

## THE EFFECT OF SLEEPING AND FOOT MASSAGE EDUCATION ON SLEEP QUALITY AND ANKLE BRACHIAL INDEX VALUE IN TYPE 2 DIABETES MELLITUS

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### Abstract

Diabetes Mellitus is a group of metabolic diseases characterized by hyperglycemia or high levels of glucose in the blood due to impaired insulin secretion, decreased insulin action or a result of both. The risk of developing type 2 diabetes will continue to increase with increasing age, obesity, and lack of physical activity. The objective of this study was to determine the effect of providing sleep management books and foot massage on sleep quality values and ankle brachial index values. The design used in this study was one group pre test-post test design. The research conducted to 30 patients Diabetes Mellitus type II in Bengkulu City Health Center Working Area, taken by random sampling technique. Then, analyzed by using *Wilcoxon test*. The results showed of statistical tests with the Wilcoxon Sign Rank Test at  $\alpha$  5% obtained a sleep quality score with p value  $0.035 < 0.05$ , and the statistical test results on the Ankle Brachial Index value with p value  $0.000 < 0.05$ . It can be concluded there is an effect of sleep management books and foot massage on changes in sleep quality scores and Ankle Brachial Index values. The recommendation could be submitted was implemented education booklets on sleep management and foot massage in order to improve sleep quality and the value of the ankle brachial index in patients with type II diabetes mellitus.

**Key words:** *Sleep quality, Ankle Brachial Index, Foot Massage, Sleep Management Book, Diabetes mellitus type 2*

### INTRODUCTION

Diabetes Mellitus (DM) is a group of metabolic diseases characterized by hyperglycemia or high levels of glucose in the blood caused by impaired insulin secretion, decreased insulin action or both. The risk of developing type 2 diabetes will continue to increase with age, obesity, and lack of physical activity (American Diabetes Association, 2018). The number of people with diabetes mellitus is currently increasing. According to the World Health Organization (WHO) in 2018, the number of people with diabetes greatly increased from 108 million people in 2000 to 422 million in 2017. Based on the 2018 ADA, people with diabetes mellitus were 25.8 million people in 2014 and increased to 29.1 million population in 2018.

Indonesia ranks 6th as the country with the highest number of DM sufferers in the world after China, India, United States, Brazil and Mexico. Based on geographic area, the highest distribution of DM sufferers is in the DKI Jakarta area as much as 3.4%, and the least is NTT as much as 0.9%. The number of people with diabetes mellitus also increased from 6.9% in 2013 to 8.5% in 2017, which means that there are 22.9 million people with DM prevalence (Basic Health Research, 2018). The prevalence with DM sufferers in 2017 was 425 million people. Indonesia ranks 6th (IDF, 2017). Type 2 DM is the most common type of DM, accounting for about 85% of DM patients (Greenstain, Wood, 2018).

The incidence of DM in Bengkulu Province is still very high with the number of sufferers as many as 19,353 people. The highest number of DM sufferers is Bengkulu City with a total of 6,060 people, followed by Bengkulu Tengah in second place with a total of 4,463 people, followed by Kepahiang in third place with a total of 1,854 people. The lowest number of DM sufferers is in Bengkulu Selatan with 255 sufferers (Profile of the Bengkulu Health Office, 2019). Patients with type 2 DM have a risk of complications that are not much different from type 1 DM (Smeltzer & Bare, 2013). Complications that may occur in people with DM are very complex because they can attack vital organs of the body. DM complications are generally divided into 2 (two), namely acute complications (hypoglycemia, ketoacidotic hyperglycemia and nonketotic hyperosmolar hyperglycemia) and chronic complications (coronary heart disease, cerebrovascular disease, hypertension, infection, peripheral vascular disease, peripheral arterial disease, and neuropathy) (Black & Hawks, 2014). In clients with DM there are three classic symptoms, namely, polyuria (a lot of urine), polydipsia (a lot of drinking) and polyphagia (a lot of eating). In addition, there are several other symptoms such as frequent drowsiness, itching especially in the pubic area, blurred vision of the eyes, numbness or pain in the lower body, skin infections, rapid irritability, very weak or tired, and nausea and vomiting (Novitasari, 2016).

The nature of the disease can prevent individuals from getting adequate rest (Potter & Perry, 2005). Patients with chronic disease conditions such as DM will more often experience insomnia. Sleep disturbances that occur in people with DM will cause a decrease in the quality of their sleep. Sleep quality is a satisfaction from the sleep experience, which integrates aspects of sleep initiation, sleep regulation, sleep quantity and feeling refreshed upon awakening (National Sleep Foundation [NSF], 2016). Peripheral arterial disease is a manifestation of atherosclerosis which is characterized by arterial

blockage in the lower extremities (Sihombin, 2016). According to the Data and Information Center of the Indonesian Hospital Association (PERSI) in 2011, the incidence of neuropathy in DM patients was more than 50%. Diabetic foot disorders with neuropathy in the form of sensory, motor and autonomic disorders. Sensory neuropathy is characterized by a feeling of numbness (paresthesia), lack of taste (hypesthesia), especially in the tips of the feet to heat, cold and pain (Monalisa & Gultom, 2017).

The Ankle Brachial Index is a non-invasive examination of blood vessels that serves to detect clinical signs and symptoms of ischemia, decreased peripheral perfusion that can lead to angiopathy and diabetic neuropathy (Mulyati, 2017). ABI value is considered normal if 1.0 while ABI value 0.9 is considered abnormal with details: mild obstruction if ABI 0.71 - <0.9; moderate obstruction when ABI 0.41 - <0.71; and severe obstruction if ABI < 0.41 (PERKENI, 2017). Management of diabetics must be done immediately to prevent complications. The first step that must be taken according to the Consensus of the Indonesian Endocrinology Association (PERKENI) 2017 is to modify a healthy lifestyle, such as medical nutrition therapy (regulation of the amount, type and schedule of meals) and regular exercise. If necessary, a healthy lifestyle is also accompanied by pharmacological intervention by administering oral antihyperglycemic agents or insulin injections.

Rest and sleep is an appropriate method of diabetes management, because sleep and rest are basic needs needed by every human being in the recovery process and restore the body's stamina to be in optimal condition. Every individual has different needs for rest and sleep and if done properly and regularly will have a good effect on health. The need for rest and sleep in sick individuals is necessary to speed up the healing process (Asmadi, 2008). Foot massage is useful for reducing peripheral resistance and increasing the elasticity of blood vessels. Increased blood supply and oxygen in the legs will prevent tingling, discomfort and tissue necrosis so that peripheral blood flow is expected to be smooth (Misnandiarly, 2016). By reducing the symptoms of neuropathy, it is hoped that the patient's sleep quality can improve. Therefore, the researchers wanted to know the effect of the Sleep Management Book and Foot Massage on sleep quality and ABI in Type 2 Diabetes Mellitus Patients in the Bengkulu City Health Center Work Area.

## METHODS

### Research Design and Subject

Foot massage is useful for reducing peripheral resistance and increasing the elasticity of blood vessels. Increased blood supply and oxygen in the legs will prevent tingling, discomfort and tissue necrosis so that peripheral blood flow is expected to be smooth (Misnandiarly, 2016). By reducing the symptoms of neuropathy, it is hoped that the patient's sleep quality can improve.

### Instruments and Data Analysis Procedures

Therefore, the researchers wanted to know the effect of the Sleep Management Book and Foot Massage on sleep quality and the Ankle Brachial Index in Type 2 Diabetes Mellitus Patients in the Bengkulu City Health Center Work Area.

## RESULTS

### A. Univariate Analysis

**Table 1 Distribution of Pre and Post Sleep Quality Scores for Type 2 Diabetes Mellitus Patients in the Bengkulu City Health Center Work Area**

Score of quality sleep	N	Pre	Post
<i>Book TLT</i>	30		
Mean		10,37	6,93
Median		10,00	7,00
SD		1,608	1,048
Min-Max		8-14	5-9
CI for Mean 95%		9,77-10,97	6,54-7,32
<i>foot massage</i>			
Mean	10,37	6,43	
Median	10,00	7,00	
SD	1,608	0,898	
Min-Maks	8-14	5-9	
CI for Mean 95%	9,77-10,97	6,10-6,77	

Table 1 showed the average sleep quality score of respondents with type 2 diabetes mellitus before being given the intervention of sleep management books and foot massage is 10.37. The results of the analysis showed that the sleep quality score of respondents with type 2 diabetes mellitus after being given an intervention with a sleep management book and foot massage was an average of 6.9.

**Tabel 2 Distribution of Ankle Brachial Index (ABI) Pre and Post Type 2 Diabetes Mellitus Patients in the Work Area of the Bengkulu City Health Center**

Score Ankle Brachial Index (ABI)	N	Pre	Post
Buku TLT	30		
Mean		0,971	1,141
Median		0,976	1,117
SD		0,024	0,082
Min-Maks		0,86-0,99	1,03-1,29
CI for Mean 95%		0,96-0,98	1,11-1,17
foot massage			
Mean		0,971	1,057
Median		0,976	1,043
SD		0,024	0,041
Min-Maks		0,86-0,99	1,01-1,17
CI for Mean 95%		0,96-0,98	1,04-1,07

Table 2 showed the average value of the ABI of respondents with type 2 diabetes mellitus before being given the intervention of sleep management books and foot massage is 0.971. The results of the analysis showed that the value of ABI of respondents with type 2 diabetes mellitus after being given an intervention with a sleep management book and foot massage was an average of 1.141.

#### B. Analisis Bivariat

**Table 3 Average Sleep Quality Score before and after being given a Sleep Management Book and Foot Massage for Patients with Type 2 Diabetes Mellitus at the Bengkulu City Health Center**

Variabel	N	Mean	Mean Rank	Sum of Ranks	Z	P value
Buku TLT	30	10,37	14,00	378,00	-4,565	0,000*
Pre		6,93				
	Post					

\*Wilcoxon

Table 5.4 statistical test results on the average score of sleep quality in the intervention of sleep management books and foot massage shows p value  $0.000 < 0.05$  meaning that there is a difference in the average score of sleep quality before and after the educational intervention of sleep management books and foot massage.

**Tabel 4 Average Ankle Brachial Index (ABI) Value before and after being given a Book on Sleep Management and Foot Massage for Patients with Type 2 Diabetes Mellitus at the Bengkulu City Health Center**

Variabel		Mean	Mean Rank	Sum of Ranks	Z	P value
Buku TLT	Pre	0,971	15,50	465,00	-4,782	0,000*
	Post	1,141				

\*Wilcoxon

Table 5 statistical test results on the average value of ABI in the intervention book management of sleep and foot massage shows p value  $0.000 < 0.05$ , meaning that there is a difference in the average value of ABI before and after the intervention education book management sleep and foot massage.

**Tabel 6 The Effect of Education on Sleep Management Books and Foot Massage on Sleep Quality Scores for Type 2 Diabetes Mellitus Patients at the Bengkulu City Health Center**

Intervensi	Selisih Skor Kualitas Tidur				Z	P value
	Mean	SD	SE	Mean Rank		
Buku TLT	6,93	1,048	0,191	8,96	-2,104	0,035*
Foot Msg	6,43	0,898	0,164	7,13		

\* Wilcoxon

Table 7 showed the results of the analysis of p value  $0.035 < 0.05$  Then  $H_a$  is accepted, so it can be concluded that there is an effect of sleep management books and foot massage on changes in sleep quality scores.

**Tabel 8 The Effect of Education on Sleep Management Books and Foot Massage on the Ankle Brachial Index (ABI) of Type 2 Diabetes Mellitus Patients at the Bengkulu City Health Center**

Intervension	The difference score of <i>Ankle Brachial Index</i>				Z	P value
	Mean	SD	SE	Mean Rank		
Buku TLT	1,141	0,082	0,014	17,24	-4,083	0,000*
Foot Msg	1,057	0,041	0,007	6,84		

\* Wilcoxon

Table 8 shows the results of the analysis of p value  $0.000 < 0.05$ . Then  $H_a$  is accepted, so it can be concluded that there is an effect of sleep management books and foot massage on changes in the value of ABI.

## DISCUSSION

### A. The Influence of Sleep Management Books and Foot Massage on Sleep Quality of Type 2 Diabetes Mellitus Patients at the Bengkulu City Health Center

Based on the results of the research that has been carried out, it can be concluded that there is an influence of sleep management books and foot massage on changes in sleep quality scores in patients with type 2 diabetes mellitus at the Bengkulu City Health Center in 2020. In accordance with research conducted by (Nadyatama, 2018) from statistical calculations using the Paired T-test, the statistical data  $t$  is 10.247 so that  $t$  with a  $p$ -value of 0.000 ( $p$ -value  $< 0.05$ ), then the alternative hypothesis ( $H_a$ ) accepted means that there is an effect of educational therapy on sleep hygiene activities on sleep quality in the elderly at BPSTW Budi Luhur Unit Yogyakarta. Based on the data obtained apart from the PSQI questionnaire, the results of the observation sheet on sleep hygiene activity therapy showed that the respondents were very cooperative in carrying out sleep hygiene activities in accordance with the guide book sourced from the Ministry of Health in 2006 in Jati 2010. After the researchers conducted observations, interviews and actions every day for 2 weeks to 15 respondents from items 1 to 10, on average, almost all elderly perform sleep hygiene activities regularly.

Sleep hygiene education is defined as a set of behavioral and environmental recommendations intended to promote healthy sleep and was originally developed for use in the treatment of mild to moderate insomnia (Leah et al, 2014). During sleep hygiene education, patients learn about healthy sleep habits and are encouraged to follow a set of recommendations to improve their sleep (eg, avoid caffeine, exercise regularly, remove noise from the sleeping environment, maintain a regular sleep schedule). Meanwhile, in line with research conducted by (Afianti, 2017) there was a significant difference in the control and intervention groups through independent t-test with an intervention mean of 60.69 and a control mean of 52.49, the results were  $p = 0.026$  ( $p < 0.05$ ). This study is considered significant by showing that there is an effect of foot massage before bed on increasing sleep quality scores in the intervention group in the ICU Dr. RSUP. Hasan Sadikin Bandung. According to (Oshvandi & Homayonfar, 2014) massage on the feet provides the benefit of reducing anxiety, stress and pain felt by patients, even though massage is given in a short time and only on the legs, it can provide benefits for the heart to become calmer, reduce stress and reduce stress improvement in sleep.

## **B. Effect of Sleep Management Book and Foot Massage on Ankle Brachial Index (ABI) Values in Type 2 Diabetes Mellitus Patients in Bengkulu City Health Center**

The results of the research concluded that there is an influence of sleep management books and foot massage on changes in the value of the ABI. In accordance with research conducted by (Khomsah, 2020) it was found that the value of ABI and foot sensitivity after the home exercise intervention increased ABI value and foot sensitivity and seen from the  $p$  value = 0.001 < 0.05 can be it was concluded that there was an effect of home exercise on the value of the Ankle Brachial Index and foot sensitivity in type 2 Diabetes Mellitus patients. According to Suharsono (2013) one of the efforts that can be made to prevent complications is by doing programmed physical exercise at home with the patient's participation in physical exercise or referred to as home exercise.

Most people with type 2 diabetes mellitus have at least one complication, including peripheral arterial disease which is the main cause of morbidity and mortality in type 2 diabetes mellitus patients. These complications occur as a result of hyperglycemia (Ikura, et al., 2017; Zheng, et al., 2018). The same opinion was expressed in a study by (Solanki et al, 2012) which states that complications due to peripheral artery disease, one of which is the risk of foot ulcers, so that screening is needed as the main action to determine vascular status and help establish a diagnosis of peripheral arterial disease performed by measuring the ankle brachial index (ABI) in patients with diabetes mellitus. Based on research (Potier, et al., 2011) which argues that the measurement results of the ankle brachial index can be used as an indicator to determine the occurrence of peripheral arterial disease.

Research by (Sunarti, 2018) based on statistical tests it can be seen that  $P$ -value = 0.016, this shows that the combination of diabetes mellitus foot exercise and foot massage is effective on ABI value in type 2 diabetes mellitus patients. the results of the study with the average ABI value before the intervention of 0.84 where the foot experienced an ischemic condition and the average ABI value after the intervention was 0.96, which means that there was an increase in the ABI value to normal with the difference in the average value before and after the intervention of 0.12. According to researchers, the benefits of massage are by alternating pressing and pushing techniques causing emptying and filling of the veins and spleen, thereby helping facilitate circulation, assisting secretion, and providing nutrients to the



tissues, then massage causes a race for nerves, blood circulation which causes a process of vasodilation local to facilitate blood circulation. In addition, stimulated motor nerves increase muscle tone and massage causing the release of a histamine-like substance that has a dilating effect on capillary blood vessels. This research is also supported by research conducted by Laksmi (2012), there is an increase in the average ABI value from 0.8971 to 0.9879 after foot massage intervention.

## **CONCLUSIONS AND SUGGESTIONS**

The results showed of statistical tests with the Wilcoxon Sign Rank Test at  $\alpha$  5% obtained a sleep quality score with p value  $0.035 < 0.05$ , and the statistical test results on the Ankle Brachial Index value with p value  $0.000 < 0.05$ ). It can be concluded there is an effect of sleep management books and foot massage on changes in sleep quality scores and Ankle Brachial Index values. The recommendation could be submitted was implemented education booklets on sleep management and foot massage in order to improve sleep quality and the value of the ankle brachial index in patients with type II diabetes mellitus.

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