



Implementation Of Diabetic Foot Spa And Sauna Bathing On Quality Of Sleep And Blood Glucose Levels In Individuals With Type 2 Diabetes

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A B S T R A C T

Diabetes is a chronic disease of glucose metabolism, which causes blood circulation obstruction such as tingling and leg pain, and itching. This study aims to determine the effect of diabetic foot spa and sauna bathing on sleep quality and blood glucose levels in individuals with type 2 diabetes. The design used a quasi-experimental. This study's population was all individuals with type 2 diabetes, applied simple random sampling, and a sample size of 60 respondents. The inclusion criteria were individuals with type 2 diabetes who did not have complications. The independent variables were sleep quality and blood glucose levels. The dependent variables were diabetic foot spa and sauna bathing. The instrument used a Pittsburgh Sleep Quality Index (PQSI) and a glucometer. The data analysis test utilized the paired t-test and independent t-test with a p-value of 0.000 ($p < 0.005$). The results of this study showed that 60 respondents, mostly (70%) women, 58.3% were aged 45- 60 years, almost half of the respondents (48.3%) had diabetes for less than one year up to five years and from the results t-test obtained $p=0.000$ ($p < 0.05$). There was an effect of diabetic foot spa and sauna bathing on sleep quality and blood glucose levels.

INTRODUCTION

Diabetes is a disease of blood sugar metabolism disorders. It has chronic hyperglycemia symptoms due to disruption in the secretion/absorption of insulin, impaired insulin function, or both (Skyler, J. S., et al, 2017). This disease has acute and chronic complications. Chronic complications that often occur are peripheral vascular disorders and sensory-motor neuropathy. A previous study reported that nearly 60% of sufferers experience microangiopathy or macroangiopathy complications (Chawla, A., Chawla, R., & Jaggi, 2016). This macroangiopathy obstructs blood flow to all organs (Maureen Farrell, Jennifer Dempsey, Suzanne C. O'Connell Smeltzer, 2013). Impaired blood circulation also results in tingling leg pain and skin itching, especially the folds around the genitals.

Diabetic patients in Indonesia reached 10.3 million – based on data from the International Diabetes Federation in 2017. This figure will continue to increase up to 16.7 million in 2045. The prevalence of diabetes was 10.9% in Indonesia and 8% in East Java (Riskesdas, 2018). 40.8% of patients with diabetes do not comply with the Chronic Disease Management Program (PROLANIS), such as home-visit and sports (Ristanova, 2018). Based on a preliminary study at the Taman Sidoarjo Public Health Center, seven of ten individuals with diabetes often experienced numbness. Their feet' tips or soles were

frequently painful, so they can't rest, especially at night. Five people experience itching and black marks on their feet' skin and complained of itching in the genitals.

High blood glucose levels cause these complications. It will cause blood circulation disorders and result in organ failures, such as heart failure and kidney failure, and neuropathy (Maureen Farrell, Jennifer Dempsey, Suzanne C. O'Connell Smeltzer, 2013). Neuropathy causes sleep quality disturbance (Bahnasy, W. S., et al, 2018).

Foot care can minimize neuropathy. One way to do foot care is a diabetic foot spa, which is foot care which consists of several stages. The first stage is to do foot exercises. The feet are cleaned with soap and soaked in warm water, followed by massaging the feet and finger (Purwanto, 2014). Sauna bathing is also one way to increase circulation to prevent neuropathy by accelerating sweat to release toxins in the body, reduce joint pain, and increase the body's resistance (Cohen, M., Hussain, 2018). The sauna bathing works by increasing the temperature in a room. Increased room temperature will increase body temperature so that the body's metabolism will increase. Furthermore, the bodies convert blood sugar into energy so that blood sugar levels will decrease (Bistara, D. N., 2019). Based on the above description, the authors will research the influence of diabetic foot spa and sauna bathing therapy on quality of sleep and blood glucose levels in people with type 2 diabetes.

METHOD

The research design used was quasi-experimental. This study included all individuals with type 2 diabetes in the Taman Sidoarjo Public Health Center in 2020 (July-August 2020), totaling 128 people. Each month the average number of patients with Type 2 diabetes was 76 individuals. The study's sampling was simple random sampling, with a sample size of 60 respondents. In this study, the inclusion criteria were individuals with type 2 diabetes who did not have heart disease, heart failure, kidney failure, or stroke. The intervention group (given diabetic foot spa and sauna bathing therapy) was 30 respondents, and the control group (given diabetic foot spa) was 30 respondents. There were measurements in quality of sleep and blood glucose levels before the intervention. After interventions (three times a week), the authors remeasured the quality of sleep and blood glucose levels. The diabetic foot spa procedures such as diabetic foot exercises, then soaking in warm water for 5 minutes, followed by a foot massage with a foot scrub and rinsing, then finally gave a foot moisturizer. The researchers did sauna bathing therapy after a diabetic foot spa for 20 minutes in the intervention group. We utilized a portable sauna device with a solution containing spices. While in the control group, we did of diabetic foot spa three times a week. The Pittsburgh Sleep Quality Index (PQSI) was an instrument to measure the quality of sleep, and a glucometer was a tool to examine blood glucose levels. The data analysis utilized a paired t-test and independent t-test with a p-value of 0.000 ($p < 0.005$).

RESULTS

Table 1 Distribution of respondents by age, gender, diabetes duration, smoking habit, medication adherence, and exercise

Characteristics of Respondents	Group				Total	
	Intervention		Control		f	%
	F	%	f	%		
Gender						
male	12	40	10	33.3	22	36.6
female	18	60	20	66.7	38	63.4
Age						
< 45 years	14	46.6	12	40	26	43.3
45 - 60 years	16	53.4	18	60	34	56.7
Diabetes Duration						
<1-5 years	10	33.3	12	40	22	36.7
6-10 years	8	26.7	6	20	14	23.3
11-15 years	6	20	6	20	12	20
16-> 20 years	6	20	6	20	12	20
Smoking habit						
Smoke	10	33.3	11	36.7	21	35
Do not smoke	20	66.7	19	63.3	39	65
Medication adherence						
Irregular	20	66.7	22	73.3	32	53.3
Regular	10	33.3	8	26.7	28	46.7
Exercise						
Often	7	23.3	7	23.3	14	23.3
Rarely	20	66.7	20	66.7	40	66.7
Never	3	10	3	10	6	10

Table 1 shows that most of the respondents are female, 45-60 years old, do not smoke, do not regularly take medication, and rarely have exercise. Almost half of them have diabetes for less than one year up to five years.

Table 2. The results of paired T-test on sleep quality

Group	n *	Pre		Post		t	p-value
		Mean	SD	Mean	SD		
Intervention	30	4.633	2.693	2.5667	0.568	4.003	0.000
Control	30	4.300	1.664	4.133	1.716	1.542	0.134

The mean value of sleep quality in the intervention group before the intervention was 4.6333 (SD 2.693), while after the intervention was 2.5667 (SD 0.568). There was a significant difference in sleep quality before and after the intervention ($p=0.000$) (Table 2).

Table 3. The results of paired T-test on blood glucose levels

Group	n *	Pre		Post		t	p-Value
		Mea n	SD	Mea n	SD		
Intervention	30	2,918	96.86	1.472	69.38	5,893	0.000
Control	30	2,630	67.02	2.575	65.06	0.784	0.439

The mean value of blood glucose levels in the intervention group before the intervention was 2.918 (SD 96.861), while after the intervention was 1.472 (SD 69,383). There was a significant difference in blood glucose levels before and after the intervention ($p=0.000$) (See Table 3).

Table 4. Differences of mean value on sleep quality between the intervention and control groups

Group	Mean	SD	Mean Difference (95% CI)	P-value Independent T-test
Intervention	1.733	1.760	1.076- 2.390	0.000
Control	0.167	0.592		

In the sleep quality variable, the mean difference in the intervention group was 1.733 (SD 1.760), while the mean difference in the control group was 0.167 (SD 0.592). There was a significant difference in sleep quality between the intervention and control groups ($p=0.000$) (See Table 4).

Table 5. Differences of mean value on blood glucose levels between the intervention and control groups

Group	Mean	SD	Mean Difference (95% CI)	P-value Independent T-Test
Treatment	1.440	133.896	94.06-194.064	0.000
Control	5.433	37.967		

In the blood glucose level variable, the mean difference in the intervention group was 1.440 (SD 133.896), while the mean difference in the control group was 5.433 (SD 37.967). There was a significant difference in blood glucose levels between the intervention and control groups ($p=0.000$) (See Table 5).

DISCUSSION

The results showed an effect of implementing diabetic foot spa and sauna bathing on the sleep quality in individuals with diabetes type 2. There was a decreased mean value of sleep quality after the intervention. A diabetic foot spa is a massage on feet soles to improve blood circulation and increase insulin. In comparison, sauna bathing is thermotherapy or temperature therapy using heat so that people can sweat. Sauna bathing can increase blood circulation, detoxification in the body, cardiovascular function, and improve sleep quality (Cohen, M., Hussain, 2018). The previous research reported diabetic foot spas on sleep quality in individuals with type 2 diabetes (Wardani, E. M., Wijayanti, L., & Ainiyah, 2019).

The implementation of the diabetic foot spa and sauna bathing was carried out three times in a row with a sauna bathing duration of 15 minutes and showed an increase in the mean from 2,567 to 4,633. The cause of its significance was because of the respondent's cooperation during the intervention. The intervention can reduce the physiological response to stress and provide a relaxing effect on the respondent so that sleep quality is good.

In the intervention group, the mean value of blood sugar levels decreased after the intervention. There was an effect of diabetic foot spa and sauna bathing on blood glucose levels in respondents. The high levels of blood glucose before the intervention is possible because of gender. Increased blood glucose levels are at risk of women with diabetes (OR = 1.37; 95% CI 1.26-1.49; $p < 0.001$) (Idris, H., Hasyim, H., & Utama, 2017). Likewise, a study in Riyadh, Saudi Arabia, aimed to evaluate the risk of developing

diabetes in 688 people. Their research showed that women were at risk of suffering diabetes (Alghadir, A., Awad, H., Al-eisa, E., & Alghwiri, 2014). That findings were different from a study conducted by Nordström et al. (2016) on 705 men and 688 women. They reported that the diabetes prevalence was 14.6% in men and 9.1% in women.

Women are more at risk of suffering diabetes because women have a component for insulin resistance. It increases when women get pregnant, do not move or exercise, or eat lots of carbohydrates. There is a process in reducing insulin sensitivity throughout women because they have less muscle mass. It does not support the high absorption of glucose and has relatively high estrogen and progesterone (Asiimwe, D., Mauti, G. O., & Kiconco, 2020). Besides, women have an index body mass more significant than men (Mildawati, Diani, N., & Wahid, 2019).

Sauna bathing causes an increase in body temperature so that glucose metabolism increases glucose use. Besides, more capillaries will open up so that more insulin receptors become available and will become more active. Then it will cause a decrease in blood glucose in individuals with diabetes (Asiimwe, D., Mauti, G. O., & Kiconco, 2020). The implementation of diabetic foot spa and sauna bathing accelerates the reduction in blood glucose levels by increasing glucose use.

A diabetic foot spa can improve blood circulation. During a diabetic foot spa session, individuals feel relaxed so that it enhances their quality of sleep. Hot temperatures at sauna bathing make the body sweating, widen blood vessels, launch circulation, and stimulate endorphins. It has an impact on body relaxation. The implementation of a diabetic foot spa and sauna bathing raises the quality of sleep

CONCLUSIONS

Implementation of sauna bathing and diabetic foot spa affect the quality of sleep and blood glucose levels. Therefore, this implementation could be an independent nursing intervention to prevent complications in individuals with type 2 diabetes.

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