



THE EFFECT OF PROGRESSIVE MUSCLE RELAXATION ON THE VALUE OF ANKLE BRACHIAL INDEX AND FOOT SENSITIVITY IN PATIENTS WITH DIABETES MELLITUS

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ABSTRACT

Diabetes mellitus (DM) is a global health threat due to many other health risks such as kidney failure, heart disease, stroke and even serious injuries that can cause complications. One of the complications is peripheral neuropathy nerve damage that causes diabetic ulcers so that there is a risk of decreased foot sensitivity and changes in ankle brachial index values in diabetics. Progressive muscle relaxation technique is one of the actions that can affect the hypothalamus to regulate and reduce the activity of the sympathetic nervous system to provide direction by moving the feet slowly and regularly. Objective: to determine the effect of progressive relaxation techniques on the value of ankle brachial index and foot sensitivity in patients with diabetes mellitus. Methods: This study used quasi experiment method with pre test and post test design approach with control group. The population of DM patients was 120 respondents, then the sample was taken using non-probability sampling and based on inclusion and exclusion criteria. Sampling using total sampling with the number of respondents 15 intervention groups and 15 control groups. Analysis using the t-test. Results: The results of the study on the ABI value obtained a p-value of 0.02 in the intervention group and a p-value of 0.414 in the control group while the foot sensitivity value obtained a p-value of 0.01 in the intervention group and 0.07 in the control group. Conclusion: This shows that there is an increase in ABI values and foot sensitivity in patients with diabetes mellitus. The progressive relaxation technique can be used as an intervention to prevent diabetic foot ulcers.

Keywords: ankle brachial index; diabetes mellitus; foot sensitivity; progressive muscle relaxation

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INTRODUCTION

Diabetes Mellitus (DM) is a metabolic disease caused by insulin disorders characterized by an increase in blood glucose levels or also known as hyperglycemia. DM is a disease that has many risks for the health of the body, and is a degenerative disease that must be considered for how to control it. DM is a global health threat because of the many other health risks such as kidney failure, heart disease, stroke and even serious injuries that can cause complications (Valentina et al., 2023). According to the World Health Organization (WHO, 2018) reported that Indonesia is in 6th place with the number of sufferers reaching 10.3 million people. This is in accordance with the Basic Health Research data (RISKESDAS, 2018) which also shows an increase in the incidence of diabetes from 6.9% in 2013 increasing to 8.5% in 2018. Central Java Province is the area with the highest incidence rate of 1.1% (Kemenkes RI, 2020). This is also comparable to the prevalence according to the International Diabetes

Federation (IDF, 2018) estimating 463 million people aged 20-70 years in the world suffering from DM in 2019 at 9.9% or 111.2 million people aged 65-79 years. Based on the results of a preliminary study of the Wonogiri Regency Office, the Wonogiri area became the 2nd most DM sufferers recapitulated in 2019 according to the 2019 DM sufferer health sector minimum service standard report (Federation, 2021)

The increasing prevalence causes us to care about overcoming the disease. This is because DM is also called the silent killer because this disease can affect other organs that can cause various complaints if not treated can cause various complications, one of which is peripheral arterial disease (PAP). Peripheral arterial disease can be caused by atherosclerosis that occurs in the peripheral arteries so that part of the blood vessels is disturbed. In vascular disease, the atherosclerotic process can cause a decrease in blood flow (perfusion) to the lower extremities which is characterized by a decrease in the ankle brachial index and a decrease in foot sensitivity (Astrie & Sugiharto, 2021). Ankle brachial index (ABI) in DM patients is a non-invasive examination to determine peripheral blood circulation disorders by measuring the ratio of systolic (brachial) pressure to foot systolic pressure. Foot sensitivity occurs due to an increase in blood sugar levels in the body, this condition will damage nerve cells, if left unchecked it will result in decreased foot sensitivity and greatly interfere with activities and reduce productivity in sufferers. To avoid complications in addition to pharmacological therapy, non-pharmacological management is also needed which is used to prevent the occurrence of peripheral arterial disease. Non-pharmacological treatment can be done with physical activity, one of which is progressive muscle relaxation therapy which aims to increase the use of blood glucose by active muscles so that blood glucose can decrease (Mataputun et al., 2020)

One of the DM controls is the control of ABI values and foot sensitivity which can be controlled by paying attention to the fulfillment of physical activity with non-pharmacological therapy where physical activity can increase the body's metabolism to work more optimally which causes blood glucose levels to be controlled, one of the physical activities that can be applied is non-pharmacological therapy, one of which is progressive muscle relaxation. This is supported (Juniarti et al., 2021). Progressive muscle relaxation is a type that focuses on tightening and relaxing sequential muscle groups. Progressive Muscle Relaxation / PMR was first introduced by Jacobson in 1938. Jacobson explained that progressive muscle relaxation can facilitate the body's oxygen consumption, increase metabolism, accelerate breathing, reduce muscle tension, balance systolic and diastolic blood pressure (Juniarti et al., 2021) Progressive muscle relaxation directs the patient's attention to distinguish the feelings experienced when muscle groups are relaxed and compared to muscles in a tense condition, the benefits of progressive muscle relaxation are also to reduce peripheral resistance and increase vascular elasticity (Seila 2016). This condition can improve blood flow as indicated by ABI values within the normal range (Sari & Harmanto, 2020)

Progressive muscle relaxation technique is one of the actions that can affect the hypothalamus to regulate and reduce the activity of the sympathetic nervous system to provide direction by moving the feet slowly and regularly. This will have an effect on feelings to relieve tension in the muscles. Progressive muscle relaxation therapy can stimulate the release of endorphin and enkephalin chemicals and stimulate brain signals that cause muscles to relax and increase blood flow to the brain and make the mind feel calm (Juniarti et al., 2021). The results of a preliminary study at Desa Gedawung in 2023 prevalence of DM cases was 120 respondents and the results of interviews were that many patients did not know the effect of DM disease if not handled properly. Therefore the authors are interested in conducting this study with the

title of the effect of progressive muscle relaxation on the ankle brachial index value of patients with diabetes mellitus in Desa Gedawung [Reviewer1]. Objective this research to determine the effect of progressive relaxation techniques on the value of ankle brachial index and foot sensitivity in patients with diabetes mellitus.

METHOD

This study uses a type of quantitative research using the quasi experiment method with a pre test and post test design with control group approach. The population in this study were patients suffering from diabetes mellitus in Desa Gedawung. The sample in this study was taken with a purposive sampling technique of 30 respondents who were divided into 15 intervention group respondents with progressive muscle relaxation and 15 control group respondents only given routine treatment. The population of DM patients was 120 respondents, then the sample was taken using non-probability sampling and carried out. Samples were taken based on inclusion and exclusion criteria. Inclusion criteria include patients with a history of DM with blood glucose > 200 gr/dl, cooperative patients, not experiencing decreased consciousness. Exclusion criteria are patients with stroke and muscle weakness, patients with lower extremity fractures, patients with leg ulcers. The data that has been collected is then tested for normality using Cronbach alpha, the data results are normal, then tested using the t-test. Ethical testing was carried out at Wonosari hospital with ethical eligibility NO.00.9/050/2023.

RESULTS

Respondent characteristics

Table 1.
Respondent characteristics (n= 30)

Respondent characteristics	f	%
Age		
56-65 years	10	33
>65 years	20	67
Gender		
Female	27	90.9
Male	3	9.1
Lama Menderita		
<1 year	9	27.3
2 years	9	27.3
3 years	9	27.3
4 years	2	11.2
5 years	1	6.9

Table 1, most respondents who suffer from DM disease are in the age range of more than 65 years as many as 20 respondents (67%). Gender data is mostly female respondents as many as 27 respondents (86.3%) and most respondents suffer from DM for approximately 1 year to 3 years with a percentage.

Tabel 2.
Analysis of the effect of progressive muscle relaxation on ABI of Intervention Group and Control Group Patients with Diabetes Mellitus (n=30)

Variable	Group	Mean	Sig
Pre test ABI	Intervention	0,873	0,02
Post test ABI	Intervention		
Pre test ABI	Control	0,782	0,414
Post test ABI	Control		

Table 2 above shows the results of statistical tests using the t-test obtained a p value of 0.02 which means that there is an effect of progressive relaxation on the value of the Ankle Brachial Index (ABI) in the intervention group. while in the control group obtained a p value of 0.414 which means there is no effect of progressive relaxation on the value of the Ankle Brachial Index (ABI).

Tabel 3.
Analysis of the effect of progressive muscle relaxation on foot sensitivity of Intervention Group and Control Group Patients with Diabetes Mellitus

Variable	Group	Mean	Sig
Pre test foot sensitivity	Intervention		
Post test foot sensitivity	Intervention	9,85	0,01
Pre test foot sensitivity	Control		
Post test foot sensitivity	Control	5,76	0,07

Table 3 above shows the results of statistical tests using t-test obtained p value of 0.01 which means there is an effect of progressive relaxation on the value of foot sensitivity in the intervention group, while in the control group obtained p value of 0.07 which means there is no effect of progressive relaxation on the value of foot sensitivity.

DISCUSSION

Based on table 1, most respondents who suffer from DM disease are in the age range of more than 65 years as many as 20 respondents (67%). According to (Arania et al., 2021) the age limit that occurs slowly is divided into several stages. Age more than 45 years is the initial stage showing a decrease in physiological functions in the body that can manifest in various diseases. Symptoms and signs of decreased physiological function become more evident this stage is called the clinical stage at the age of 45 years and above which includes a decrease in all body system functions including the immune, metabolic, endocrine, sexual, reproductive, muscle and nervous systems degenerative diseases begin to be diagnosed. Activity and quality of life are reduced both physically and psychologically impaired. According to (Mildawati et al., 2019) age greatly affects the risk of high glucose levels, because the increasing age is increasingly susceptible to the risk of neuropathy complications, the age of a person who is more than 35 years old will experience physiological changes that can reduce a person's body function, thus it is often found that many experience complications at the age of 45 and above.

Based on research conducted based on data collection at Desa Gedawung, the results of the study were female gender with the results of 27 female (90.9%), and the number of men was 3 people (9.1%). This research is in line with Farida et al., (2020) with the majority of respondents obtained being female with 13 people (76.5%). According to (Mildawati et al., 2019) women have a higher risk of suffering from neuropathy complications compared to men because women are related to pregnancy, because pregnant women insulin resistance arises so adenosine monophosphate activated protein kinase (AMPK) which works as cellular energy does not come out even though insulin works well because of adenosine monophosphate activated protein kinase AMPK. This is a risk factor for DM. Based on this study, the majority of respondents had DM for approximately 1 year to 3 years in the intervention group with 12 respondents (80.1%) and the control group with 15 respondents (33.3%). This study is in line with (Ramadhan & Marissa, 2015) the majority had diabetes for <5 years with 41 respondents (87.2%).

According to (Girsang et al., 2020) if diabetes is not treated properly, many complications will arise, the longer you suffer from DM that is not treated properly, the more complications there will be complications of DM itself there are two chronic and acute chronic

complications namely macrovascular and microvascular complications macrovascular diseases such as coronary heart disease, cerebral vascular disease and peripheral vascular disease. While microvascular complications such as retinopathy, neuropathy and neuropathy are able to affect the nerves in the legs so that blood flow is not smooth. The effect of progressive muscle relaxation on the value of the ankle brachial index in DM patients is known by the t-test signed rank test with SPSS obtained a p-value of 0.02 or p-value <0.5, meaning that there is an effect of progressive muscle relaxation on the value of the ankle brachial index. This research is supported by research by Vaningrum & Yuniartika, (2022) using the Wilcoxon signed rank test which shows a p value = 0.001 or <0.05 the mean at pretest 186.65 with a standard deviation of 70.780 while at posttest mean 154.90 with a standard deviation of 386.86 these results mean H₀ is rejected and H_a is accepted.

According to Priyantini et al., (2022) who say that low activity such as infrequent exercise is due to one of them is the age factor because most sufferers are > 56 years old so that usually elderly patients on average experience a decrease in physical condition so that not infrequently of those who feel reluctant to do productive physical activity. According to the theory of Hasani, (2015) progressive muscle relaxation exercises can be done as one of the physical exercises for people with DM. this exercise as an exercise for stretching and muscle relaxation so that it can have an impact on increasing glucose transform to be more effective so that glucose levels can be normal. This exercise is also very easy to do anywhere and anytime. According to (Girsang et al., 2020) progressive muscle relaxation movements, especially when moving the legs stretching the leg muscles are considered effective in improving blood flow to the legs, increasing the work of insulin, reducing the risk of arteriosclerosis and playing a role in increasing systolic pressure in the legs so that it affects the ABI value. According to Simajuntak & Simamora, (2017) many factors affect the value of ABI increased glucose in the blood so that blood flow is reduced and there is an increase in platelet aggregability associated with the development of microvascular complications so that the ABI value of blood flow is not normal.

This is in line with the results of progressive muscle relaxation on foot sensitivity with a p-value in the intervention group of 0.02. This is in line with Priyanto's research (2019) which states that relaxation progressive therapy aims to facilitate blood circulation in the body, relaxation progressive therapy is able to strengthen leg muscles and improve impaired blood circulation in neuropathy patients. In accordance with Sherwood's (2017) theory that explains the effect of activity on foot sensitivity is the binding of myosin and active molecules to the cross bridge causing contraction of muscle fibers that require energy. Each active molecule has a specific binding site for myosin cross bridge binding. If the muscle is not used, its actin and myosin content decreases, its fibers become smaller, and therefore it becomes atrophic (reduced in mass) and weaker. In relaxed muscle fibers, contraction does not occur; actin cannot bind to the cross-bridge due to the position of two other types of proteins - tropomyosin and troponin - within the thin filament (Potter & Perry, 2016).

CONCLUSION

The effect of progressive muscle relaxation on ABI values in the intervention group obtained a P-value of 0.02 where this was stated to be significant for the intervention group. The control group obtained a P-value of 0.414 which means there was no effect. And there is an effect of progressive muscle relaxation on the value of foot sensitivity in the intervention group obtained a P-value of 0.01 where this is stated to be a significant effect on the intervention group. In the control group, the P-value is 0.07 which means there is no effect.

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