score NMT intervention, group diabetic foot exercise and group interventions control.

Variable	Group	Pre-post ABI	P
		Mean±SD	
Diabetes mellitus	NMT Intervention	12,14±218,50	0·000
	Diabetic Foot Exercise Intervention	9.87±148.00	0.006
	Control	11.22±101.00	0.404

Wilcoxon test

Based on table 4 Wilcoxon test results on repair microcirculation patients with diabetes mellitus on pre-post test ABI value shows difference mean score in group NMT intervention and ABI pre-test leg exercise intervention were more low compared with post-ABI with score p = <0.05 then there is a significant difference. Whereas group control no there is a difference between pre-test ABI and post-ABI with score p = > 0.05.

The result of group means score NMT intervention pre-test and post-test ABI has a mean of 12.14 % with a score significant 0.000 (p= <0.05) that there is a significant difference _ before and after in the group NMT intervention. The result of group means score diabetic foot exercise intervention pre-post test ABI with score 9.87 % with score significant 0.006 (p = <0.05) that there is a significant difference _ before and after diabetic foot exercise. The result of group means score control pre-post test ABI with a mean of 11.22 % with a score significant 0.404 (p = >0.05) that no there is significant difference _ before and after control.

Table 5. Mann Whitney U test results against repair microcirculation diabetes mellitus patients in post-test ABI value group NMT interventions, diabetic foot exercise interventions and groups control.

Variable	Group	ABI post-test Mean±SD	Different	P
Diabetes mellitus	NMT Intervention Control	27.40± 0.189 18.02 ± 0.189	9.38	0.010 -
	Diabetic Foot Exercise Intervention Control	24.70±0.160 2 1.37 ±0.160	3.33	0.384 -
	NMT Intervention Diabetic Foot Exercise Intervention	25.93± 0.165 18.25 ± 0.165	7.68	0.041 -

Mann Whitney U test

Based on table 5 the value of Mann-Whitney U test results to repair microcirculation patients with diabetes mellitus on post-test ABI group NMT intervention 27.40% and the group control 18.02% mean difference of 9.38% with a score significant 0.010 (p = < 0.05), then could prove existence difference Among group NMT and group interventions control. Whereas group diabetes foot exercise intervention was 24.70% and group control of 37% mean difference 3.33% with score significant 0.384 (p => 0.05) so could prove no there is significant difference _ Among group diabetic foot exercise intervention and groups control. Whereas group NMT intervention 25.93% and group diabetic foot exercise intervention 18.25% mean difference of 7.68 % with a score significant 0.04 (p= <0.05), then could prove that NMT intervention is present influence significant compared with group diabetic foot exercise intervention.

Table 6. Distribution Of Mean Rank Value to Repair Microcirculation Diabetes Mellitus Patients on ABI Post-Test Based On Group NMT Interventions, Diabetic Foot Exercise Interventions And Groups Control.

Variable		N	Mean Rank	df	X^2	p-value
Post ABI	NMT	21	42.33			
	Diabetic Foot Exercise	22	31.45	2	4,781	0.029
	Control	23	27.39			

Multivariate Analysis

Based on table 6 looks the ranking for repair microvascular to score Ankle Brachial Index in patients with diabetes mellitus is the highest happens in groups NMT intervention with an average of 42.33%. While the lowest happens to the group control with an average of 27.39%. Result x 2 as big as 4,781 with score Asymp.Sig of p=0.029 (p=<0.05), based on the Kruskal Wallis test could conclude that NMT intervention, diabetic foot exercise, and control to

repair microvascular to ABI value in patients with diabetes mellitus there is a significant difference.

DISCUSSION

Age

The majority age in the study this ie 56-65 years (Late elderly), p this is in line with study (Naba, O.S, Adu, A.A, and Hingga, I.A 2021) and research (Alva, M. L et al. 2018) stated that patients with diabetes are more common in the late elderly age group, namely 56-65 years, abnormal blood glucose levels are influenced by age. The elderly (elderly) is someone who has entered the final stages of the life phase, The older the age, the lower the organ function, and the need for physical exercise is not met optimally, so the risk of developing a peripheral vascular disease (Putra et al. 2020; Sammulia, Elfasyari, and Pratama 2020). According to the assumption researcher, the majority of patients with diabetes mellitus at the age of elderly end 56-65 years caused because at the age elderly occur drop organ functions such as decline insulin production so that cause rate glucose in blood Becomes increase, as well occur limitations for practice physique optimally so that risky experience even diabetes complications.

Gender

The majority gender is women, women have a risk of developing diabetes mellitus because physically women risky have the opportunity against the increase in body mass index (Bintoro, T et al. 2019). This is in line with research (Widiastuti 2020), which shows that the majority of respondents with diabetes mellitus are women (79%). Women are more likely to have diabetes mellitus because pre-menstrual syndrome and post-menopause cause fat distribution as a result of hormonal disturbances. A decrease in the hormone estrogen causes vasoconstriction of blood vessels, occurs an increase in LDL levels atherosclerosis forms in the arteries and blood vessels. According to the assumption researcher, the majority of people with diabetes mellitus are girl, think the caused because woman by physique have the opportunity happening increase in BMI, as well as woman experience premenstrual syndrome and postmenopausal can affect _ _ to the cell body for respond to insulin so that influence rate glucose in blood and risk increase prevalence diabetes mellitus.

Long Suffering from Diabetes Mellitus

Long time suffering from diabetes the majority more than 5 years, p this in line with study (Djamil and Mappanganro 2021), based on the majority have long suffered from diabetes mellitus > 5 years that is as much as (77%). Length of patient suffers diabetes has _ risk happening complications of diabetes mellitus because enhancement rate glucose blood in a period long could cause the damage vessels blood, so cause occur damage network that is disturbance circulation vessels blood (Hijriana et al. 2016). The longer the patient suffers from diabetes mellitus have risk happening complications like diabetic foot ulcers that manifestation end from neuropathy peripheral, abnormal Vascular, and Peripheral Arterial Disease (PAD) (Efriliana et al. 2018; Lintang,S.A et al. 2020; Simanjuntak, Sinaga, and Simamora 2020). According to the assumption researcher, The majority of long-term sufferers of diabetes mellitus are 6-10 years cause damage to respirator blood and disorder circulation vessels blood that causes risk happening complications microvascular like diabetic foot ulcer, neuropathy peripheral, abnormal Vascular and Peripheral Arterial Disease (PAD).

Blood Pressure

Pressure blood majority 110-129 mmHg. This thing in line with research (Djamil and Mappanganro 2021), in the study his respondent has pressure normal blood pressure blood systolic 120-139 mmHg, and pressure blood diastolic 80-89 mmHg. Inspection and monitoring of pressure blood by routine could minimize the risk happening disease hypertension in diabetics and prevent happening complications. That thing supported with subjective data results in the assessment of several some many patients who said have history hypertension and routinely consume drug amlodipine 5 mg. According to the assumption researcher, the majority of research this that is pressure blood in the normal limit is 110-129 mmHg because patients check their health regularly and patients who have disease blood tall routine consume drug antihypertensive, so the majority pressure blood respondents to research this in normal limit.

Effectiveness repair Ankle Brachial Index (ABI) patients with diabetes mellitus against the neuromuscular taping (NMT) intervention and the diabetic foot exercise intervention group.

Analysis result group mean _ NMT intervention pre-test and post-test ABI has a mean of 12.14% with score significant 0.000 that there is significant difference _ before and after conducted ABI assessment in the group NMT intervention. This thing also in line with the study (Mukaroma. L 2019) that there is an influence of lymphatic Neuromuscular Taping (NMT) to change the Ankle Brachial Index (ABI) values in patients with diabetes mellitus. Happening dilated vessels blood launch circulation Genre blood so that occur after lymphatic NMT insertion that causes circulation blood Becomes fluent (Yanda,R and Rahayu,B.U. 2018).

Analysis result group mean _ diabetic foot exercise intervention pre-post test ABI with value 9.87% with score significant 0.006 that there is significant difference before and after gift diabetic foot exercise intervention. This thing in line with a study (Girsang and Sitorus 2020; Putra et al. 2020) which shows the existence of the effect of foot exercise on score Ankle Brachial Index (ABI) in patients with type 2 diabetes. Diabetic foot exercise launches circulation periphery in the last leg cause happening contraction in muscles leg that compresses the vein so that the venous wall in the system circulation contract and occur enhancement pressure arteries during leg gymnastics and causes increase ABI value (Sammulia et al. 2020; Wahyudi 2020). This thing in line with the study (Utami,I.T. 2019). mentions that there is a significant difference in pre-post ABI values in the leg gymnastics group

Patients with diabetes mellitus have a risk happening change in the elasticity of capillary vessels blood, thickening wall vessels blood, and formation of plaque that can result in vascularization to peripheral Becomes obstructed. states like this could result in Patients with diabetes mellitus tend to have higher ABI values low (Pratomo and Apriyani 2018). The more low ABI value then will increase the risk tall disease vascular and have risk happening complications disease of the extremities lower like disease arteries (PAD),

foot ulceration, and neuropathy peripheral(Anggraeni 2018; Hijriana et al. 2016; Simanjuntak et al. 2020).

Condition ischemia heavy is marked with ABI value <0.5 mmHg occurs due to poor peripheral perfusion/atherothrombosis leading to hypoxia network so that cause ischemia of the extremities under /leg and if there is wound, mama the cure will difficult. Whereas condition critical foot ischemia be marked with ABI value <0.5 mmHg indicates has occur critical leg ischemia that is manifested with happening ulceration and gangrene. Happening gangrene shows the existence Dead network or necrosis (Adiputra et al. 2020; Pratomo and Apriyani 2018).

The Effectiveness of Ankle Brachial Index (ABI) Improvement in Diabetes Mellitus Patients Against the Neuromuscular Taping (NMT) Intervention and The Control Group.

Analysis result difference ABI value in the group NMT and group interventions control mean difference 9.38% with score significant 0.014 (p = < 0.05), then could prove existence difference Among group NMT and group interventions control. This thing shows if there is a significant difference in mean ABI scores Among group NMT and group intervention control. Analysis result difference ABI value in the group NMT intervention exists influence Neuromuscular Taping on ABI value against repair microcirculation diabetes mellitus patients in the group NMT intervention after conducted intervention During one week with replacement of taps every 3 days very that is on the day first day _ 3rd and day 6. That thing proved with existence enhancement post-ABI value. Replacement of taping done During three day very for maintaining condition adhesive tape so that still installed with good. The installation of Neuromuscular Taping (NMT) performed by right and true could get positive musculoskeletal effects, such as launch circulation Genre increase circulation Genre blood and vessels blood (Blow, 2012; (Permata and Ismaningsih 2020).

This thing in line with a study (Kurniawan, H. 2018), there is the effect of NMT on ABI scores in type 2 DM patients, which concludes that NMT influences ABI scores so that NMT can Become therapy complementary for beneficial diabetic foot care as prevention complications disturbance vascular like disturbance Genre blood in the extremities marked bottom /leg with painful moment rest on the extremities bottom that gives rise to risk happening diabetic foot ulcer because of neuro ischemia and ischemia network. Analysis result difference ABI value in the group control no there is a difference in results pre-post ABI value. That thing occurs because group control no get therapy installation of Neuromuscular Taping (NMT) and is not given intervention anything, however, respondents get therapy pharmacology from the health center. Though so, group control no experience drop ABI score of normal range to range insufficiency arteries mild caused because happening disease arteries peripheral. Complications of disease arteries periphery in patients with diabetes mellitus can occur because of state disorders of the vessels blood peripheral, especially in the extremities bottom /foot which is one complication vascular from diabetes mellitus (Utami,I.T. 2019).

The Effectiveness of Ankle Brachial Index (ABI) Improvement in Diabetes Mellitus Patients Against The Diabetes Foot Exercises Intervention Group And The Control Group.

Analysis result difference ABI value in the group diabetic foot exercise intervention and groups control mean difference 3.33% with score significant 0.384 (p = > 0.05). This thing shows if no there is a significant difference in the average ABI value between group diabetic foot exercise intervention and groups control. Analysis result there is the effect of diabetic foot exercise on the ABI value on repair microcirculation diabetes mellitus patient but no significant. This thing in line with study (Adiputra et al. 2020; Astrie and Sugiharto 2021; Lasia 2020; Prihatin 2019; Putra et al. 2020; Resti, Ludiana, and Pakarti,A.T 2019), mentions there is the effect of diabetes mellitus foot exercise on change Ankle Brachial Index (ABI) values in Type II DM patients. Enhancement post-ABI value occurs because of the existing movement of the limbs that causes stretching muscles in the legs and compresses the veins around muscle so that push blood toward the heart then venous pressure will be decreased. Mechanisms help launch circulation blood in the extremities lower so that repair circulation blood (Putra et al. 2020).

Analysis result difference ABI value in the group control no there is a difference in results pre-post ABI value. That thing occurs because the group control no gets diabetic foot exercise. The results of the pre-post ABI assessment have not occurred changed to ABI value. This thing because no occur effective contraction of the muscles calf can facilitate adequate venous return repair circulation in vessels venous blood so that no occur enhancement to ABI value even no there changes ABI value and tend permanent (Lasia 2020).

The Effectiveness of Ankle Brachial Index (ABI) Improvement in Diabetes Mellitus Patients Against Intervention Neuromuscular Taping (NMT) and Interventions Diabetic Foot Exercise.

Analysis result difference ABI value in the group NMT and group interventions diabetic foot exercise intervention mean difference 7.68% with score significant 0.041 (p = < 0.05), then could prove NMT intervention more good compared to with diabetic foot exercise intervention. This thing shows if there is a significant difference in mean ABI scores Among group NMT intervention and the diabetic foot exercise group. Analysis result group ABI value intervention more Neuromuscular Taping good compared to group diabetic foot exercise intervention against repair microcirculation diabetes mellitus patient. Attached is neuromuscular taping During one week with replacement taping every three days very more cause-effect positive on circulation peripheral so that increase ABI value, and can to do activity whatever though taping is installed.

Analysis result group ABI value diabetic foot exercise intervention has influence but no sign on the results post-ABI value because several some many factors like leg exercises that don't conduct with true and correct, no conducted by routine, and rate glucose blood in the patient also affects effect positive from diabetic foot exercise. Several some many respondents in the group diabetes foot exercise intervention say not have time to do leg exercises because many of their professional house and some respondents are busy with work.

Diabetic foot exercise done routinely and regularly in diabetic patients has an impact positive for enhancement of ABI value because with To do movements in diabetic foot exercise right and truly beneficial for launch circulation blood in the extremities down and prevent like happening complications disease arteries peripheral (Girsang and Sitorus 2020). According to the American Diabetes

Association, 2019, diabetic foot exercise activities are recommended at least 5 times a day one week with 30 minutes duration (Sya' diyah et al. 2020). Non-diabetic foot exercise conducted routine and regular only a little increased ABI value (Lasia 2020).

Effectiveness Repair Ankle Brachial Index (ABI) Patients with Diabetes Mellitus Against Neuromuscular Taping Intervention (NMT), Diabetes Foot Exercise Intervention, And Group Control.

Based on results analysis significant 0.029 (p=<0.05), can be concluded that NMT intervention, diabetic foot exercise, and control to repair microvascular to ABI value in patients with diabetes mellitus there is a significant difference. Ankle Brachial Index (ABI) examination aims to: evaluate function circulation in arteries in the extremities lower to Know the process of atherosclerosis that influences circulation arterial perfusion to the distal extremity (Saputra,D. 2020). Decrease perfusion usually is marked with loss pulsation peripheral, pain moment walks, then feel getting better when resting and easy happening infection of the extremities bottom foot (Arista and Rahayu 2021).

By physiology, signs, and symptoms happening diabetic foot complications like neuropathy diabetic be marked with the appearance of pain in the legs and tingling that occurs if the condition hyperglycemia so which could cause disorders of the nerves peripheral and circulation Genre blood (Cristiningtyas,I 2018). That thing by following per under complaint respondents to research this is saying feel pain in the legs, often tingling, and average results respondents GDS check more than 200 mg/dl. Giving intervention Neuromuscular Taping (NMT) lymphatic with method installation technique decompression conducted the installation of taping during one week and done replacement taping every three days once. Decompression technique could bring up in the form of folds on the taping so that cause stretch on the lining. Stretching that occurs in the skin cause pressure on the network skin to decrease and circulation under the taping to be smooth and improve ABI value (Blow, 2012; (Kurniawan, H. 2018).

A deep foot exercise intervention study conducted for one week give effect positive to change the ABI value. The movements made could expedite the circulation of genre blood. In diabetic foot exercise, there is effective leg stretching that launches circulation of blood to the extremity down, reduces the risk of arteriosclerosis, improves circulation of genre blood to the feet, and also plays a role for increase pressure of systolic foot (Girsang and Sitorus 2020; Pratiwi et al. 2019). According to a study (Trisna. E and Musiana 2018), happened changes to results in ABI value in the normal range after diabetic foot exercise, a thing because occur stimulation from activity movement of the muscles extremity active bottom moment to do leg gymnastics movements, so that stimulation could result in vasodilation in vessels blood so that launch circulation Genre blood inside tissue in the extremities bottom.

According to a study (Astrie and Sugiharto 2021), the movements carried out During beneficial foot exercise intervention for increase endorphins that help reduce pain, vasodilation _ vessels blood cause vessels abnormal blood has widening vessels blood so that occur drop pressure blood especially associated brachial systolic with change ABI value.

Group control no conducted NMT intervention and foot exercise, only given care standard with gift therapy pharmacology and blood sugar test by a routine from Health Center. In group control majority of respondents did not occur a significant change to score Ankle Brachial Index (ABI). That thing because no occur effective contraction of the muscles in the extremities bottom that can increase strength muscle extremity bottom repair circulation vessels venous blood so that no occur significant improvement against ABI even tend fixed.

LIMITATIONS OF THE STUDY

The NMT and foot exercise intervention in this study was only carried out for one week, based on the results of studies in several journals, it was more effective if the intervention was carried out for 3 weeks. In the foot exercise intervention, research was only carried out on the first, third, and sixth days, so that on the second and fourth days the respondents were not directly monitored in carrying out foot exercises.

CONCLUSION AND SUGGESTION

There is an effect on changes in the value of the Ankle Brachial Index (ABI) before and after given Neuromuscular Taping (NMT) intervention and diabetic foot exercise. There was a significant difference between the intervention group and the control group on changes in the Ankle Brachial Index (ABI) value. Neuromuscular Taping (NMT) and diabetic foot exercises can Become a reference in gift education and intervention nursing for applied at home sick as action preventive prevention complications microvascular especially in patients with diabetes mellitus.

ETHICAL CONSIDERATION

The Health Research Ethics Committee of the Faculty of Medicine and Health Sciences UNISA N0.2001/KEP-UNISA/III/2022 approved this study.

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