

The Effect of Foot Massage on Diabetic Neuropathy Symptoms in Patients with Diabetes Mellitus at Kabila Health Center

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ABSTRACT

Diabetes mellitus is a non-communicable disease with high morbidity and mortality rates that can cause complications of diabetic neuropathy due to chronic hyperglycemia and low physical activity. Diabetic neuropathy causes complaints such as tingling, nausea, pain, and sensory disturbances that decrease quality of life, so non-pharmacological interventions are needed as a safe and effective alternative. Foot massage was chosen as one of the interventions because it is easy to do, low cost, can be applied by patients and families, and has been proven to be effective in reducing symptoms of diabetic neuropathy. The purpose of this research is to determine the effect of Foot Massage on the symptoms of Diabetic Neuropathy in Diabetes Mellitus patients. This study is a quasi-experimental study with a pre-test post-test with control group design involving 18 respondents in the experimental group and 18 respondents in the control group taken using purposive sampling techniques. The results of the study showed that after being given foot massage therapy, the experimental group experienced a decrease in symptoms of diabetic neuropathy, where 27.8% of respondents were in the category of mild symptoms, 66.7% of moderate symptoms, and only 5.6% still experienced severe symptoms. On the other hand, in the control group there was no meaningful change, with the majority of respondents (83.3%) remaining in the moderate symptom category. The results of the Independent t-test showed a significance value of 0.001 ($p < 0.05$), which proved that foot massage therapy had a significant effect on reducing symptoms of diabetic neuropathy in patients with diabetes mellitus at the Kabila Health Center.

INTRODUCTION

Diabetes Mellitus (DM) is one of the non-communicable diseases with high morbidity and mortality rates in Indonesia. DM is characterized by increased blood glucose levels due to the body not being able to produce insulin or not being able to use insulin effectively, so it is chronic (American Diabetes Association, 2020). (American Diabetes Association, 2020).

Globally, According to *the International Diabetes Federation* in 2021 diabetes facts and figures show an increasing burden on individuals, families, and countries around the world. The IDF shows that 10.5% of adults aged 20-79 years have diabetes, and almost half are unaware that they have the disease. By 2045, IDF projections show that 1 in 8 adults, about 783 million, will be living with diabetes with an increase of 46%. And more than 90% of people with diabetes are caused by socio-economic, demographic, environmental, and genetic factors.

According to Rikesdas in 2018, the prevalence of Diabetes Mellitus patients in Indonesia is 1,017,290 (1.5%) people and the highest regional prevalence is in West Java with 186,809 people, followed by East Java with 151,878 people, Tengan Java with 132,565 people, North Sumatra with 55,351 people, and Banten with 46,621 people. Gorontalo Province is ranked 32nd out of 34 provinces with the number of cases of diabetes mellitus of 4,547 people.

Based on data obtained from the Gorontalo Provincial Health Office, the prevalence of diabetes in 2024 will be 23,585 (4%) people diagnosed with diabetes spread across several regions, including Pohuwato

Regency with 827 people, Gorontalo City with 2,886 people, North Gorontalo Regency with 2,386 people, Gorontalo Regency with 6,203 people, Boalemo Regency with 6,095 people, and Bone Bolango Regency with 5,206 people which ranks third in the highest prevalence of diabetes (Gorontalo, 2024).

Based on data obtained from the Bone Bolango Regency Health Office, the prevalence of diabetes mellitus in 2024 will amount to 5,206 people, which is the latest diagnosis data and spread across various health centers. From this data, the Kabila Health Center was recorded to have the highest number of cases compared to other health centers in Bone Bolango Regency. The high incidence of DM is influenced by various factors, including obesity, dyslipidemia, family history, unhealthy lifestyle, and lack of physical activity Hastuti (2020).

Of these various risk factors, low physical activity is one of the dominant causes of diabetic neuropathy. Physical activity plays an important role in improving insulin sensitivity, improving peripheral blood circulation, and preventing nerve damage due to chronic hyperglycemia. Research by Soelistijo (2021) shows that diabetic patients who lack physical activity have a 2 times greater risk of developing neuropathy than patients who are physically active. Therefore, this study is more focused on interventions in the form of simple physical activities such as foot massage, because it is proven to be able to improve peripheral circulation, stimulate nerves, and provide a relaxation effect that has an impact on improving symptoms of diabetic neuropathy. When diabetes mellitus is not optimally controlled, it can cause various complications, one of which is diabetic neuropathy. Complications of diabetic neuropathy can cause complaints in the form of tingling, feeling bad, pain, and impaired sensory function that affect the patient's quality of life. To reduce these symptoms, non-pharmacological interventions are a fairly effective alternative option. Various forms of non-pharmacological interventions can be applied, such as health education, nutrition regulation, increased physical activity, and relaxation therapy.

To reduce these symptoms, non-pharmacological interventions are a fairly effective alternative option. Various forms of non-pharmacological interventions can be applied, such as health education, nutrition regulation, increased physical activity, and relaxation therapy. However, pharmacological therapy often causes side effects such as hypoglycemia, indigestion, and decreased organ function when used in the long term. Meanwhile, other non-pharmacological interventions such as health education, nutrition management, and physical activity still face limitations in the form of low patient adherence and lack of support from health workers. This condition shows the need for a simpler, safer, cheaper, easier to learn, and can be applied sustainably by patients and families. Of these various interventions, *foot massage* was chosen because it is easy to do, does not require large costs, can be applied by health workers and families, and has been proven effective in reducing symptoms of diabetic neuropathy (Essinta, 2023). *Foot massage* is a therapy that is not only effective, but also easy to do independently by patients and families without the need for professional assistance. This is because *foot massage* has clear standard operating procedures (SOPs) and can be taught through simple education (Mona, 2020).

Several studies have proven that giving *foot massage* can alleviate the symptoms of diabetic neuropathy. Research from Erlina et al. (2022) with the research title "The Effect of Massage Therapy and Foot Exercises on the Risk of Diabetic Foot Ulcers in Type 2 Diabetes Mellitus Patients" found that foot massage therapy can reduce the risk of diabetic ulcers after massage therapy 3 times a week for 3 weeks with a p value of 0.001. Another study by Hastuti (2020) entitled "The Effect of *Foot Manual Massage* on Increasing Foot Sensitivity of Diabetes Mellitus Patients at the Pratama Clinic of the Jatibening Medical Center" showed that *foot massage* had a significant effect on reducing the risk of peripheral neuropathy in patients with diabetes mellitus ($p = 0.038$; $\alpha = 0.05$).

Based on the results of observations at the Kabila Health Center, it was found that patients with diabetes mellitus have never received *foot massage intervention* as a form of treatment for complications of diabetic neuropathy. The therapy provided so far is limited to the administration of medications and dietary regulation. From the results of interviews with health workers, it is also known that there has been no implementation of foot massage interventions at the Kabila Health Center. From the results of initial observations of 10 patients with diabetes mellitus with diabetic neuropathy at the Kabila Health Center, it was found that the most frequent complaints were tingling (70%), pain in the legs, especially at night (50%), nausea or numbness (40%), and sleep disturbances due to discomfort in the lower legs (30%). These symptoms indicate the presence of peripheral neuropathy that interferes with the patient's daily activities. This reinforces the importance of research on non-pharmacological interventions such as *foot massage* in reducing symptoms of diabetic neuropathy. Based on this problem, the researcher is interested in conducting research related to "The Effect of *Foot Massage* on Symptoms of Diabetic Neuropathy in Patients with Diabetes Mellitus at the Kabila Health Center".

METHODS

This study is a *quasi-experimental* research with a *pre-test, post-test with control group design*. In this design, there are two randomly selected groups, namely the experimental group and the control group. Both groups were given a *pre-test* to find out the initial condition, then the experimental group was given treatment

in the form of *foot massage*, while the control group was not given treatment, but the control group still received standard care from the Puskesmas (medicine and routine education). After the research is completed, the control group will also be given a *foot massage* as a form of applying the principle of justice. After the intervention was completed, both groups were given a *post-test* to see if there were any differences before and after treatment.

RESULTS

Respondent Characteristics

Characteristics of Respondents in the Control Group

Distribution of respondents by age in the control group

Table 1. Distribution of respondents by age in the control group

No.	Age Group	Age	Frequency (n)	Percentage (%)
1	Late Adulthood	35 - 45 Years	3	16.7
2	Early Aging	45 – 55 Years	0	0.0
3	The End of Age	56-65 Years	10	55.6
4	Senior Mass	>65 years old	5	27.8
Total		Quantity	18	100

Source : Primary Data (2025)

Based on Table 1, the results were obtained that of the 18 respondents in the control group, the majority were in the Late Elderly age category (56–65 years) as many as 10 respondents (55.6%), while the lowest frequency was in the Late Adult age category (36–45 years) as many as 3 respondents (16.7%).

Distribution of respondents by gender in the control group

Table 2 Frequency Distribution of Respondent Characteristics by Gender In the Control Group

Yes	Gender	Frequency (n)	Percentage (%)
1	Male	8	44.4
2	Women	10	55.6
Total		18	100

Source : Primary data (2025)

Based on the table 2, female respondents dominated the control group with a total of 10 people (55.6%) compared to 8 men (44.4%).

Frequency distribution of respondent characteristics based on length of suffering In the control group

Table 3 Frequency Distribution of Respondent Characteristics by length of suffering In the Control Group

Yes	Long Suffering	Frequency (n)	Percentage (%)
1	1-5 Years	3	16.7
2	6-10 Years	5	27.8
	>10 Years	10	55.5
Total		18	100

Source : Primary Data (2025)

Based on table 3 most of the respondents in the control group had a history of diabetes for more than 10 years (55.5%), which clinically increased the risk of permanent nerve damage.

Characteristics of Respondents in the Intervention Group

Distribution of respondents by age in the intervention group

Table 4. Distribution of respondents by age in the intervention group

No.	Age Group	Age	Frequency (n)	Percentage (%)
1	Late Adulthood	35 - 45 Years	5	27.8
2	Early Aging	45 – 55 Years	5	27.8
3	The End of Age	56-65 Years	3	16.7
4	Senior Mass	>65 years old	5	27.8
Total		Quantity	18	100

Source : Primary Data (2025)

Based on Table 5, it shows that in the intervention group, the age distribution is quite even, where the categories of Late Adult, Early Elderly, and Elderly each amount to 5 respondents (27.8%).

Distribution of Respondents by Gender in the Intervention Group

Table 5 Frequency Distribution of Respondent Characteristics by Gender In the Intervention Group

Yes	Gender	Frequency (n)	Percentage (%)
1	Male	8	44.4
2	Women	10	55.6
Total		18	100

Source : Primary data (2025)

Based on table 5, it shows that in the intervention group 10 respondents (55.6%) were dominated by women, the same as the characteristics of the control group.

Frequency distribution of respondent characteristics based on length of suffering In the intervention group

Table 6 Frequency Distribution of Respondent Characteristics by length of suffering In the Intervention Group

Yes	Long Suffering	Frequency (n)	Percentage (%)
1	1-5 Years	7	38.9
2	6-10 Years	10	55.6
	>10 Years	1	5.5
Total		18	100

Source : Primary Data (2025)

Based on table 6, the majority of respondents in the intervention group had Diabetes Mellitus for 6-10 years, namely 10 respondents (55.6%). This suggests that respondents are in a chronic phase, where long-term exposure to high blood sugar is at high risk of damaging peripheral nerves (neuropathy). Therefore, the administration of *foot massage intervention* in this group is very important to help improve blood circulation and restimulate the sensitivity of the foot nerves that are starting to decline.

Univariate Analysis

Distribution of Pre-test and Post-test Diabetic Neuropathy Symptom Levels in the Control Group

Table 7. Distribution of Diabetic Neuropathy Symptom Levels *Pre-test* And *Post-test* In the Control Group

Groups	Symptom Levels	<i>Pre-Test</i> (Initial)		<i>Post Test</i> (End)	
		f	%	f	%
Controls	Lightweight	0	0	1	5.6

	Medium	9	50.0	15	83.3
	Weight	9	50.0	2	11.1
	Total	18	100	18	100

Source : Primary Data (2025)

Based on Table 7, it can be seen that in the control group when the *pre-test* was carried out, 9 respondents experienced moderate symptoms (50.0%) and 9 people (50.0%) experienced severe symptoms. At the time of the post-test, there was a change in distribution where the category of mild symptoms became 1 person (5.6%), the majority of respondents were in the moderate category, which was 15 people (83.3%), and the category of severe symptoms decreased to 2 people (11.1%). These changes showed a shift in neurological health status in the control group respondents even though they were not given a specific intervention.

Distribution of Pre-test and Post-test Diabetic Neuropathy Symptom Levels in the Intervention Group

Table 8. Distribution of Diabetic Neuropathy Symptom Levels *Pre-test* And *Post-test* In the Intervention Group

Groups	Symptom Levels	<i>Pre-Test</i> (Initial)		<i>Post Test</i> (End)	
		f	%	f	%
Controls	Lightweight	0	0	9	50.0
	Medium	2	11.1	9	50.0
	Weight	16	88.9	0	0
	Total	18	100	18	100

Source : Primary Data (2025)

Based on Table 8, it can be seen that in the intervention group before being given therapy (*pre-test*), the majority of respondents experienced severe symptoms as many as 16 people (88.9%) and moderate symptoms as many as 2 people (11.1%). After being given foot massage therapy, the post-test results

Bivariate Analysis

Table 9. Differences in the Symptom Levels of Diabetic Neuropathy in Diabetes Mellitus Patients Who Have Undergone *Foot Massage* Therapy and Undergone *Foot Massage*

Symptoms of Diabetic Neuropathy in Patients with Diabetes Mellitus	<i>Red</i>	<i>Std. Deviation</i>	<i>Sig (2-tailed)</i>
Intervention Groups	4.72	.782	0.001
Control Group	5.61	.750	

Analysis of the Symptom Levels of Diabetic Neuropathy in the Control Group

Based on Table 9. Above, it can be seen that in the control group the mean level of diabetic neuropathy symptoms was 5.61 with a standard deviation of 0.750. This high mean value indicates that in the control group that was not given foot massage therapy interventions, the level of complaints of neuropathy symptoms tended not to decrease and remained at a higher number than the intervention group

Analysis of the Symptom Levels of Diabetic Neuropathy in the Intervention Group

Based on Table 9. above, it was found that in the intervention group the mean level of diabetic neuropathy symptoms was 4.72 with a standard deviation of 0.782. The results of the *Independent T-test* showed a significance value (*Sig. 2-tailed*) = 0.001, which means that the value is smaller than the alpha value ($0.001 < 0.05$). This shows that there is a significant difference between the intervention group and the control group, where the *mean* value of the intervention group is lower than that of the control group. Thus, it can be concluded that *foot massage therapy* is effective in reducing the level of symptoms of diabetic neuropathy in patients with diabetes mellitus.

DISCUSSION

Levels of Diabetic Neuropathy Symptoms Before and After in the Control Group

Based on Table 7, the distribution of neuropathy symptom levels in the control group during the initial observation (*pre-test*) showed that out of a total of 18 respondents, there were no respondents in the mild symptom category (0%), while 9 respondents were in the moderate symptom category (50.0%), and the remaining 9 people (50.0%) were in the severe symptom category. These preliminary data illustrate that at the beginning of the study, all control group respondents had experienced significant sensory impairment.

After further observation during the study period without being given a foot massage intervention (*post-test*), important clinical phenomena were found through analysis in each category cell. In the analysis of light category cells, the number of respondents increased from zero to one person (5.6%). These minimal changes suggest that without intensive physical stimulation, it is very difficult for respondents to achieve optimal restoration of nerve function independently.

Further explanation can be seen in the analysis of medium category cells, where there was a very significant increase in frequency from 9 people (50.0%) to 15 people (83.3%). The addition of respondents in this category came from a shift in respondents who were previously in the heavy category but experienced a slight decrease in scores. Despite the visible movement in the scores, the majority of respondents remained stuck in the moderate category, which proves that without additional intervention, neuropathy symptoms tend to persist and are unable to reach the overall mild category.

Meanwhile, in the analysis of heavy category cells, the number of respondents decreased from 9 people (50.0%) to 2 people (11.1%). It should be noted that although the number in these cells decreased, the respondents did not move to the mild category but only shifted to the moderate category. This suggests that the nerve damage experienced by the control group respondents is still at a disturbing level. This condition occurs because without interventions such as *foot massage* to mechanically improve peripheral microcirculation, the nerve tissue does not get maximum oxygenation for the restoration of perfect nerve function.

Overall, the per-cell analysis in this control group confirmed that pharmacological routine treatment alone had a very limited impact on reducing the severity of neuropathy. This is in line with the theory that neuropathy is a progressive complication that requires a combination of non-pharmacological therapies to improve blood flow to nerve endings. Without massage stimulation, peripheral blood circulation does not experience a significant increase, so the neurological status of the respondents tends to remain in the range of moderate to severe symptoms.

Levels of Diabetic Neuropathy Symptoms Before and After in the Intervention Group

Based on Table 8, the distribution of neuropathy symptom levels in the intervention group at the time of initial observation (*pre-test*) showed a fairly severe clinical condition, where there were no respondents in the mild symptom category (0), only 2 people (11.1%) were in the moderate symptom category, and the majority of respondents as many as 16 people (88.9%) were in the severe symptom category. The high number in this weight category indicates that before being given an intervention, almost all respondents experienced serious sensory impairment with a high risk of diabetic foot complications.

After being given an intervention in the form of foot massage therapy 6 times in 2 weeks, very significant changes were found through in-depth analysis in each category cell at the post-test. In the analysis of light category cells, there was a very drastic increase in frequency from 0 people (0%) to 9 people (50.0%). The appearance of a significant number in these cells provides strong scientific evidence that regular mechanical stimulation is able to restore nerve conduction function to the minimum symptom stage. This shows that nerve damage in people with DM is reversible or can be corrected if proper stimulation is given to peripheral blood flow.

Further explanation can be seen in the analysis of medium category cells, where the number of respondents increased to 9 people (50.0%). It is important to understand that although the frequency appears to be increasing numerically, all respondents in this category are the result of successful therapy for those who were previously in the severe category. This shift reflects a gradual improvement in the blood microcirculation in the legs, which allows nutrients and oxygen to reach peripheral nerve tissue, so that the severity of neuropathy can be lowered.

The most crucial and meaningful change was found in the analysis of heavy category cells, where the frequency of respondents decreased drastically from 16 people (88.9%) to zero or none at all (0%). The loss of all respondents from this weight category was the main finding in this study, which confirmed that *foot massage* had very high effectiveness in preventing the worsening of neuropathy symptoms. Stimulation of nerve points in the legs triggers the release of nitric oxide that widens the vessels blood, thus inhibiting the process of nerve ischemia which is the main cause of severe symptoms.

Overall, the per-cell analysis of this intervention group proved that foot massage therapy was much more effective than relying solely on standard pharmacological treatments. The massive movement of data from the heavy to light and moderate categories suggests that these non-pharmacological interventions are

capable of having a real physiological impact on the improvement of sensory function of the legs. This supports the theory that touch and pressure on foot massage techniques can increase pain thresholds and improve nerve conduction in patients with Diabetes Mellitus.

To analyze the effect of *foot massage therapy* on the symptoms of diabetic neuropathy in patients with diabetes mellitus by comparing the control group and the intervention group

Based on the results of the *Independent t-test* listed in table 9, a significance value (*Sig. 2-tailed*) of 0.001 (<0.05) was obtained. This shows that there is a significant difference between the group that was given *foot massage therapy* and the group that was not given therapy. The *mean* value in the experimental group was lower at 4.72, while in the control group it was 5.61. The difference in average values indicates that *foot massage therapy* has an effect on reducing the level of diabetic neuropathy symptoms in patients with diabetes mellitus at the Kabila Health Center.

The decrease in the level of symptoms of diabetic neuropathy in the experimental group occurred because *foot massage therapy* provided physiological effects in the form of increased blood circulation, muscle relaxation, and stimulation of the peripheral nervous system. According to Gusasi (2022), massage on the feet can help improve blood flow and increase the delivery of oxygen and nutrients to nerve tissue damaged by hyperglycemia. This process supports nerve regeneration and decreases the intensity of neuropathy symptoms such as tingling, pain, and burning in the legs.

In addition, *foot massage* also stimulates the release of endorphins hormones which function as natural analgesics for the body. This is explained by Hidayah (2023) who states that foot massage is able to increase relaxation and decrease sympathetic nerve activity, so that the body becomes calmer and the level of neuropathy pain is gradually reduced. This relaxation effect is what helps patients feel more comfortable after receiving therapy.

The results of this study are in line with Ningsih's findings in 2022 which stated that regular *foot massage* can significantly reduce the level of peripheral neuropathy symptoms ($p = 0.000$). The study explains that massage on the feet improves vasodilation and peripheral blood circulation which plays an important role in improving peripheral nerve function in patients with type 2 diabetes mellitus.

The difference in results between the experimental group and the control group in this study also shows that *foot massage* can be used as one of the effective nonpharmacological interventions to reduce the symptoms of diabetic neuropathy. The control group that did not receive therapy showed no significant change, this proves that a decrease in symptoms only occurred in the group that was given treatment in the form of *foot massage*.

According to Muda in 2021, one way to overcome diabetic neuropathy disorder is to increase blood circulation in the lower extremities so that the supply of oxygen and nutrients to the nerve tissue increases. Foot massage therapy is a simple form of intervention that can be done independently by the patient or with the help of health professionals as part of non-pharmacological treatment.

Thus, it can be concluded that there is a significant influence between the administration of *foot massage therapy* on the reduction of the level of diabetic neuropathy symptoms in patients with diabetes mellitus at the Kabila Health Center. This intervention can be used as an alternative to nonpharmacological nursing therapy that is easy to apply, safe, and effective in helping to reduce symptoms of neuropathy and improve the comfort and quality of life of patients with diabetes mellitus.

CONCLUSION

Based on the results of the study, before the intervention, most of the respondents in the experimental group experienced severe (69.4%) and moderate (30.6%) symptoms of diabetic neuropathy, while in the control group the majority experienced moderate symptoms (83.3%), so the initial condition of the two groups was relatively the same. After being given foot massage therapy, the experimental group showed a decrease in the level of diabetic neuropathic symptoms, with 27.8% of respondents experiencing mild symptoms, 66.7% moderate symptoms, and only 5.6% still experiencing severe symptoms, while in the control group there were no significant changes. The results of the Independent t-test showed a significance value of 0.001 ($p < 0.05$), which confirmed that foot massage therapy had a significant effect on reducing the symptoms of diabetic neuropathy in patients with diabetes mellitus at the Kabila Health Center.

ADVICE

This research is expected to provide benefits in an effort to reduce the symptoms of diabetic neuropathy through the application of foot massage therapy. It is hoped that patients with diabetes mellitus will be able to apply this therapy independently with the guidance of health workers to improve the quality of life. The Kabila Health Center is recommended to develop foot massage education and training as a promotive and preventive effort, and the results of this research can be used as a reference in nursing education. Researchers are then advised to study other factors that affect diabetic neuropathy in order to obtain more comprehensive results.

REFERENCES

- Amen, Nur Fadilah, Sabaruddin Garancang, Kamaluddin Abunawas, Muhammadiyah Makassar, Islam Negeri, and Alauddin Makassar. 2023. "INTRODUCTION Research is a creative process to express a symptom through its own way so that information is obtained. Basically, the information is the answer to the problems that were questioned before. By Ka" 14 (1): 15–31.
- Erlina, Rita, Dewi Gayatri, Azzam Rohman, Fitriyan Rayasari, and Dian Novianti Kurniasih. 2022. "Effect of Massage Therapy and Foot Exercises on the Risk of Diabetic Foot Ulcers in Type II Patients with Diabetes Mellitus: Randomized Controlled Trial." *Journal of Nursing* 14 (53): 753–66.
- Essinta, RF. 2023. "The Concept of Fulfilling the Needs of Safety, Comfort, Pain, and Implementation Therapy Football Massage," 9–33. http://eprints.poltekkesjogja.ac.id/12785/4/Chapter_2.pdf. Federation, International Diabetes. 2021. "International Diabetes Federation."
- Gusasi, Fatra Fasya, Vivien Novarina Kasim, Nur Auliyah, and Roidah Abd. 2022. "Gorontalo" 5 (1): 57–63.
- Hastuti, Mona. 2020. "Effectiveness of Foot Spa Therapy in Reducing Diabetic Neuropathy Complaints in Patients with Diabetes Mellitus." *Journal of Maternity Midwifery* 5 (2): 11–20. <https://doi.org/10.34012/jumkep.v5i2.1255>.
- Hidayah, Nurul, Dian Aulia Kurniawati, Dewi Siti Nurkhasanah Umaryani, and Novi Ariyani. 2023. "Journal of Nursing Muhammadiyah Bengkulu." *Cereals for* 8 (1): 51. II, B A B. 2021. "No Title," no. 2020: 6–49.
- Journal, Malahayati Nursing, and P- Issn. 2020. "BAETIC FOOT SPA IN COMPLICATIONS OF Sri's neuropathy" 2: 180–87.
- Ministry of Health of the Republic of Indonesia. 2020. "Infodatin Remains Productive, Prevents, and Overcomes Diabetes Mellitus 2020." Data and Information Center of the Ministry of Health of the Republic of Indonesia.
- Lestari, Zulkarnain, and ST Aisyah Sijid. 2021. "Diabetes Mellitus: Review of Etiology, Pathophysiology, Symptoms, Causes, Methods of Examination, Treatment and Prevention." *UIN Alauddin Makassar*, no. November: 237–41.
- Mardastuti, Yuanita, Ahmad Asmedi, and Abdul Gofir. 2019. "Diabetic Neuropathy Symptom-Indonesian Version and Diabetic Neuropathy Examination-Indonesian Version as Score Diagnostic." *Neuroscience Periodical* 15: 55–65.
- Milita, Fibra, Sarah Handayani, and Bambang Setiaji. 2021. "Incidence of Type II Diabetes Mellitus in the Elderly in Indonesia (Riskesdas Analysis 2018)." *Journal of Medicine and Health* 17 (1): 9. <https://doi.org/10.24853/jkk.17.1.9-20>.
- Putri D, Yuwandita Tamara Putri, and Azelia Nusadewiarti. 2020. "Management of Type 2 Diabetes Mellitus Patients with Diabetic Neuropathy and Retinopathy Through the Family Medicine Approach." *Medusa* 9 (4): 631–38.
- Rahmasari, Ikrima, and Endah Sri Wahyuni. 2019. "Effectiveness of Memordoca Carantia (Bitter Sugar) on Lowering Blood Glucose Levels." *Infokes* 9 (1): 57–64.
- RI, Ministry of Health. 2024. "Type 2 Diabetes Mellitus. Ministry of Health Directorate General of Health Services.," 1–119.
- Rifat, Ivan Dzaki, Yesi Hasneli N, and Ganis Indriati. 2023. "An Overview of Diabetes Mellitus Complications in People with Diabetes Mellitus." *Journal of Professional Nursing* 11 (1): 52–69. <https://doi.org/10.33650/jkp.v11i1.5540>.
- Sasombo, Antania, mario Esau Katuuk, and Hendro Bidjuni. 2021. ", Mario Esau Katuuk." *The Relationship of Self Care and Complications of Diabetes Mellitus in Patients with Type 2 Diabetes Mellitus at Husada Sario Manado Clinic* 9 (2): 54–62.
- Umar, F R, W J F A Tumbuan, H n Alum, Influencing Factors, Marketing Performance, Restaurants, et al. 2023. "Kinamang Grilled Fish In The City Of Manado Factors Influencing The Marketing Performance Of Kinamang Grilled Fish Restaurants In The City Of Manado *Journal Emba Vol . 11 No. July 3, 2023 , p. . 679-688*" 11 (3): 678–88.
- Zuryati, Masmun. 2018. "Effect of Massage Therapy Using VCO (Virgin Coconut Oil) on Reducing Peripheral Neuropathy in Clients with Type 2 Diabetes Mellitus," 18–26.