



**EFFECTIVENESS OF BUERGER ALLEN EXERCISE AND WARM WATER FOOT SOAK ON FOOT SENSITIVITY SCORE IN A GROUP OF PATIENTS WITH TYPE 2 DM**

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**ABSTRACT**

Diabetes mellitus (DM) is a chronic metabolic disease that requires medical attention and self-care management, namely buerger allen exercise and warm water foot bath to avoid complications. One of the complications of DM is diabetic ulcer. The main cause of diabetic ulcers is due to reduced foot sensitivity. Objective to analyze the effectiveness of Buerger Allen exercise and warm water foot bath on foot sensitivity score. The research design is Quasi Experiment non equivalent prepost test and between two groups. In this study, 36 respondents were obtained through purposive sampling. The intervention was carried out for 6 consecutive days with implementation 2 times a day. The instrument used was a 10 gram monofilament tool. Analysis using paired t-test, independent t-test and ancova test. There is a mean difference before and after the intervention on foot sensitivity scores, but there is no significant difference between foot sensitivity scores performed buerger allen exercise with water foot soak ( $\rho$  value=0.447>0.05) and there is an influence of confounding variables, namely length of suffering ( $\rho$  value=0.000 <0.05). The both exercises can be used as an independent nursing intervention option as a preventive measure for peripheral blood circulation disorders of the feet.

**Keywords:** buerger allen exercise; diabetes mellitus type 2; sensitivity score; warm water foot bath

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**INTRODUCTION**

Diabetes Mellitus (DM) is a chronic metabolic disease that requires medical care and self-management education to prevent complications (Suryati et al., 2019) . Diabetes mellitus is a metabolic disorder characterized by increased blood sugar levels (hyperglycemia). Chronic and uncontrolled hyperglycemia can lead to macrovascular disease complications which include myocardial infarction, stroke and Peripheral Arterial Disease (PAD). Peripheral Arterial Disease (PAD) is a narrowing of the peripheral arteries caused by atherosclerosis due to complications from Diabetes Mellitus (DM). As a result, there is a decrease in blood flow to the extremities which, if left untreated, will cause intermittent claudisio, gangrenous wounds and the risk of amputation (Richard Mataputun et al., 2020).

The global prevalence of diabetes in 2019 was estimated to be 9.3% increasing to 10.2% (in 2030 and 10.9% in 2045. Prevalence is higher in urban (10.8%) than rural (7.2%), and in high- income countries (10.4%) than low-income countries (4.0%). One in two (50.1%) people living with diabetes do not know they have diabetes. The global prevalence of impaired glucose tolerance was estimated at 7.5% in 2019 and is projected to reach 8.0% by

2030 and 8.6% by 2045 (Saeedi et al., 2019).

IDF states that Indonesia is currently in 7th position with DM in the world, with a total of 10 million people and is predicted to increase to 6th position by 2040 with a total of 16.2 million people who have the potential for Diabetic Foot Wound (LKD) complications (IDF, 2017). Meanwhile, Cancellierem (2016) states that diabetic neuropathy affects nearly 50% and increases the morbidity of LKD, amputation and death faster up to 85%. In 2021, Banjar Regency ranks third out of 13 regencies/cities in South Kalimantan Province with 5,756 people with Diabetes Mellitus (15%). (Dinkes Provinsi Kalsel, 2021).

Unhealthy lifestyle changes such as excessive food (fatty and lack of fiber) can increase blood sugar levels, so that the feet experience tingling or numbness which will result in neuropathy and decreased sensitivity to the feet (Jannaim et al., 2018). Decreased foot sensitivity is a symptom of peripheral neuropathy, the most common microvascular complication in diabetes mellitus as a cause of foot injuries (Yang et al, 2018). One of the dangerous complications of DM disease is diabetic foot wounds which can cause infection and foot deformities up to limb amputation (Kawasaki et al., 2013). Early detection of sensation disorders needs to be done by conducting a neurological examination. Neurological examination in this case examination of foot sensation can be done with a 10 gr monofilament test (Yang et al., 2014). The 10 gr monofilament is a tool that is often used to detect sensory neuropathy as the gold standard for identifying loss of sensation in the feet, practical and easy to use (Craig et al., 2014). The 10 gr monofilament has a sensitivity of 41-93% and a specificity of 65-87% (Dros et al., 2009).

Management of diabetes complications is by changing lifestyle, pharmacological therapy, non-pharmacological therapy and if needed, interventional therapy with surgery. Non-pharmacological management is one of the best treatments to help prevent circulation disorders and sensation disorders. Non-pharmacological management can be done by doing physical activities such as *Brisk Walking Exercise*, *Buerger Allen Exercise*, *Diabetes Gymnastics*, *Acupressure*, *Foot Massage*, and *Foot Soak* where it aims to increase the use of glucose by active muscles so that glucose in the blood can decrease (Richard Mataputun et al., 2020).

Buerger-Allen exercise is one of the most common exercises in diabetics to dilate blood vessels by using postural changes and stimulation of peripheral circulation by modulating gravity and performing muscle contractions to improve perfusion in the lower extremities for 12-13 minutes twice a day for five effective days (Lamkang, 2017). The movements of Buerger-Allen can increase arterial and venous blood flow. This exercise is an easy exercise, can be done independently at home, does not have to be in a group, does not need a long time to practice.

Warm water soaking can be widely used. Warm water foot soak is a situation where the feet are in contact with water with a temperature of 40-42°C (Richard Mataputun et al., 2020). Warm water soaking in people with DM can facilitate blood flow in the veins so that there is a vasodilatory reaction in the blood vessels. The benefits of warm water can be used in medicine because it has great effects and benefits where in the tissue metabolism will occur along with the exchange between body chemicals and body fluids, then the biological effect is that heat can cause dilatation of blood vessels which can increase blood circulation, so that it will result in foot sensitivity (Utama et al., 2017).

Buerger Allen exercises and warm water foot soaks are able to overcome circulation and sensation disorders in people with diabetes mellitus because in addition to having almost the same function and the two exercises strengthen each other. Water media is the right therapeutic medium for injury recovery, because scientifically warm water has a physiological impact on the body, namely it can improve blood circulation and the loading factor in the water will strengthen the muscles and ligaments that affect the joints of the body. In addition, warm temperatures can increase tissue flexibility. (Utama et al., 2017). Based on the results of preliminary studies, it was found that the majority did not know about non-pharmacological management of Buerger Allen exercises and warm water foot soaks to increase foot sensitivity in order to avoid complications in the form of peripheral neuropathy or foot ulcers. Based on this, the purpose of research is to know the effectiveness of Buerger Allen Exercise and warm water foot soak on foot sensitivity scores in groups of Type 2 DM Patients in the Martapura 1 Health Center Working Area.

**METHOD**

The design of this study is *Quasi Experiment non equivalent prepost test and between two groups*. The independent variable is the intervention of Buerger Allen Exercise and Warm water foot soak and the dependent variable is foot sensitivity score. *Counfounding* variables are Age, Gender, Length of Suffering, Comorbidities, Smoking History, Habit of Drinking Caffeine. The sample of this study was 36 respondents who were divided into 2 groups of 18 people each. The first group was the Buerger Allen Exercise intervention group and the second group was the warm water foot soak intervention group. Buerger Allen Exercise for 6 consecutive days with implementation 2 times a day (morning and evening) for 15 minutes and Warm water foot soak Temperature 37.7-40.5<sup>0</sup> C for 6 consecutive days with implementation 2 times a day (morning and evening) for 20 minutes. The instrument used was a 10 gram monofilament tool. Bivariate analysis to use *paired t-test and independent t-test*. Multivariate test using ancova test to determine the effect of intervention/treatment given by controlling confounding variables. Research data collection was carried out after the researcher received approval to pass an ethical review from the Ethics Commission of the Intan Martapura College of Health Sciences.

**RESULTS**

Table 1.  
Frequency Distribution of Respondents' Characteristics in the Buerger Allen Group and Warm Foot Soak in the Group of Patients with Type 2 DM (n=36)

Characteristics	Sub characteristic	Group		Group		Total	
		Buerger Allen		Foot Soak		f	%
		f	%	f	%	f	%
Gender	Male	5	27,8	6	33,3	11	30,6
	Female	13	72,2	12	66,7	25	69,4
Age	Late adulthood	0	0	1	5,6	1	2,8
	Early elderly	4	22,2	2	11,1	6	16,7
	Late elderly	8	44,4	9	50	17	47,2
	Seniors	6	33,3	6	33,3	12	33,3
Duration of suffering	1-5 years	14	77,8	16	88,9	30	83,3
	6-10 years	4	22,2	2	11,1	6	16,7
Smoking	Smoking	4	22,2	5	27,8	9	25
	Non smoking	14	77,8	13	72,2	17	75
Hypertension	Hypertension	4	22,2	5	27,8	9	25
	Not Hypertension	14	77,8	13	72,2	17	75

Table 1, the majority of respondents were female as many as 25 respondents (69.4%), the majority of the late elderly age as many as 17 respondents (47.2%), the majority of the length of suffering for 1-5 years as many as 30 respondents (83.3%), the majority did not smoke as many as 17 respondents (75%) and not hypertension as many as 17 respondents (75%).

Table 2.

Frequency Distribution of foot sensitivity scores before and after in the BuergerAllen and Warm Foot Soak Groups in the Group of Patients with Type 2 DM (n=36)

variable	mean	Median	SD	Min-max	95% CI
Pre buerger allen foot sensitivity score	6,19	6,50	1,373	4-8	5,51-6,88
Post buerger allen foot sensitivity score	6,33	6,50	1,515	4-8	5,58-7,09
Pre foot soak Foot sensitivity score	6,33	6,50	0,939	4-8	5,87-5,80
Post foot soak Foot sensitivitas score	6,67	7	1,043	4-8	6,15-7,19

Based on the data above, the mean foot sensitivity score before the Buerger Allen intervention was 6.19, median 6.50, standard deviation 1.373, lowest score 4 and highest score 8 with the lower and upper limits of the 95% confidence level of 5.51-6.88. The mean foot sensitivity score after the Buerger Allen intervention was 6.33, median 6.50, standard deviation 1.515, lowest score 4 and highest score 8 with the lower and upper limits of the 95% confidence level of 5.58-7.09. The mean foot sensitivity score before the warm water foot bath intervention was 6.33, median 6.50, standard deviation 0.939, lowest score 4 and highest score 8 with the lower and upper limits of the 95% confidence level of 5.87-5.80. The mean foot sensitivity score after the warm water foot bath intervention was 6.67, median 7, standard deviation 1.043, lowest score 4 and highest score 8 with the lower and upper limits of the 95% confidence level of 6.15-7.19.

Table 3.

Results of *paired t-test* Analysis of Foot Sensitivity Score Before and After the Intervention of Buerger Allen Exercise and Warm Foot Soak in the Group of Patients with Type 2 DM (n=36)

Foot sensitivity	Mean	SD	ρ value	95% CI
BuergerAllen Before-after	-0,1389	0,2304	0,020	-0,2535-(-0,0243)
Foot soak Before-after	-0,333	0,2425	0,000	-0,4539-(-0,2127)

Based on the table above, the mean or average foot sensitivity score before and after buerger allen is -0.1389 and  $\rho$  value = 0.020 ( $\rho$  value <0.05) which means  $H_0$  is rejected, meaning that there is an effect of buerger allen exercise on foot sensitivity scores. The mean foot sensitivity score before and after warm water foot soak is -0.333 and  $\rho$  value = 0.000 ( $\rho$  value <0.05) which means  $H_0$  is rejected, meaning that there is an effect of warm water foot soak on foot sensitivity scores.

Table 4.

The results of the *independent t-test* analysis of the difference in mean difference between the Buerger Allen Exercise Intervention and Warm Foot Soak on foot sensitivity scores in the Type 2 DM Patients Group (n=36)

Group	Mean	SD	$\rho$ value	95% CI
Foot sensitivity score				
Buerger Allen	6,333	1,0432	0,447	-0,5476-1,2143
Foot Soak	6,667	1,5146		

Based on the table above, the  $\rho$  value = 0.447 ( $\rho$  value > 0.05) means that  $H_0$  is accepted, meaning that there is no significant difference between the foot sensitivity scores performed by Buerger Allen exercise and warm water foot soak.

Table 5.

Results of Ancova Test Analysis of Foot Sensitivity Score to Buerger Allen Exercise and Warm Water Foot Soak and *Counfounding* variables Age, Sex, Duration of Suffering, History of Hypertension, Smoking (n=36)

	$\rho$ value
<i>Corrected Model</i>	0,000
Age	0,208
Gender	0,367
Duration of suffering	0,000
History of hypertension	0,201
Smoking	0,720
Interventions	0,104
R Square	0,785

Based on the table above, the results of the Ancova test of Foot Sensitivity Score on Buerger Allen Exercise and Warm Water Foot Soak and the *Counfounding* variables of Age, Gender, Length of Suffering, History of Hypertension, Smoking obtained a value of  $\rho$  value = 0.000 ( $\rho$  value < 0.05) which means that there is a role of *confounding variables*, namely length of suffering on changes in foot sensitivity scores and all models show the absence of variable influence (age, gender, history of hypertension, and smoking). The results of the intervention  $\rho$  value = 0.104 which means that there is no difference in foot sensitivity scores between the Buerger Allen exercise intervention and warm water foot soak after controlling for the variable of length of suffering.

## DISCUSSION

The majority of respondents were female as many as 25 respondents (69.4%), in general, women have a higher risk of developing DM because physically women have a greater chance of increasing body mass index. In addition, there are also hormonal and metabolic factors that facilitate the distribution of body fat to accumulate so that obesity occurs which triggers Insulin resistance which causes atherosclerosis. The prevalence of DM is higher in women at 53.2% than men at 46.8% (Wahyuni & Alkaff, 2012) and postmenopausal menstrual cycle syndrome (premenstrual syndrome), which makes it easier for body fat distribution to accumulate due to this hormonal process, putting women at risk of developing type 2 diabetes (Trisnawati & Setyorogo, 2013).

The majority of the late elderly age as many as 17 respondents (47.2%), The risk of diabetes increases with age, especially after the age of 50 years, because glucose intolerance increases at this age. In addition, the elderly experience a 35% decrease in mitochondrial activity in muscle cells. This is associated with a 30% increase in muscle fat, leading to insulin

resistance. The results of this study are in line with the statement that normal blood glucose levels tend to increase slightly but gradually after the age of 50 years, especially in inactive people (Hasaini, 2019).

The majority of the length of suffering for 1-5 years as many as 30 respondents (83.3%), Suffering from a chronic disease for a long time affects a person's experience and knowledge in managing DM. The length of suffering from DM, which is then associated with persistent hyperglycemia, causes the formation of *Advance Glycosylate End Products* (AGDS), which causes complications. In patients with DM, chronic hyperglycemia causes complications that affect almost all organ systems. One of the complications is neuropathy. Along with the results of research that shows there is a relationship between length of suffering and the risk of peripheral neuropathy in patients with type 2 DM. The longer a person suffers from DM, the greater the risk of developing neuropathy, where the length of suffering from DM with high blood glucose levels can weaken and damage the walls of capillaries that vascularize the nerves so that nerve damage occurs, namely neuropathy. (Simanjuntak & Simamora, 2020).

The majority of respondents did not smoke as many as 17 people (75%). Smoking habit is one of the factors that can aggravate and influence the development of diabetes. The risk of arteriosclerosis can increase, one of the causes is smoking. Arteriosclerosis will result in vascular insufficiency so that blood flow to the dorsalis pedis, popliteal, and tibial arteries will also decrease (Alodokter Kemenkes RI, 2023). The majority of respondents were not hypertensive as many as 17 respondents (75%). Several references link blood pressure with insulin resistance. The effect of high blood pressure on the onset of diabetes is due to thickening of the blood vessels which causes the diameter of the blood vessels to narrow. This interferes with the process of transporting glucose from the blood. This is in accordance with research (Trisnawati & Setyorogo, 2013). There is a significant relationship between blood pressure in people with diabetes, the probability is 6.85 times higher than in people without hypertension.

### **Mean Foot Sensitivity Score**

The mean difference in foot sensitivity scores before and after the Buerger Allen intervention increased from 6.19 to 6.33, which is a low risk of neuropathy within the next 4 years. Prevention of peripheral vascularization disorders and sensation disorders in the pillars of diabetes mellitus management is a form of non-pharmacological action. One of them is in the form of *exercise*, namely Buerger Allen. This intervention can be given to people with diabetes mellitus to prevent peripheral vascularization disorders, given to people with diabetes mellitus with the aim of improving circulation so as to increase sensation to the peripheral area (Khomsah et al., 2020). The process of onset of neuropathy is usually progressive. Prolonged high blood sugar leads to the accumulation of sorbitol, which increases the activity of the polyol pathway and causes changes in nerve tissue. These changes contribute to impaired signaling in the nerves leading to decreased sensation in the feet of patients with type II DM. This leads to a lack of sensitivity to pain, heat, mechanical injuries and eventually diabetics do not realize that they have sustained some type of foot injury which eventually leads to foot ulcers (Simanjuntak & Simamora, 2020).

The mean foot sensitivity score before the warm water foot bath intervention increased from 6.33 to 6.67 in the category of low risk of neuropathy within the next 4 years. Warm water foot bath intervention can improve peripheral blood circulation. This is in accordance with research on the effect of diabetic foot exercises and warm water foot soaking on peripheral

blood circulation in patients with diabetes mellitus (Utama et al., 2017). Foot circulation is the circulation of blood pumped throughout the body by the heart, one of which is the feet, which is influenced by three factors, namely viscosity (blood viscosity), blood vessel length and blood vessel diameter. DM is one of the factors that affect blood pressure due to the viscosity factor caused by the accumulation of blood sugar. Blood viscosity causes impaired circulation throughout the body and reduces blood flow to body tissues.

### **Test of Differences Before and After Intervention**

The mean foot sensitivity score before and after the buerger allen was -0.1389 and  $\rho$  value=0.020 ( $\rho$  value <0.05) which means  $H_0$  is rejected, meaning that there is an effect of buerger allentraining on foot sensitivity scores. In the opinion of the researcher, the increase in foot sensitivity scores in respondents shows that Burger-Allen training has an effect on diabetic foot sensitivity. Increased foot sensitivity is due to respondents following the Buerger-Allen exercise and also doing it properly and correctly. When someone does the Buerger-Allen exercise, it causes the leg muscles to contract, which increases metabolism in the muscles. As a result, the blood vessels in the foot area dilate, which stabilizes blood circulation and increases the use of glucose in the metabolic process and increases foot sensitivity.

The Buerger-Allen is exercise is a combination of postural changes (leg elevation  $45^\circ$ , lower limbs and sleeping on the back) and ankle muscle pump consisting of two dorsiflexions and plantarflexion. Leg  $45^\circ$  height is a position where the lower leg is placed at a higher position than the heart. This condition is an attempt to create a pressure difference between the toes and the heart. The blood in the veins is like a liquid that flows from a higher place to a lower place, so when the leg is elevated, the venous return flow increases and the tip of the leg or leg goes towards the heart, while the arterial blood flows, which distributes in the leg, reducing the pressure and the flow slows down. The elevated position of the legs causes the blood flow in the veins of the lower limbs to be drained, and also when the amount of blood flowing to the heart increases, the walls of the heart chambers tighten, causing the muscles to contract even more strongly, so the excess blood returning to the heart is automatically pumped back into circulation.

When the feet hang lower than the lower legs and the heart is lowered, the blood carried by the arteries flows rapidly from high pressure to low pressure, from the heart to the lower limbs, that is, from the heart to the lower limbs and meets the flow in the blood vessels, increasing blood flow to the toes or lower legs. Changes in gravity affect the distribution of fluids in the body by helping to alternately empty and fill the blood column, which can increase blood flow through the blood vessels. Next in the lying position is the vertical position which plays an important role in balancing blood flow, so that it does not stagnate in one place. Muscle pumps in the form of dorsiflexion and plantar flexion work the muscles to contract and stimulate blood vessels to secrete blood or release nitric oxide. Endothelial cells are a layer of specialized epithelial cells that line the lumen of all blood vessels and function to release vasoactive paracrine that plays a role in vasodilation, namely NO (nitric oxide). Nitric oxide is produced by converting the amino acid L-arginine to L-citrulline under the action of the enzyme NO synthase (NOS). Nitric oxide stimulates soluble guanylyl cyclase (SGC), which increases the synthesis of cyclic GMP from guanine triphosphate (GTP) (24). The increase in cyclic GMP leads to relaxation of vascular smooth muscle. As the smooth muscle cells relax, the blood vessels dilate, allowing blood to flow more evenly to the peripheral parts of the legs (Richard Mataputun et al., 2020). This is in line with the results of research (Suryati et al., 2019) that is, there is an effect of Buerger Allen exercise on foot

sensitivity with an average difference before and after Buerger Allen exercise is -2.846 with  $\rho$  value 0.000 ( $<0.05$ ) and strengthened by this study reinforced by research (Chang et al., 2016). Found that Buerger Allen exercise has a positive impact on circulation, improves blood flow, improves walking ability, reduces necrosis, prevents embolism, pain, and cyanosis in the blood vessels (Chang et al., 2016).

The mean foot sensitivity score before and after the warm water foot soak is -0.333 and  $\rho$  value = 0.000 ( $\rho$  value  $<0.05$ ) which means  $H_0$  is rejected, meaning that there is an effect of warm water foot soak on foot sensitivity scores. This hot water foot soak therapy can affect blood vessels, where hot water stabilizes blood flow, the other is the water load factor, which strengthens the muscles and ligaments that affect the joints of the body. very easy for everyone, does not require expensive costs and has no harmful side effects. Therefore, each respondent can affect the sensitive points on the feet if done properly and regularly, and supported by a good and healthy lifestyle. In addition to the quality and quantity of hot water foot bath therapy, it is necessary to improve a healthy lifestyle after treatment in order to avoid neuropathy. This is in line with research (Utama et al., 2017) namely there is an effect of diabetic foot exercises and foot soaking with warm water on peripheral blood circulation in patients with diabetes mellitus. The stages of implementing foot gymnastics therapy after warm water immersion is carried out massage on the feet. Massage procedures can improve blood and lymph circulation, by increasing the delivery of oxygen and food substances into body cells, while also increasing the removal of metabolic waste from the body. Relevant research results state that 56% of respondents responded well (symptoms of diabetic neuropathy disappeared).

### **Difference in Foot Sensitivity Score between Buerger Allen Exercise and Warm Foot Soak Interventions**

From these two measurements, it can be concluded that Buerger-Allen and warm water footbaths are equally effective in improving foot sensitivity scores in patients with type 2 diabetes. According to the researcher's analysis, Buerger-Allen exercise and warm water foot bath can be self-interventions, especially performing preventive and rehabilitation exercises for patients with type 2 diabetes with uncontrolled blood sugar. However, soaking feet in warm water improved foot sensitivity scores more than Buerger-Allen exercise. In the warm water foot soak group, the mean was 6.667, while in the Buerger Allen exercise group it was 6.333. However, there was no statistical difference in foot sensitivity scores after being given Buerger Allen exercise and warm water foot bath. According to the researcher's assumption, because both interventions are complementary therapies that are carried out as recommended, namely 6 consecutive days twice (morning and evening) so that both have an effect on foot sensitivity. Along with previous research by Sukarja, Sukawana, and Rasdin (2017) that complementary medicine can be beneficial by providing interventions according to the recommended intensity and frequency. The therapy or intervention that was intervened was Buerger Allen exercise and warm water immersion, carried out for 2 weeks with the result that it could increase the sensitivity of the patient's feet from day to day (Permatasari et al., 2020). That exercise can improve lower extremity perfusion, then increased sensitivity is known by stimulating sensation at certain nerve cell points (Radhika et al, 2020). The more patients show sensation that can be felt, the more foot sensitivity increases in patients with diabetes mellitus.

### **Model Analysis**

The results of the Ancova test of Foot Sensitivity Score to Buerger Allen Exercise and Warm Water Foot Soak as well as the *Counfounding* variables of Age, Gender, Length of

Suffering, History of Hypertension, Smoking obtained a value of  $p$  value = 0.000 ( $p$  value <0.05) which means that there is an influence of confounding variables, namely length of suffering on changes in foot sensitivity scores. And there is no difference in foot sensitivity scores between the Buerger Allen exercise intervention and warm water foot soak after controlling for the variable of length of suffering. According to the researcher's assumption that the increase in vascular complications in diabetics depends on the duration of the disease and how blood glucose can be controlled. The longer a person has DM, the higher the risk of developing atherosclerosis and neuropathy.

Long-term DM patients may develop complications. In DM, a person is exposed to chronic hyperglycemia which leads to micro and macrovascular complications (Papatheodorou et al, 2017). The duration of DM can worsen the condition of the blood vessels. Diabetes can impair arterial endothelial function. This layer is a biologically active organ, as it is able to produce a vasodilator called nitric oxide (NO). NO is an important stimulus for vasodilation and reduces inflammation by modulating the interaction between leukocytes and the blood vessel wall and limiting the migration and proliferation of vascular smooth muscle cells and limiting the activation of blood clotting cells. Therefore, loss of NO destroys blood vessels and causes atherosclerosis (Richard Mataputun et al., 2020)

## CONCLUSION

There is a mean difference before and after the Buerger Allen Exercise Intervention and Warm Foot Soak on foot sensitivity scores in the Type 2 DM Patients Group, but there is no significant difference between foot sensitivity scores performed by Buerger Allen exercise and warm water foot soak and there is an influence of confounding variables, namely length of suffering on changes in foot sensitivity scores. And it is recommended that the intervention of buerger-allen exercise and warm water foot bath can be used as one of the nursing interventions in Type 2 Diabetes Mellitus patients as a preventive measure for peripheral blood circulation disorders of the feet.

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