

Research Article

Benson's Relaxation Techniques to Improve Sleep Quality in Diabetes Mellitus Patients

Zaqqi Ubaidillah*, Rani Karisma Rosul, and Reni Ilmiasih

Department of Nursing, University of Muhammadiyah Malang

ORCIDZaqqi Ubaidillah: <https://orcid.org/0000-0001-8494-2027>**Abstract.**

The sleep pattern of diabetics are disturbed because they often wake up and have difficulty going back to sleep. This study aimed to determine the effect of Benson's relaxation technique on the sleep quality of clients with diabetes mellitus at the Polowijen Health Center. This research design used Pre-Experimental One Group pre-post design. The sample in this study was 30 people with diabetes mellitus with poor sleep quality. The research instrument used was a sleep quality questionnaire. The study was conducted from 1st July to 7th August 2019. Data were analysed with the T-Dependent test (Paired Sample T Test). The results of this study indicated that there is an effect of the Benson relaxation technique on the sleep quality of diabetes mellitus patients, with the average total score after the Benson relaxation technique being 18.83 and the results of the T-Dependent statistical test (Paired Sample T Test) was a Sig.2 Tailed 0.000. Benson's relaxation technique accelerates a comfortable and relaxed condition. As a result, the secretion of catecholamine and cortisol hormones inhibits the production of endorphins, enkephalins, and serotonin increases, the stimulation of the Reticular Activating System (RAS) decreases, then the secretion of the hormone melatonin increases when the brain is relaxed, and the Bulbar Synchronizing Regional (BSR) is active, causing a person to fall asleep.

Keywords: sleep quality, diabetes mellitus, Benson relaxation techniqueCorresponding Author: Zaqqi Ubaidillah; email: zaqqi@umm.ac.id

Published 8 March 2023

Publishing services provided by Knowledge E

© Zaqqi Ubaidillah et al. This article is distributed under the terms of the [Creative Commons Attribution License](#), which permits unrestricted use and redistribution provided that the original author and source are credited.

Selection and Peer-review under the responsibility of the ICMEDH Conference Committee.

1. INTRODUCTION

DM is characterized by typical symptoms including polyphagia, polydipsia, and polyuria and some experience weight loss. In addition, DM clients experience itching on the skin, nausea, dizziness which it can interfere their sleep (1). A total of 46 respondents with a percentage of 59% had sleep disorders and as many as 32 respondents with a percentage of 41% did not experience sleep disorders (2). From 68 respondents, 43 respondents (63.2%) had poor sleep quality and 25 respondents (36.8%) had good sleep quality (3). The prevalence of sleep quality in DM clients is 56.2% poor sleep quality and 43.8% good sleep quality(4).

OPEN ACCESS

Poor sleep quality in DM clients is caused by frequent urination at night (nocturia), overeating before going to bed, excessive stress and anxiety, increased body temperature at night, which can lead to reduced sleep quality, impaired immune response, endocrine metabolism and function. Cardiovascular (5). If the DM client has woken up, and to start sleeping again has difficulty. This is supported by research conducted on clients with type 2 DM which showed that there was a relationship between type 2 diabetes mellitus to initiate sleep and difficulty maintaining sleep due to complaints of pain and nocturia. Thus, due to the clinical symptoms experienced, DM clients experience a decrease in sleep quality (3). Sleep quality is an individual's ability to sleep which does not only reach the amount or duration of sleep. Poor sleep quality can cause disturbances in physiological balance, such as decreased daily activities, feeling weak and tired, decreased endurance, and unstable vital signs; and psychological balance disorders that arise such as unstable emotions, lack of confidence, excessive impulsivity and carelessness(6).

People with sleep disorders or poor sleep quality or sleep quantity have decreased sensitivity to insulin, resulting in increased blood glucose and can worsen the development of DM. On the other hand, sleep disturbances facilitate the hypothalamic-pituitary-adrenocortical system to release extra glucocorticoids resulting in increased glucose production, while glucose consumption is reduced, thereby affecting glycemic control. Therefore, good sleep quality is very important to maintain effective glycemic control and improve the quality of life of DM clients(7).

During sleep, the body's metabolic rate will be reduced by 15% due to physical inactivity, while the basal metabolic rate will be maintained at 80% to maintain the body's cellular processes. In the Slow Wave Sleep (SWS) phase, less glucose is used in the brain, the pituitary secretes Growth Hormone (GH) and cortisol, which are hormones that affect glucose regulation. Usually Growth Hormone (GH) levels increase at the beginning of sleep and reach a peak in the Slow Wave Sleep (SWS) phase, cortisol levels increase in the REM (Rapid Eye Movement) phase, so that the NREM (Non-Rapid Eye Movement) phase of glucose metabolism decreases. A person with poor sleep quality causes hormonal dysregulation, namely an increase in cortisol levels which will cause a decrease in protein synthesis and increase gluconeogenesis, causing hyperglycemia. This hyperglycemia can cause an increase in osmotic diuresis, so that as compensation, the body will expel the excess glucose through urination, causing polyuria. As a result of polyuria, the body loses fluids and electrolytes, resulting in dehydration. Then there will be thirst due to dehydration, so the need for fluids increases and will result in Hyperglycemic Hyperosmolar State (HHS). Gluconeogenesis also produces ketones,

which can lead to diabetic ketoacidosis so the need for fluids increases and will result in Hyperglycemic Hyperosmolar State (HHS). Gluconeogenesis also produces ketones, which can lead to diabetic ketoacidosis so the need for fluids increases and will result in Hyperglycemic Hyperosmolar State (HHS). Gluconeogenesis also produces ketones, which can lead to diabetic ketoacidosis(8).

The various kinds of adverse effects caused by poor sleep quality above, it is necessary to provide appropriate interventions to improve sleep quality. One way that can be used is the Benson relaxation technique. Benson's relaxation technique is a combination of relaxation techniques with the strength of a good belief that is a success factor for relaxation. The element of belief used is the mention of words or sentences in accordance with their respective religious beliefs repeatedly and with an attitude of resignation. This therapy can be used to reduce tension or achieve a calm state, such as relieving pain, stress, insomnia, lowering blood pressure and depression(9). Benson's relaxation technique is one of the complementary therapies that is inexpensive and easy to learn by clients(10). In addition, the advantage of the Benson relaxation technique when compared to other relaxation techniques is that the Benson relaxation technique is easier to do and does not cause any side effects. Benson relaxation technique can be done 10-20 minutes twice a day(9). This is also supported by research by Masry, Aldoushy, & Ahmed (2017) showing that the Benson relaxation technique has a positive effect in reducing postoperative pain and improving sleep quality in adults and the elderly who undergo joint surgery. There was a significant difference in the group that received Benson's relaxation technique compared to the control group who only received routine care on the sleep quality of hemodialysis clients.

Various studies state that the Benson's relaxation technique is quite effective in improving sleep quality, but there is still no intervention in clients with diabetes. Therefore, this study aims to determine the effect of the Benson relaxation technique on the sleep quality of diabetic clients before and after being given the Benson relaxation technique.

2. MATERIALS AND METHODS

The research design used in this study is Pre-Experimental (One Group pre-post design). The sampling technique in this study uses quota sampling. The sample inclusion criteria in this study are as follows: (1) Type 2 diabetes mellitus client with Sleep Quality Questionnaire range < 62.5%. (2) Diabetes mellitus clients routinely check at the Polowijen Public Health Center, Malang City. (3) Clients with diabetes mellitus who have the ability

to communicate. (4) Clients with diabetes mellitus who have support from the family. (5) Not currently participating in another research. (6) Willing to be a respondent. The number of respondents in this study were 30 respondents. Prior to the intervention, the patient was given a pre-test in the form of a sleep quality questionnaire (KKT) and an interview. Furthermore, the patient was given the Benson relaxation technique intervention 2 times a day for 10-20 minutes. The frequency of the intervention is once during the day accompanied by the researcher and once before going to bed at night independently for 5 consecutive days. Finally, patients were evaluated by being given a post-test in the form of a sleep quality questionnaire (KKT) which was the same as the pre-test. The Sleep Quality Questionnaire (KKT) consists of 7 question points. The assessment of each question point uses a Likert scale of 1-4. Total score 7-28. 7 is the lowest value and 28 is the highest value. Data analysis using T-dependent test

3. RESULTS

3.1. Characteristics of Respondents

Respondents in this study were diabetes mellitus clients at the Polowijen Public Health Center, Malang City who met the inclusion criteria of 30 people using quota sampling technique. The following are the characteristics of the respondents after grouping the data.

The distribution of respondents based on age in clients with diabetes mellitus at the Polowijen Public Health Center Malang City is 30 people in the form of a table as follows:

Based on table 1 above, it is known that of the 30 people who were respondents in this study, most of them were respondents with an age range of 56-65 years (late old age) as many as 20 people. Most of the respondents were female with a total of 22 respondents. Most of the respondents who had diabetes mellitus for > 10 years, which were 16 people. The highest frequency of comorbidities is hypertension with a total of 6. Most of the respondents have a BMI of obesity level 1 as many as 16 people.

3.2. Special Data

TABLE 1: Characteristics of Respondents Based on Age, Gender, Duration of Diabetes Mellitus, Comorbidities and BMI of Diabetes Mellitus Clients at the Polowijen Health Center Malang City in July 2019 (n=30).

No	Characteristics	Frequency (n)	Percentage (%)
1	Age		
	46-55 years old	6	20
	56-65 years old	20	67
	> 65 years old	4	13
	mean		59.3
	SD		5.79
2.	Gender		
	Man	8	27
	Woman	22	73
3.	Duration of Diabetes Mellitus		
	10 years	14	47
	> 10 years	16	53
4.	Co-morbidities		
	Hypertension	6	20
	Heart disease	5	17
	Cholesterol	4	13
	Gastritis	4	13
	Neurological disorders	3	10
	Vertigo	1	3
	Gout	1	3
	Osteoporosis	1	3
	Itchy rash	1	3
	There isn't any	4	13
5.	Body Mass Index (BMI)		
	Healthy weight range	4	13
	Underweight range	5	3
	Overweight range	1	17
	Obesity range level 1	16	54
	Obesity range level 2	4	13

3.2.1. Sleep Quality of Diabetes Mellitus Clients

Data sleep quality of clients with diabetes mellitus pre and post intervention Benson relaxation technique was obtained through an assessment with the Sleep Quality Questionnaire. In the sleep quality questionnaire, there are 7 question points and scoring using a Likert scale of 1-4. The lowest total score was 7 and the highest total score was 28. The higher the score, the better the sleep quality. The results of the distribution of pre and post data on diabetes mellitus clients are depicted in the fig. 1.

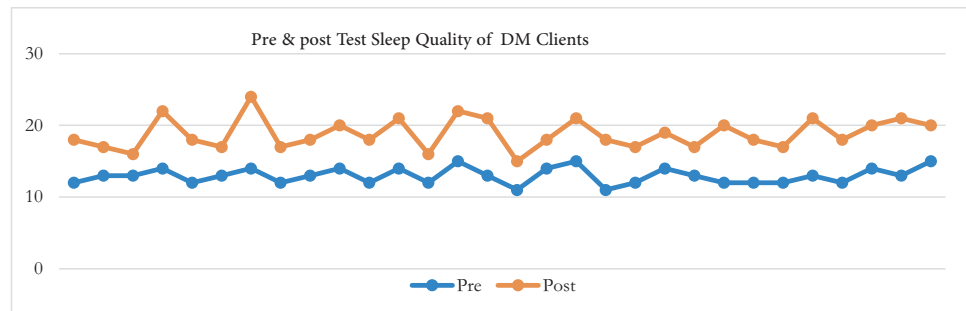


Figure 1: Distribution of Sleep Quality of Diabetes Mellitus Clients at the Polowijen Health Center Malang City Before and After Performing the Benson Relaxation Technique.

The picture describes the sleep quality of a diabetes mellitus client before and after doing the Benson relaxation technique. The blue line on the graph shows the sleep quality of the diabetes mellitus client before (pre) doing the Benson relaxation technique. The orange line on the graph shows the sleep quality of the diabetes mellitus client after (post) doing the Benson relaxation technique. In the graph above, it can be seen that all respondents before (pre) doing the Benson relaxation technique had poor sleep quality. They just had half of the total sleep quality score was 12 (43%), 10 respondents (33%). Moreover, there had total sleep quality score only 11 (39%), 2 respondents (7%). Meanwhile, after (post) doing the Benson relaxation technique, most of the respondents had good sleep quality as many as 21 people (70%),

TABLE 2: Distribution of Sleep Quality of Clients with Diabetes Mellitus Before and After Performing the Benson Relaxation Technique.

	Number of Samples	Maximum Value	Minimum Value	mean	SD
Pre	30	15	11	12.97	1.13
Post	30	24	15	18.83	2.13

Based on the table above, the average total sleep quality score of diabetic clients before (pre) doing the Benson relaxation technique is 12.97 with a standard deviation of 1.13. The average sleep quality of clients with diabetes mellitus before (pre) doing the Benson relaxation technique was poor with a total score of 12.97 sleep quality. The minimum score for the total sleep quality score is 11 with a maximum score of 15. The average sleep quality after (post) doing the Benson relaxation technique is good with the total sleep quality score increasing to an average of 18.83 with a standard deviation of 2.13. The minimum score for the total sleep quality score is 15 with a maximum score of 24.

4. Data analysis

4.1. Normality Test

Normality test is a test conducted to see whether the independent variable and dependent variable or both are normally distributed or not(11). In this study, the number of samples was 30 respondents, so the researchers used the Shapiro-Wilk normality test method. The data is said to be normally distributed if the significance value of the Shapiro-Wilk test $> \alpha$ (0.05) is used(12).

TABLE 3: Shapiro-Wilk . Normality Test Results.

<i>Shapiro-Wilk</i>				
		Statistics	df	Sig.
Sleep Quality (pre-post difference)		0.940	30	0.89

Based on the table 3 above, the results of the Shapiro-Wilk normality test obtained a significance value (p-value) of 0.89 which is greater than (0.05) so it can be concluded that the sleep quality data of the diabetes mellitus client is normally distributed. The results of the Shapiro-Wilk normality test were calculated using the SPSS 25 program.

4.2. T-test Dependent (Paired Sample T-Test)

In this study using T-dependent test (Paired Sample T Test) to test whether there is a difference between before (pre) and after (post) the Benson relaxation technique intervention on the same group of samples.

TABLE 4: Dependent T-Test (Paired Sample T-Test).

<i>Paired Sample Test</i>			
	mean	SD	Sig. 2 Tailed
Pre Test- Post Test	5,876	1,634	0.000

Based on the table above, the T-Dependent test (Paired Sample T Test) with a level of $\alpha = 5\%$. The significance value obtained is 0.000. The significance value $< (0.05)$, it can be concluded that there was a difference in the quality of sleep before (pre) and after (post) the Benson relaxation technique significantly

5. DISCUSSION

5.1. Overview of Sleep Quality of Diabetes Mellitus Clients Before Benson Relaxation Technique is performed

Most of the respondents in this study had poor sleep quality because respondents not only had diabetes mellitus, but also had other diseases such as hypertension, heart disease, cholesterol, stomach, nerves, gout, vertigo, osteoporosis, and itching. Uncontrolled blood glucose levels can trigger microvascular (small blood vessels) and macrovascular (large blood vessels) complications, thereby affecting changes in blood pressure. There is a significant relationship between blood sugar levels and blood pressure in the elderly with type 2 diabetes. Diabetes mellitus can also cause damage to the vestibular organs in the inner ear. Cerebrovascular disease is also 2x more likely to occur in diabetic clients compared to non-diabetic clients. Low insulin production or insulin uptake by body cells also causes metabolic disorders in the form of increased blood fatty acids, cholesterol, phospholipids, and lipoproteins. If this happens continuously, it will trigger angiopathy which can cause retinal, kidney, coronary heart and stroke complications(13).

Osteoporosis and fractures are also more common in patients with diabetes mellitus than are usually coincidental. In clients with type 1 diabetes mellitus, bone mass decreases and the risk of fracture increases, thus meeting the criteria for osteoporosis. However, in clients with type 2 diabetes mellitus, bone mass may increase and the risk of fracture increases. Clients with type 2 diabetes mellitus may not easily meet the criteria for osteoporosis, even though their bone fragility increases. One of the reasons many fractures occur despite the increased bone density in type 2 diabetes mellitus, is associated with hypoglycemia or an increased number of falls due to complications from visual disturbances, cerebral ischemia and poor balance due to neuropathy(14).

Hyperglycemia conditions also cause disruption of the mechanism of the immunoregulatory system which results in decreased chemotaxis, phagocytosis and bactericidal ability of leukocyte cells, so that the skin is more susceptible to infection. The infection usually attacks the skin in the folds of the armpit, under the breast, inguinal or often in women causing itching in the pubic area and vaginal discharge(15)(16).

In this study, almost all respondents were in the age range of 56-60 years. The mean age is 59.3 years. This is in line with the results of the 2015 National Institute of Diabetes and Digestive and Kidney Disease (NIDDKD) survey which stated that the most diabetes mellitus clients were in the 45–64-year age range. Type 2 diabetes mellitus tends to increase with age. Other studies also mention that blood sugar concentrations will increase 1-2 mg% per year during fasting and will increase by about 5.6-13 mg% at

2 hours of PP, increasing the risk of impaired glucose tolerance and type 2 diabetes mellitus(2).

Most of the respondents in this study were female. This is in line with the survey results of the National Institute of Diabetes and Digestive and Kidney Disease (NIDDKD) in 2015 and the Data and Information Center of the Indonesian Ministry of Health in 2015 which stated that the majority of clients with diabetes mellitus were women. Diabetes mellitus is more common in women due to eating habits in women who tend to like foods that contain chocolate, sugar, and fast food, where these foods can increase glucose levels.(17). Zahra's research (16) suggests that diabetes mellitus occurs mostly in women because it is related to poor diet and physical activity.

Most of the Body Mass Index (BMI) owned by respondents are obese level 1. In line with Perkeni (2015) which states that the risk factor for type 2 diabetes mellitus is obesity. In previous studies it was also stated that obesity has a 3.38 times chance of developing diabetes mellitus compared to people who are not obese(18). Obesity occurs due to excessive intake of nutrients continuously which causes excess fat stores. Fatty acids are stored in the form of chemical compounds in the form of triacylglycerol which are found in adipocyte cells. Free fatty acids can circulate in blood vessels throughout the body and cause oxidative stress or lipotoxicity. Lipotoxicity can also interfere with insulin receptor function, which can lead to insulin resistance. The consequence of insulin resistance is hyperglycemia, resulting in disturbed sleep.(19) (20)

Poor sleep quality is associated with poor HbA1C glycemic control. In line with Surani et al (20) stated that clients with poor sleep have difficulty with diabetes control. The secretion of catecholamine and cortisol hormones will increase blood glucose levels. In addition, several physiological experiments have also shown that the concentration of cortisol in the blood and insulin resistance increase along with decreased sleep quality(21).

In this study, most of the respondents had diabetes mellitus for >10 years. This is in line with Kurniati's research (22) which shows that more respondents have poor sleep quality with a duration of diabetes mellitus >10 years. Azizah's research (2017) shows that there is a relationship between duration of diabetes mellitus and sleep quality.

In this study, almost all clients with diabetes mellitus had poor sleep quality, which was described by the time it took to start sleeping >60 minutes, 5-6 hours of sleep at night, waking up 3-4 times at night, feeling a little sleepy when waking up. in the morning, does not feel-good sleep due to frequent awakenings, feels a little satisfied with his night sleep, and never takes a nap.

5.2. Overview of Sleep Quality of Diabetes Mellitus Clients After Benson's Relaxation Technique

After using the Benson relaxation technique 2 times a day for 5 consecutive days in this study, most of the respondents' sleep quality was good, which was illustrated by the results of the sleep quality questionnaire that changed, namely the time to start sleeping at night 16-30 minutes, the duration of sleep was 16-30 minutes. sleep 5-6 hours, wake up 1-2 times at night, feel a little sleepy when you wake up in the morning, don't sleep well enough at night, quite satisfied with the night's sleep, and the time it takes to sleep during the day <1 hour.

By doing the Benson relaxation technique which is a non-pharmacological therapy, it can improve sleep quality because the Benson relaxation technique can inhibit sympathetic nerve activity, then the muscles of the body become relaxed so that the feeling becomes calm and comfortable. Benson relaxation techniques can also affect the secretion of hormones that cause a person to sleep(23).

Rahman, Handayani & Sholehah research proves that there is an effect of Benson relaxation therapy on the sleep quality of the elderly so that it has implications for improving sleep quality and not showing signs of sleep deprivation, and experiencing problems in their sleep. In line with Hidayat's research, A. (25) found that there was a significant difference in increasing sleep quality between before and after being given Benson relaxation, and decreased sleep problems experienced by the elderly at PSTW Sabai Nan Aluih Sicincin. The research of Maulinda, Candrawati & Adi also proves that there is an effect of Benson relaxation techniques on the sleep quality of the elderly at the Permadi Elderly Posyandu, Malang City. Agus Research, AI(24) also showed that there was a significant effect of giving Benson relaxation on decreasing PSQI scores in cancer clients. Likewise, research by Suswanto, AW (2017) concluded that Benson relaxation therapy is effective in reducing stress and improving sleep quality in hemodialysis patients at RSUD dr. Harjono S., Sp. OG Ponorogo.(24) (25).

5.3. Comparative Analysis of Sleep Quality in Diabetes Mellitus Clients Before and After Intervention

The results of this study that it showed an increasing in the quality of sleep felt by respondents, this is because the Benson relaxation technique has a positive effect on sleep quality which, if done, can reduce the secretion of the hormone cortisol which

is a stress hormone (23). It was also shown in a previous study by Rambod, Poulari-Mohammadi, Pasyar, Rafii & Sharif that there was a significant effect of using Benson relaxation techniques on the sleep quality of hemodialysis clients. Benson's relaxation technique also has a positive effect in reducing postoperative pain and improving sleep quality in adults and elderly clients undergoing joint surgery (26).

Benson's relaxation technique can help the secretion of serotonin from special cells in the *raphe* nucleus of the pons and medulla sleep system (Bulbar Synchronizing Regional (BSR) which can cause a person to fall asleep. Benson's relaxation technique can accelerate relaxed and calm conditions, so that the relaxation response of the parasympathetic nervous system can stimulate the hypothalamus to secrete Corticotropin Releasing Factor (CRF), so that it can stimulate the pituitary gland to increase the production of endorphins, enkephalins and serotonin. On the other hand, when the body and mind relax, the brain will also increase the secretion of the hormone melatonin (27). So as a result of the secretion of these hormones, it can reduce stimulation of the Reticular Activating System (RAS). (28). Reticular Activating System (RAS) activation will continue to decrease if the room is quiet and dark, the hormone melatonin increases. When the stimulation of the Reticular Activating System (RAS) decreases, the Bulbar Synchronizing Regional (BSR) activates, causing a person to fall asleep. (6).

In addition, respondents said that Benson's relaxation technique was easy to apply. Therefore, respondents reported that there were changes and improvements in sleep quality. The total score of sleep quality between before and after doing the Benson relaxation technique increased by an average of 5,876. When compared between before and after the Benson relaxation technique was carried out, the highest total score of sleep quality before the Benson relaxation technique was performed was 15 and after the Benson relaxation technique there was an increase, with a total score of 24 sleep quality.

The difference in total sleep quality scores between before and after the Benson relaxation technique varied. Although all experienced an increase, the data obtained showed the difference in the total score of sleep quality in pre and post intervention, the lowest was 3 and the highest was 10, with an average difference in the total score of 5.87. Researchers assume that the increase in sleep quality with the difference in the total score of varying sleep quality is caused by several factors, including the age of the respondents who are mostly included in the category of late old age, which in old age, a person experiences a lot of degeneration of body cells, thus experiencing decreased physical ability and other diseases, such as hypertension, diabetes mellitus, osteoporosis and so on.

6. CONCLUSION

After using Benson's relaxation technique, 2 times a day for 5 days continuously, almost all respondents experienced improve their quality of sleep. Benson's relaxation technique accelerates comfortable and relaxed conditions, thereby inhibiting the secretion of catecholamine and cortisol hormones, which then increases the production of endorphins, enkephalins, and serotonin, resulting in decreased Reticular Activating System (RAS) stimulation, then melatonin secretion increases when the brain relaxes and relaxes. Bulbar Synchronizing Regional (BSR) is active, causing a person to fall asleep.

References

- [1] World Health Organization (WHO). Global Report on Diabetes. World Health Organization. WHO; 2016.
- [2] Tentero IN, Pangemanan DH, Polii H. Hubungan diabetes melitus dengan kualitas tidur. *J E-Biomedik EBM*; 2016. p. 4.
- [3] Kurnia J. Mulyadi, Rottie JV. Hubungan Kualitas Tidur dengan Kadar Glukosa Darah Puasa pada Pasien Diabetes Melitus Tipe 2 di Rumah Sakit Pancaran Kasih GMIM Manado. *E-J Keperawatan E-Kp*; 2017. p. 5.
- [4] Simanjuntak TD, Sawaraswati LD, Muniroh M. Gambaran Kualitas Tidur Pada Penderita Diabetes Melitus Tipe-2 Di Wilayah Kerja Puskesmas Ngesrep. *Jurnal Kesehatan Masyarakat*. 2018;6(1).
- [5] Caple C, Grose S. Evidenced-Based Care Sheet: Sleep and Hospitalization. *Sleep Hosp*; 2012.
- [6] Potter PA, Perry AG. *Fundamental Keperawatan*. Jakarta: Salemba Medika; 2010.
- [7] Zhu BQ, Li XM, Wang D, Yu XF. Sleep quality and its impact on glycemic control in patients with type 2 diabetes mellitus. *Int J Nurs Sci*. 2014;1(3):260–5.
- [8] Jacobus DJ. Gangguan tidur meningkatkan risiko diabetes melitus. *Cdk*. 2016;43(2):144–6.
- [9] Solehati T, Kosasih CE. *Konsep dan Aplikasi Relaksasi dalam Keperawatan Maternitas*. Bandung: PT. Refika Aditama; 2015.
- [10] Otaghi M, Borji M, Bastami S, Solymanian L. The effect of Benson's Relaxation on depression, anxiety and stress in patients undergoing hemodialysis. *Int J Med Res Health Sci*. 2016;5(12):76–83.

- [11] Ghozali I. *Aplikasi Analisis Multivariete Dengan Program IBM SPSS 23*. 8th ed. Semarang: Badan Penerbit Universitas Diponegoro; 2016.
- [12] Enterprise J. *Lancar Menggunakan SPSS untuk Pemula*. Jakarta: Elex Media Komputindo; 2018.
- [13] Smeltzer SC, Bare BG. *Textbook of Medical Surgical Nursing*. Philadelphia: Lippincott & Wilkins; 2010.
- [14] Starup-Linde J, Vestergaard P. Management of endocrine disease: Diabetes and osteoporosis: cause for concern? *Eur J Endocrinol*. 2015 Sep;173(3):R93–9.
- [15] Saskia TI, Mutiara H. Infeksi Jamur pada Penderita Diabetes Melitus. *Majority*. 2015;4(7):1–6.
- [16] Zahra A. Hubungan Kualitas Tidur dengan Kadar Glukosa Darah Penderita Diabetes Melitus Tipe 2 pada Peserta Prolanis di Bandar Lampung. Universitas Bandar Lampung; 2018.
- [17] Sumangkut S, Supit W, Onibala F. Hubungan Pola Makan Dengan Kejadian Penyakit Diabetes Melitus Tipe-2 di Poli Interna BLU. RSUP. PROF. DR. R. D. Kandou Manado. *Ejournal Keperawatan E-Kp*. 2013;1(1):1–6.
- [18] Nugroho PS, Wijayanti AC. Indeks Massa Tubuh dan Kaitannya dengan Diabetes Melitus pada Umur > 15 Tahun di Indonesia, Studi Data Survei Kehidupan Keluarga Indonesia V. *J Publ Kesehat Masy Indones*. 2018;5(1):12–5.
- [19] Azizah N. Hubungan antara Lama Menderita DM dengan Kualitas Tidur pada Pasien Diabetes Melitus Tipe 2 di RSI Sultan Agung Semarang. Universitas Islam Sultan Agung Semarang; 2017.
- [20] Surani S, Brito V, Surani A, Ghamande S. Effect of diabetes mellitus on sleep quality. *World J Diabetes*. 2015 Jun;6(6):868–73.
- [21] Bonita B, Asnawi H, Aulia H. Hubungan Aktivitas Fisik, Kualitas Tidur, dan Indeks Massa Tubuh dengan Kadar HbA1c Pada Pasien DM Tipe 2 yang Datang ke Poliklinik Endokrin Metabolik Diabetik di RSUP DR. Mohammad Hoesin Palembang. *J Biomedik Fak Kedokt Univ Sriwij*. 2017;3(1):30–8.
- [22] Kurniati E. Hubungan Tingkat Depresi dengan Kualitas Tidur Pasien Diabetes Mellitus Tipe 2 di Poli Penyakit Dalam RSUD Panembahan Senopati Bantul. Sekolah Tinggi Ilmu Keperawatan Jendral Achmad Yani Yogyakarta; 2017.
- [23] Yulia MO. Pengaruh Pemberian Teknik Relaksasi Benson dan Aromaterapi Lavender terhadap Tekanan Darah pada Pasien Hipertensi Primer di RSUD Dr. Soediran Mangun Sumarso Wonogiri. Stikes Kusuma Husada Surakarta; 2016.
- [24] Agus AI. Pengaruh Relaksasi Benson terhadap Kualitas Tidur Pasien Kanker. UGM; 2018.

-
- [25] Hidayat A. Pengaruh Terapi Relaksasi Benson Terhadap Kualitas Tidur Lansia di Panti Sosial Tresna Werdha (PSTW). Sabai Nan Aluih Sicincin. Universitas Andalas; 2016.
- [26] Masry SE, Aldoushy EE, Ahmed NA. Effect of Benson's Relaxation Technique on Night Pain and Sleep Quality among Adults and Elderly Patients Undergoing Joints Replacement Surgery. *Int J Nurs Didact*; 2017. p. 7.
- [27] Solehati T. Pengaruh Tehnik Relaksasi Benson terhadap Intensitas Nyeri dan Kecemasan Klien Post Seksio Sesarea di RS Cibabat Cimahi dan RS Sartika Asih Bandung. Universitas Indonesia; 2008.
- [28] Park ER, Traeger L, Vranceanu A, Scult M, Lerner JA, Benson H, et al. The Development of a Patient-Centered Program Basedon the Relaxation Response: The Relaxation ResponseResiliency Program (3RP). *Acad Psychosom Med*. 2013;54(2).