

**THE EFFECTIVENESS DIABETIC FOOT SPA TO PERIPHERAL BLOOD
CIRCULATION OF DM TYPE 2 PATIENT IN PUSKESMAS WONOKROMO
SURABAYA**

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Abstract

Diabetes mellitus type 2 is often occur and became chronic complication of vascular peripheral disease caused by decreasing peripheral blood circulation. One of therapy to improve peripheral blood circulation is diabetic foot spa, The purpose of this study is to find out the effectiveness of diabetic foot spa towards peripheral blood circulation. Design of this study is Quasy-Experiment. The population were all diabetes mellitus patients type 2 in Public Health Centre Wonokromo Surabaya. Number of sample was 46 person, divided into 2 group, that are treatment group and control group, with 23 person each group, taken by purposive sampling technique. Data analyzed by Mann-Whitney test with $\alpha=0.05$. Study results on treatment group before giving diabetic foot spa majority (52.2%) of peripheral blood circulation in mild category and for control group mostly (60.9%) have blood circulation in mild category as well. After the foot spa was give to the treatment group, almost entirely (91.3%) had normal peripheral blood circulation, whereas in the control group majority (73.9%) remain mild. Analysis of Mann-Whitney test $P=0.000 < \alpha=0.05$, which means diabetic foot spa is effective towards blood circulation. The more frequent perform of diabetic foot spa, the better peripheral blood circulation, it can prevent complications of diabetes mellitus.

Keywords:diabetic foot spa, peripheral blood circulation

1. Background

Diabetes mellitus is a chronic progressive disease with characteristic inability of the body to perform the metabolism of carbohydrates, fats, proteins, which can lead to increased blood sugar (hyperglycemia) (Black & Hawks, 2009). Diabetes mellitus type 2 is the most common type of diabetes occurs, covering about 85% of diabetic patients (Greenstain & Wood, 2010). Type 2 diabetes can cause various complications in patients, either acute or chronic. One of the complications of chronic vascular disease occurs is a lot of peripheral sensory neuropathy and or motor. Nearly 60% of sufferers experiencing these complications (Black & Hawks, 2014).

Peripheral vascular disease, and complications of neuropathy caused by decreased peripheral blood circulation to the nerve fibers, causing the diabetics wounds prone to gangrene. DM patients with gangrene wounds that continues can be at risk of amputation as the opinion of Greenstain and Wood (2010) that sufferers of diabetes mellitus could experience a lower limb amputation is 15 times larger than not suffering from diabetes. A variety of interventions to prevent or slow down the complications developed through research. Intervention ever examined inter alia massage feet, foot gymnastics and joint range of motion exercises or often known as Range of Motion (ROM) (Ika, 2010).

One type of therapy that is currently developing new spa foot to diabetes. Diabetes is foot spa therapy for patients with diabetes mellitus thoroughly ranging from gymnastics, foot cleansing (skin cleansing), foot mask, and foot massage. Some House cuts already implemented a diabetes foot spa, one of the examples in the House Cuts Aska Sidoarjo. But the effect on the peripheral blood circulation improvement haven't researched further, so that nurses need to develop it.

Statistical reports from the International Diabetes Federation (IDF) mentions, that

in the year 2012 there are already more than 371 million diabetics with each year the number of occurrence of diabetes goes up 3% or increased by 7 million people. In 1995, Indonesia is situated at number 7 as the country with the largest number of diabetics in the world, and by 2025 it is estimated Indonesia would go up into the number 5 most. Now, the society reported a big city such as Jakarta and Surabaya had already reached almost 10% of the population who have diabetes (Tandra, 2013).

Diabetes has become the biggest cause of death in the world. In 2012 there is already a 4.8 million deaths caused by diabetes. Predicted by 2030 there will be 52 million deaths per year due to disease is not contagious like diabetes mellitus along with increased risk factors due to changes in lifestyle, emotional with mental disorders changes the physical environment and the development of an increasingly modern world (of health RI, 2010). Complications of diabetes among other peripheral vascular disease, neuropathy, and diabetic foot, it can cause diabetes. The State of chronic diabetic foot not handled properly can develop into an act of amputation. Each year, more than 1 million people are diabetics lose one of her legs as diabetic complications (FK UI, 2011). More than half of the lower limb amputee non traumatic relate to changes due to diabetes such as peripheral neuropathy and vascular disease (Black & Hawks, 2009). In the region there are Puskesmas Wonokromo own 50% of sufferers of diabetes mellitus that was injured due to a gangrene peripheral blood circulation decline. The issue is a major cause of morbidity, disability, and mortality in a person suffering from diabetes mellitus (Prabowo, 2007).

In the region of Puskesmas Wonokromo, Surabaya obtained from 5 people, there are 10 people with minor injuries are black on the left leg. Based on a survey of 5 people 3 (60%) who experienced peripheral blood circulation disorders and mild by the value

of the ankle brachial index 0.8 on respondents who have wounds and 0.9 on the respondents who do not have cuts. While the two other respondents (40%) have an ankle brachial index 1.1 which means normal.

When someone is already affected by diabetes mellitus, then the things that can be done is to prevent complications of diseases of peripheral neuropathy and diabetic vascular surgery by improving blood circulation in the feet. In diabetic patients, decreased peripheral blood circulation caused by insufficiency of insulin, so that the disturbances occurred in the form of hoarding sorbitol in vascular intima, hiperlipoproteinemia, and blood clotting abnormalities (Price & Wilson, 2005). In the end, disorders of the peripheral blood circulation will cause complications of peripheral vascular disease and diabetic neuropathy. If it is not prevented, it will happen a gangrene wounds can culminate in acts of amputation. Factors that can affect the peripheral blood circulation include drugs, stop smoking, exercise, and foot care (Black & Hawks, 2009).

Various efforts undertaken to prevent and control the occurrence of complications in the treatment DM. Foot care is one of the factors that can affect the peripheral blood circulation. Diabetic foot spa is a series of foot care activities in which there is a foot gymnastics activities, cleaning with warm water, and massage (Purwanto, 2014). These activities in addition to unleash a flow of blood, also makes the patient feel comfortable and relaxed. Nurses can provide education and training families to do foot spa at home, so the diabetic patient is interested, and regularly conduct foot spa in order to prevent the onset of gangrene wounds.

2. Research methodology

The purpose of this research is to know the effectiveness of Diabetic foot spa to the peripheral blood circulation. This research is quantitative research design with a quasi experiment with the approach pre-post test with control group design. The population of this research is the whole type 2 DM patients in the region of Puskesmas Wonokromo Surabaya. While the number of samples of 46 people who meet the criteria for inclusion is politically subdivided into 23 people's treatment group and the control group of 23 people. The time of the research was started from March until April 2015 2011. Data analysis with SPSS 18 using the Wilcoxon Signed Rank test with $\alpha = 0.05$

3. Research results

The results showed from 46 respondents was almost entirely (76,0%) aged 45-59 years i.e. as many as 35 people. On the basis of gender, is almost entirely (91.3%) female-sex as many as 42 people. Distribution of the work indicate that 30 people (65,2%) has a job as a housewife. Of the 46 respondents, obtained at least already affected by type 2 diabetes mellitus during 1 year and at most for 7 years. Distribution regularity of therapy showed most respondents (67.3%) regularly carry out diabetes therapy that is as many as 31 people. Based on the frequency of sports of respondents obtained a large majority (54,3%) that is as much as two people who never exercise. Most (63,0%) i.e. as many as 29 people from 46 respondents have an activity walk or bike for less than 1 hour. Most respondents (95,6%) do not have the habit of smoking and almost entirely (82.6%) have a pattern of eating that obedient towards abstinence of food or drink sugary or fatty foods.

Distribution of ankle brachial index prior to diabetic foot spa treatment group and the control group can be seen in table 1 below.

Table 1. Distribution of ankle brachial index in the treatment group and the control group *before giving diabetic foot spa* in the region of Puskesmas Wonokromo Surabaya

No.	ABI	treatment group		Control group	
		n	%	n	%
1.	Normal	8	34,8	5	21,7
2.	Abnormal	2	8,7	1	4,3
3.	mild	12	52,2	14	60,9
4.	moderate	1	4,3	3	13,0
count		23	100	23	100

Table 1 shows the distribution of ankle brachial index and treatment groups respondents control group prior to diabetic foot spa. Results on treatment group before giving diabetic foot spa majority (52.2%) of peripheral blood circulation in mild category and for control group mostly (60.9%) have blood circulation in mild category as well.

Table 2. Ankle brachial index distribution of respondents in group treatment and the control group after the diabetic foot spa done in work-area Puskesmas Wonokromo Surabaya

No.	ABI	treatment group		Control group	
		n	%	n	%
1.	Normal	21	91,3	4	17,4
2.	Abnormal	0	0	1	4,3
3.	Mild	2	8,7	17	73,9
4.	Moderate	0	0	1	4,3
count		23	100	23	100

Table 2 shows the distribution of the ankle brachial index in the treatment group and the control group after the diabetic foot spa is done. On the Group's treatment is almost entirely (91.3%) have an ABI in the category after a normal diabetic foot spa, while in the control group (mostly 73,9%) had mild ABI.

Table 3. Ankle brachial index difference distribution before and after do diabetic foot spa treatment groups and differences in ankle brachial index before and after do diabetic foot spa treatment group

No	ABI	treatment group				Control group			
		Pre		Post		Pre		Post	
		N	%	n	%	n	%	n	%
1.	Normal	8	34,8	21	91,3	5	31,7	4	17,4
2.	Abnormal	2	8,7	0	0	1	4,3	1	4,3
3.	Mild	12	52,2	2	8,7	14	60,9	17	73,9
4.	Moderat	1	4,3	0	0	3	13,0	1	4,3
e									
count		23	100	23	100	23	100	23	100
P value <i>Wilcoxon</i>		0,000*				1.000			
P value <i>Mann-Whitney</i>		0,000							

Table 3 shows that out of 23 respondents group treatment most (52.2%) had mild category before ABI performed acts of diabetic foot spa, and, after diabetic, almost entirely (91.3%) have an ABI in the category. In the control group obtained filmed (60.9%) had mild category before ABI conducted, diabetic foot spa's actions after the implementation of the diabetic foot spa obtained a large majority (73,9%) have an ABI in the category of light.

Wilcoxon Sign Rank test based on the Group's treatment of obtained values $P = 0.000$ and value of $\alpha = 0.05$ means $P < \alpha$ then H_0 is rejected, meaning that diabetic foot spa effective against peripheral blood circulation in patients of type 2 diabetes mellitus in the Working Area Puskesmas Wonokromo. Whereas in the control group $P = 1000$ value obtained and the value of $\alpha = 0.05$ means $P > \alpha$ then H_0 is accepted, which means no influence on blood circulation because the control group of patients not given the action of diabetic foot spa.

Based on Mann-Whitney test to differentiate diabetic foot spa post results in the treatment group and the control group P value = 0.000 obtained and the value of $\alpha = 0.05$ means $P < \alpha$, meaning < that there is a difference between meaningful treatment group and the

control group after the action of diabetic foot spa.

4. Discussion

4.1 the peripheral blood circulation before the action of diabetic foot spa (pre test)

The results showed that diabetic foot spa prior obtained from 23 respondents group treatment most (52.5%) had a peripheral blood circulation in the category of light. Whereas in the control group the majority (60.9%) have a peripheral blood circulation in the category of light. Peripheral blood circulation which can be measured by the value of the ankle brachial index shows the risk someone could be injured gangrene or not. In diabetic patients, when blood glucose levels are not controlled, either in a long time on diabetes mellitus, blood vessels in various tissues throughout the body began experiencing impaired function and changes in the structure of the resulting insufficiency of blood supply to the tissues. This will further increase the risk to exposed wounds gangrene (Guyton & Hall, 2014). Disorders of the peripheral blood circulation will cause peripheral vascular disease complications and diabetic neuropathy in people with diabetes mellitus.

Age is one factor that can affect the peripheral blood circulation. Peripheral vascular disease is often a lot of experienced people who are older (Black & Hawks, 2014). Based on table 5.1 shows that out of 23 respondents was obtained by treatment group almost entirely (78,3%) aged 45-59 years of age, while the control group respondents from 23 most (73,9%) aged 45-59 years. The incidence of type 2 diabetes mellitus reached its peak at age 40-70 years of age, this is because the age group above 40 years of age have a higher risk of DM due to decreased glucose tolerance associated with decreased sensitivity of the peripheral cells against the effects of insulin. This is in accordance with the theory of Guyton & Hall (2014) insulin resistance in people with Diabetes

Mellitus (DM) type 2 tends to increase at above 30 years of age. It is caused due to a decreased sensitivity of body tissues to insulin. Resistance to insulin causing vulnerability to diseases of peripheral vascular surgery in patients of diabetes mellitus which resulted in decline against the peripheral blood circulation. Besides the older person's age then the blood circulation will be progressively decreased (Tandra, 2008).

In addition to age, gender also influence on peripheral blood circulation. Based on the research results obtained from 23 respondents group the treatment almost entirely (91.3%)-sex female, and of the 23 respondents control group almost entirely (91.3%) female-sex also. It is in accordance with the theory of Guyton & Hall (2014) that 6% of women suffered polycystic ovarian syndrome (PCOS), leading to increased production of androgens in the ovaries and insulin resistance as well as endocrine disorders is one of the tersering in women. Although the pathogenesis of PCOS remains unclear, insulin resistance and hiperinsulinemia often encountered, approximately 80% of women who experience this syndrome. Although the percentage shows a small figure on a woman for the onset of PCOS, but it can be influential and led to higher risk women affected by disorders of blood circulation. Distribution of respondents based on occupations shows that out of 23 respondents treatment group obtained majority (65,2%) has a job as a housewife and a control group of 23 respondents most (65,2%) also had a job as a housewife. The work of someone associated with everyday activities, where activity affecting a person's blood circulation

Results of the study on public data show that most respondents (69,6%) in group treatment and most of the respondents (56,5%) in the control group do activities walk or cycle ≤ 1 , moreover, habitual

exercise of the respondents. Most of the treatment group (56,5%) have never exercised, and of the 23 respondents control group majority (52.5%) also obtained never exercising. This means that the work is not absolutely affects the circulation of blood of a person, depending on the activity carried on in his job.

4.2 the peripheral blood circulation after the action of diabetic foot spa (post test)

Peripheral blood circulation in patients of type 2 diabetes mellitus in the working area Puskesmas Wonokromo Surabaya after diabetic foot spa action given changes, especially on the Group's treatment. Based on table 2 shows that out of 23 respondents group the treatment after a diabetic foot spa is almost entirely (91.3%) experienced an increase in peripheral blood circulation into the normal category. While the control group respondents from 23 most (73,9%) have a peripheral blood circulation in the category of light. Measurement of peripheral blood circulation with an ankle brachial index is categorized into 5 categories namely normal value of $ABI \geq 1.0$, abnormal (≥ 1.4), lightweight (≤ 0.9), moderate ($\leq 0.6-0.8$), and weight (≤ 0.5). Normal means in the blood vessels is not the case of a disturbance, whereas showed a mild to severe atherosclerosis, and abnormal means this has happened at the constriction of blood vessels in various places in the body. The occurrence of atherosclerosis in the blood vessels in patients of diabetes mellitus is caused due to disturbances in the form of hoarding sorbitol in vascular intima, hiperlipoproteinemia, and blood clotting disorders such as advanced by theory Price & Wilson (2005).

Based on general data concerning age, sex, occupation, length of exposed diabetes therapies, regularity, frequency of exercise, walking or cycling activities, the habit of smoking, and diet between the treatment and control group showed almost the same percentage. After the action of diabetic foot spa for 5 days shows an improvement against the blood

circulation of the respondents in the control group, whereas in the control group (mostly 73,9%) peripheral blood circulation were still in the category of light. This means that the action of diabetic foot spa which was given to group treatment can increase peripheral blood circulation in preventing chronic complications of diabetes mellitus. Diabetic feet Spa foot care is thoroughly, in which leg treatments is one of the factors that affect peripheral blood circulation such as the theory and by the Black Hawks (2014).

2.7 the difference the peripheral blood circulation pre diabetic foot spa-post on the Group's treatment and peripheral blood circulation difference pre diabetic foot spa-post in the control group

Table 3 shows the difference in the pre and post test control group and treatment group. On the Group's treatment of diabetic foot spa, after changing the value of the ankle brachial index of light becomes normal even though a small percentage (8.7%) still have the ABI in the category of light. That is because there are respondents who smoked, had not run a therapy of diabetes, and not keep the diets against fatty and sugary foods. According to Black and Hawks (2014), smoking is a powerful vasoconstrictor so disrupt the blood flow to the extremities. It makes a smoker prone decreased peripheral blood circulation. Diet question is does not control the food and drinks that contain high sugar and fatty foods. Food and drinks with high sugar levels will certainly lead to increased blood sugar levels, so people with uncontrolled eating patterns are more vulnerable to disorders of the circulation of the blood. Like the opinion of Helmawati (2014) stating that the unbalanced diet closely related to diabetes mellitus.

Diabetic foot spa consists of a wide variety of activities, namely diabetic foot gymnastics before implementation of the foot spa, skin cleansing, namely cleansing

with the use of baby bath SOAP that is gentle and mild, pedicure, namely cutting nails annihilation if respondents have nails that are long, foot mask that is the Act of giving wraps with the aim to clear dead skin cells, but for these actions is not done every day in order for the layers of the skin are not depleting , and the last was the foot massage namely massage superficial on the feet to improve blood circulation. Diabetic foot spa is made of approximately 30 minutes for 5 days in a row in group treatment. Activities in diabetic foot spa give effect on peripheral blood circulation. These activities in addition to unleash a flow of blood, also makes the patient feel comfortable and relaxed.

According to Andriyanto et. Al. (2013), effective against foot gymnastics sensitivity levels. The given stimulation of foot gymnastics refleksiologi session will create a relaxed and launched the blood circulation. Lancarnya the blood circulation allows blood to deliver more oxygen and nutrients to the cells of the body, as well as bring more poison to issued. So a smooth blood flow will increase protection sensation on the skin. At the time of skin cleansing activities (cleansing), feet soaked clients by using warm water. Warm water is beneficial to improve blood circulation, because the warm water can create a vasodilatory on blood vessels (Susanti, 2012).

In addition to gymnastics legs and soaking with warm water foot massage, activity in the diabetic foot spa also affect peripheral blood circulation. According to Badawi (2009), foot massage or foot massage can affect the body's hormones, that can increase the secretion of endorphins. Endorphins have a narcotic effect experienced reduced pain and enhance the excitement. Endorphins cause the vasodilatory blood vessel so it can enhance peripheral blood circulation.

Table 3 also shows the distribution of the value of the ankle brachial index in the

control group between before and after the action of diabetic foot spa. Based on table 3 shows that 23 of the control group respondents most (60.9%) had mild category before ABI performed acts of diabetic foot spa, foot spa and after implementation of the diabetic, the majority (73,9%) also have the ABI in the category of light. This shows that there is no meaningful difference in the value of ankle brachial index control group. In the control group was not performed actions such as diabetic foot spa on the Group's treatment. For 5 days in a row, in the control group respondents just doing everyday activities as usual and equally undergoing treatment of diabetes. Although there are 2 in the control group respondents who have ABI is being increased to mild, but based on the activity of the 23 respondents obtained from the control group most (56,5%) have activity walk or cycle ≤ 1 hour and the majority (52.5%) also obtained never exercising.

4.4 effectiveness of diabetic foot spa to the peripheral blood circulation in patients of type 2 diabetes mellitus in the working area Puskesmas Wonokromo Surabaya

The effectiveness of the diabetic foot spa against the peripheral blood circulation in patients of type 2 diabetes mellitus in the working area of Surabaya Wonokromo Puskesmas can be seen in table 3 which indicates that of the 23 groups after treatment given diabetic foot spa is almost entirely (91.3%) have an ankle brachial index. Wilcoxon Sign Rank test based on obtained values 0.000 and P is the value of $\alpha = 0.05$, meaning $\alpha P H_0$ is rejected then $<$, meaning there is a diabetic foot spa's effectiveness against the peripheral blood circulation in patients of type 2 diabetes mellitus in the working area Puskesmas Wonokromo Surabaya.

Based on the data above, it can be concluded that diabetic foot spa effective against peripheral blood circulation. Foot gymnastics is one of the activities of the exercise in the foot spa for waging a peripheral blood circulation, in it there is

some movement to train the muscles of the legs. According to the opinion of the Sari (2012) that there are benefits of exercise for people with diabetes that is control blood sugar by decreasing insulin resistance which increases insulin sensitivity in the muscles and other tissues so that the sugar levels experienced improvement. Insulin resistance itself may lead to vulnerability to disease peripheral vascular gymnastics activities, so that the foot is very helpful in diabetic foot spa.

Diabetic feet Spa foot care is an activity that required the diabetic patient thoroughly to prevent gangrene wounds. Like the opinion of Helmawati (2014) that prevention of the incidence of diabetic foot is absolutely necessary. The principle of prevention is avoiding the occurrence of diabetes foot wounds and continue to attempt to control the State of the blood sugar. On diabetic foot spa in addition to gymnastics events away, cleaning activities (skin cleansing) and a pedicure or cutting nails intended to prevent nails that are too long and goes into so it can injure the feet. Foot massage is a series of activities the activities of the diabetic foot spa not less important in addition to foot gymnastics activities, skin cleansing, pedicure, and foot mask. In foot massage there are certain points which connect to the organs of the pancreas to stimulate the production of insulin. Like the opinion of Gala (2009) that the massage on the sole of the foot area of the left can stimulate the pancreas to produce insulin

Foot massage is also very tolerated by many people because in addition beneficial for blood circulation, but provide a relaxing effect.

4.5 Research Limitations

In this study, researchers have limitations cannot control how the eating patterns of respondents, daily activities such as walking or cycling, as well as sporting activities. That is because the research done in the community.

5. Conclusion

There is the effectiveness of the diabetic foot spa against the peripheral blood circulation and there are meaningful differences between the treatment group and the control group. The more routine done diabetic foot spa in patients of diabetes mellitus, it is also getting better circulation of blood perifernya in preventing complications of diabetes mellitus.

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