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The Effectiveness Of Buerger Allen Exercise On Decreasing ABI Value In Diabetes Mellitus Patients With Virginia Henderson's Nursing Model Theory Approach In The Covid-19 Pandemic

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ABSTRACT
Diabetes mellitus (DM) is a metabolic disorder, with increased levels of sugar in the blood. Untreated elevated blood sugar levels can lead to micro/macrovascular complications and neuropathy. One of the chronic complications of diabetes mellitus type 2 is diabetic foot ulcers. Buerger Allen exercise is one of the efforts to increase peripheral perfusion where the exercise is an exercise system for lower leg arterial insufficiency by applying changes in the position of gravity and muscle pumps through the application of ankle movements for smooth muscle blood vessels with the aim of facilitating adequate oxygen diffusion and nutrient supply to the body. Adequate ulcer area was measured by the Ankle Brachial Index (ABI). This study uses a Quasy Experiment design of two variables studied with a pre-test and post-test control design approach. The sampling technique used purposive sampling on 45 respondents in the intervention group who were given the Buerger Allen exercise and 45 respondents in the control group who were not given the intervention. The results showed that there was a significant difference in the value of the Ankle Brachial Index (ABI) before and after being given the Buerger Allen Exercise treatment, namely $p < 0.05$. In conclusion, buerger allen exercise was effective in increasing the value of the Ankle Brachial Index (ABI).

Keywords: Diabetes mellitus, Buerger Allen exercise, Ankle Brachial Index

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BACKGROUND

Diabetes mellitus (DM) is a group of metabolic diseases characterized by hyperglycemia that occurs due to abnormalities in insulin secretion, insulin action or both (PERKENI, 2021). If diabetes mellitus cannot be managed properly for a long time, dangerous complications will arise, one of which is diabetic foot injury which can cause infection and foot deformity to limb amputation and cause death in about 25% of DM patients who suffer from foot injuries. . (Kawasaki, et al., 2013). This occurs due to decreased capillary, venous and arterial blood flow. This decrease in blood flow if left untreated can lead to neuropathy (Chadwick, Edmonds, and McCardle, 2013).

The simplest supporting examination that can be done to detect peripheral circulation disorders is to assess the value of the Ankle Brachial Index (ABI). An ABI value > 1.0 is said to be good or normal and if < 0.9 is said to be at risk for peripheral circulation disorders, therefore the action to detect peripheral circulation disorders that is appropriate for DM patients is to measure the ABI (Williams & Wilkins, 2012). Foot exercise is one of the physical exercises for foot care that can be given to people with Diabetes Mellitus to prevent peripheral arterial disease with the aim of increasing the peripheral circulation of the feet.

Buerger Allen Exercise is a series of foot treatments that can overcome the complications of diabetes by increasing blood circulation. Buerger Allen exercise can increase peripheral circulation through a combination of muscle pumps and changes in the force of gravity (Nadrati, 2018). The purpose of this movement is to help meet sufficient oxygen and nutrients into the blood vessels, maximize the work of small muscles, prevent foot deformities, improve blood flow, increase insulin production in glucose transport to cells so that it can help the healing process of diabetic foot wounds and lowers blood sugar levels. Based on the results of these theories, the researchers wanted to identify the effect of Buerger Allen exercise on changes in ABI values in diabetic patients

METHODS

Study design

This study uses a Quasy Experiment design of two variables studied with a pre-test and post-test control design approach. The sampling technique used purposive sampling on 45 respondents in the intervention group who were given the Buerger Allen exercise and 45 respondents in the control group who were not given the intervention.

Respondents

The population and sample in this study were all diabetes mellitus patients under the working area of Bangkalan Public Health Center.

Instrument

Data collection is divided into two, namely demographic data and ABI score data. The ABI score was obtained by dividing the leg systolic blood pressure (dorsalis pedis) by the arm (brachial) systolic blood pressure using a sphymomanometer. Interpretation of normal ABI values (0,9 – 1,3), mild obstruction (0,71 – 0,89), moderate obstruction (0,41 – 0,69), and severe obstruction (less than 0,4).

Data Collection

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The initial stage of data collection starting from obtaining research permission and approval from research respondents, respondents will be selected according to the criteria of inclusion and exclusion, respondents in this study are DM patients under the working area of Bangkalan Public Health Center with purposive sampling techniques. The intervention was given to the treatment group 6 times for 6 days with a duration of 15 minutes at each meeting. The ABI scale was measured according to the SOP that had been determined using a stethoscope and doppler. Then data analysis univariately with frequency distribution tables and bivariate analysis using paired T-Test statistical tests to be concluded.

Ethical considerations
Ethical principles that are fulfilled include the approval of respondents with evidence of filling out the approval sheet to be a respondent, ensuring that the value of usefulness is greater than the risks received by respondents, and also paying attention to the rewards received by respondents as a form of compensation and the importance of maintaining the confidentiality of respondents' data

RESULT

Table 1 Respondent characteristics

Demographics	Intervention Grup		Control Grup	
	No	%	No	%
Ages				
30 – 35 years old	10	22	9	20
36 – 40 years old	12	27	11	24
41 – 45 years old	9	20	12	27
45 – 50 years old	14	31	13	29
Gender				
Male	32	71	30	67
Female	13	29	15	33
Marital Status				
Married	40	89	43	96
Not Married Yet	5	11	2	4
Duration of suffering from diabetes				
5 – 10 years	27	60	15	34
11 – 15 years	18	40	10	22
16 – 20 years	0	0	16	35
21 – 25 years	0	0	4	9
Smoking history				
Smoke	28	62	22	49
Do not smoke	17	38	23	51

Source: primary data of patient of diabetics under the working area of Bangkalan Public Health Center

Most of the ages of DM patients in the intervention group were in the age range of 45-50 years (31%) and the same thing happened in the control group, namely in the 45-50 years age range (29%).

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Tabel 2 The effect of Buerger Allen Exercise on changes in ABI values (n = 45)

Grup	Mean		SD		Paired T-Test	P Value
	Pre Test	Post Test	Pre Test	Post Test		
Intervention grup	0,737	0,913	0,067	0,086	9,204	< 0,05 Signifikan
Control Grup	0,845	0,842	0,58	0,074	1,003	> 0,05 Tidak Signifikan

Source: primary data of patient of diabetics under the working area of Bangkalan Public Health Center

Table 2 shows the difference in statistical tests of the mean and standard deviation of the two groups after the treatment was given. The test results showed a significant change in the mean value of the intervention group when compared to the change in the mean in the control group which was not significant. The standard deviations are 0.074 and 0.067, respectively. The difference in the mean in the two groups clearly shows that the intervention group has a high difference in the mean ABI value, meaning that there is a significant change in the ABI value. The mean result is that the change in ABI value in the intervention group is better than the control group with a significant p value (0.000) which means that there is a significant difference in the effect of changes in the ABI value in the intervention group and the control group.

DISCUSSION

a. Respondent characteristics

The average age of respondents in both groups shows an age range of 45-50 years. Research by Rac-Albu, et al (2014) also concluded that DM often occurs in the 45-50 year age range. In line with the results of previous studies, research by Jannoo, et al (2015) reported a significant correlation between age and the incidence of DM in the 45 year age group due to the aging process which causes a decrease in physiological function including a decrease in pancreatic function and the occurrence of insulin hormone retention, so that the ability ineffective blood glucose regulation. Uncontrolled hyperglycemia causes an increased risk of chronic complications, both macrovascular and microvascular, one of which is impaired peripheral tissue perfusion. Referring to the results of the study, it is known that the average respondent has a history of DM for 7 years. Diabetes with a history of DM for more than 5 years has a greater risk of complications, one of which is atherosclerosis. Complications of atherosclerosis mostly occur in the legs (macrovascular). Atherosclerosis that is not treated properly will cause blockage (obstruction) of the arteries and/or veins in the legs which results in impaired blood flow in the legs. Peripheral perfusion disorders in the legs suffered by DM patients for a long time cause nerve death (neuropathy) in the feet of DM patients, causing reduced and or loss of tactile sensation in the feet. Most of the diabetics who have reduced or even lost the sensation of touch in the feet are not aware that their feet have been injured and cause ulcers Sinaga & Hiswani (2012) and Alvarsson, et al (2012).

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b. Difference in Average ABI Value

The results showed that there was a difference in the average difference in ABI values after being given BAE in the two groups with a p value of 0.00. Lamkang's research (2017) states that the effect of Buerger Allen Exercise is to effectively improve peripheral blood circulation.

The effects felt by DM sufferers after doing the burger allen exercise are increased ability to walk, reduce pain (intermittent claudication), reduce tingling sensations, reduce leg edema which can be assessed from increasing peripheral circulation adequacy from changes in the Ankle Brachial Index (ABI) value. The adequacy of peripheral circulation by the Buerger Allen exercise is the result of methods and variations of exercise by optimizing the movement of the lower limbs so that the muscle pump process occurs and movements that utilize the force of gravity so that there is a smooth movement of blood flow in the lower limbs towards the heart and the whole body.

c. The Effect of Buerger Allen Exercise on Changes in ABI Value

There was a significant difference in the ABI value in the intervention group before and after the Buerger Allen Exercise. On the other hand, there was no significant difference in the ABI value in the control group. This is in line with the research of Aruna and Thenmozi (2015) who reported that there was an increase in Nitric Oxid levels which played an important role in increasing peripheral perfusion in the legs after 3 months of Buerger Allen Exercise. This is also supported by the research of Chang, et al (2015) who concluded that the obstruction of blood flow in the diabetic feet due to the DM disease process can be overcome with Buerger Allen Exercise.

CONCLUSION

Based on the results of statistical tests the Buerger Allen Exercise method has been shown to have an effect on changes in ABI values, which means increasing lower extremity perfusion among diabetes mellitus patients with previous perfusion disorders.

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