

## Range of Motion Exercises and Foot Massage Assistance to Control Diabetic Neuropathy Symptom of Diabetes Mellitus Patient in Kabila Health Center Working Area

Fakhriatul Falah<sup>a)</sup>, Ratnawati, Eka Firmansyah Pratama

Poltekkkes Kemenkes Gorontalo, Gorontalo, Indonesia

<sup>a)</sup>Corresponding author: fakhriatulfalah@gmail.com

### ABSTRACT

Gorontalo ranks 7th in terms of diabetes mellitus sufferers from 35 provinces in Indonesia. One area of Gorontalo city that has quite a high number of Diabetes Mellitus sufferers is Kabila sub-district with a total of 147 people over the last 3 months. 90% of DM sufferers who come for examination to the Community Health Center experience symptoms of diabetic neuropathy. Symptoms of diabetic neuropathy are a type of nerve damage that people with diabetes are prone to and cannot be cured, so patients must be taught how to control these symptoms. Therefore, this community service activity is expected to increase the knowledge, skills, and abilities of diabetes mellitus patients in carrying out ROM exercises and foot massages. This community service activity aims to train diabetes mellitus patients in carrying out foot care which includes ROM exercises and foot massage so that the patient's symptoms of diabetic neuropathy can be controlled. Apart from involving patients, Health Cadres are also trained as facilitators so that the sustainability of this activity in the community can be guaranteed. This community service begins with education regarding DM foot care, demonstration of ROM and foot massage procedures, and evaluation. From the activity, there was a decrease in the neuropathy score by 3 scores after the intervention was given, so it can be concluded that ROM assistance and foot massage can reduce complaints of neuropathy symptoms in patients.

### ARTICLE INFO

#### **Article History:**

*Submitted/Received 04 November 2024*

*First Revised 09 December 2024*

*Accepted 25 January 2025*

*First Available online 31 January 2025*

*Publication Date 31 January 2025*

#### **Keyword:**

*Diabetes Mellitus*

*Community Services*

*Health Education*

*Foot Massages*

## INTRODUCTION

One of the non-communicable diseases that has high morbidity and mortality rates in Indonesia is Diabetes Mellitus. Diabetes Mellitus is an increase in blood sugar levels in the body caused by not being able to produce insulin in the body or not being able to use insulin effectively and for a long time (chronic) (Shaully, Aharonov et al., 2021) . According to (American Diabetes Association, 2020), Diabetes mellitus is a metabolic disease characterized by hyperglycemia due to abnormalities in insulin secretion, insulin action, or both (Gupta et al., 2019).

Globally, the International Diabetes Federation (IDF) estimates that around 537 million people will suffer from diabetes mellitus in the world in 2021. Indonesia is in fifth place with 19.5 million people aged 20 to 70 years suffering from the disease. (International Diabetes Federation, 2021). According to Basic Health Research in 2018, the prevalence of diabetes mellitus in Indonesia reached 1.5% (1,017,290 people). Gorontalo Province ranks 7th out of 34 provinces with a prevalence of 10,977 people (1.74%) (Riskesdas, 2018) .

One of the areas in Gorontalo Province that has a fairly significant number of diabetes mellitus is Bone Bolango Regency. According to the 2018 Gorontalo Province Basic Health Research, Bone Bolango Regency was ranked 4th with a prevalence of 1,477 people (1.33%) (Riskesdas, 2018). The incidence of diabetes mellitus in Bone Bolango Regency in 2022 will reach 9,513 people (39.3%) and is ranked first in Gorontalo Province. From the results of initial data collection in the Kabila Health Center working area, it was found that the total number of Diabetes Mellitus sufferers in 2022 would be 147 people (Gorontalo, 2019) .

Prolonged hyperglycemia in DM patients can cause several chronic complications. One chronic complication that often occurs is Diabetic Neuropathy (ND), namely peripheral nerve damage which results in symptoms of tingling, pain, numbness, or weakness in the feet and hands. 50% of type II DM sufferers experience ND (American Diabetes Association, 2020). Diabetic Neuropathy in DM occurs due to high blood sugar levels which can cause blood viscosity to increase and result in reduced/slow transport of oxygen and nutrients in the lower extremities. A common symptom of diabetic neuropathy is parathesia (numbness/numbness) so there is a risk of easily experiencing injury or infection in the feet without the client feeling or knowing (Radhika et al., 2020).

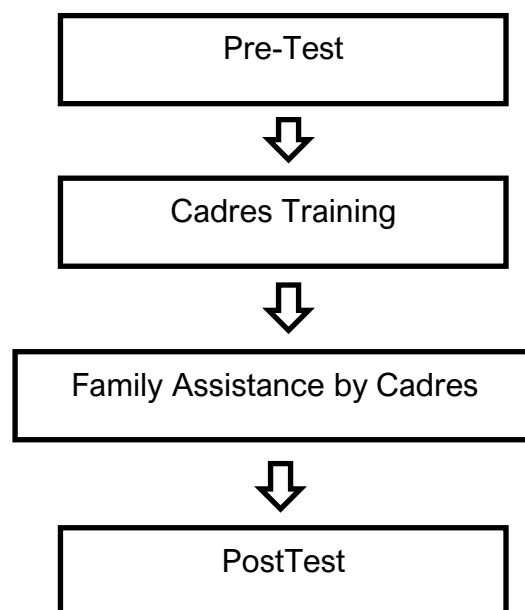
Suffering from Diabetes Mellitus (DM) in the long term can be at risk of developing peripheral neuropathy. Treatment of diabetic neuropathy apart from pharmacological (drugs) can also be done non-pharmacologically, including through good foot care management (Mark, 2008). One of the foot care interventions that can be carried out on diabetes patients is Range of Motion (ROM) exercises and foot massage or massage therapy. ROM exercises and foot massage therapy are carried out to improve blood circulation in the patient's feet so that sugar deposits do not occur and blood which carries oxygen and nutrients can flow to the tips of the toes so that all parts of the feet will get an adequate oxygen supply. An adequate oxygen supply to the feet will reduce the signs and symptoms of diabetic neuropathy such as tingling and numbness (Kohar, 2008).

Several studies have proven that giving foot massage can relieve the symptoms of diabetic neuropathy. Research from (N. L. P. I. B. Agustini et al., 2020) found a reduced risk of peripheral neuropathy in DM patients who were given foot massage therapy. Research from (Falah et al., n.d.) found that the application of foot massage intervention could reduce the symptoms of diabetic neuropathy in diabetes patient. Apart from foot massage, ROM exercises are also effective in reducing symptoms of peripheral neuropathy in DM patients. Research from (Surianti et al., 2017) Surianti, Majid dan Puspitha (2017) found that there was a reduction in symptoms of diabetic neuropathy in patients who were given ROM therapy intervention . Research from (Putriyani et al., 2020a) found the range of motion therapy to be effective in increasing foot sensitivity in patients with peripheral neuropathy (Putriyani et al., 2020b) . The results of initial data collection found that one of the symptoms most complained about by diabetes patients who came for treatment to the health center was symptoms of diabetic neuropathy which included numbness or reduced ability to feel pain or changes in temperature, a feeling of tingling or burning, sharp pain or cramps and muscle weakness. These symptoms really interfere with the patient's activities and thus affect the quality of his life, this is the

background for carrying out community service activities accompanying ROM exercises and foot massage to reduce symptoms of diabetic neuropathy in diabetes mellitus patients.

## METHOD

This activity was carried out for two months from July to August 2024. Subjects used in this activity are 10 health cadres and 20 people with diabetes. Each cadres giving assistant to 2 family member with diabetes. Cadres assistant giving in two month with intervention once a week. Before giving assisteant cadres were trained about foot care management of diabetic patient. The community service activity are divided into 3 stages which include cadre education, cadre assistance in carrying out ROM and foot massage on diabetes patients through home visit and continued to the evaluation stage. Before and after activity, there was measurement of cadres knowledge about foot care and measurement of neuropathy score of diabetic patient. The instrument for measuring the degree of diabetic neuropathy uses the Neuropathy Deficit Score (NDS) wich was adapted from (Kamel et al., 2018). The score range of (3-4) mild, (5-6) moderate, and (7-10) severe neuropathic symptoms. Instrument to measure cadres knowledge was adapted from (Anggraini, 2020) which consist of 39 question about diabetic foot care. The Community service process can be seen on the flow chart below



**FIGURE 1.** Community Service Activity Process

## RESULT

Based on the community service activity, the result was obtained as seen in the table 1.

**TABLE 1.** Cadres' Knowledge about Foot Care

Neuropathy Deficit Score		Score Change
Before	After	
15	34	19

**Table 2 .** Neuropathy Symptom Score before and after Intervention

Neuropathy Deficit Score		Score Change
Before	After	
8	5	3

From the table 1 , it can be seen that after education given there is an increase in cadre knowledge about diabetic foot care. Educational material delivered to health cadres according to CDC (2023) includes daily foot checks, keeping feet clean and dry, selecting and wearing shoes and socks, the correct way to cut nails, maintaining foot fitness and signs and symptoms on the feet requires a doctor's examination (Rivani et al., 2024). Health cadres need to be given education because they are expected to be able to accompany diabetes patients and their families in carrying out foot care. Health education programs for both health cadres and DM sufferers so that they can know the appropriate and correct treatment in carrying out treatment either for themselves or for others. Counseling is also important in efforts to reduce the number of incidents or new cases of DM. In addition, an effective DM training or counseling program for Health Cadres aims to ensure control of risk factors to reduce morbidity, disability and mortality rates so that Health Cadres are expected to increase awareness and commitment to participating in training (Rivani et al., 2024). One component of knowledge that is lacking is the importance of using moisturizer on the feet and signs of decreased circulation in the legs. So in this activity, counseling is also provided on how to recognize signs of decreased circulation in the feet and how to overcome them through range of motion exercises and foot massage. The same result also appeared from community service held by (Nurmalisa et al., 2023) that found there was an increasing of cadres knowledge after given education about foot care management of diabetic patient. Research from (Windani Mambang Sari et al., 2023) found that education for cadres is effective in increasing cadres' confidence in providing counseling to diabetes patients.

From table 2, it was found that there was decreasing of neuropathy symptom score of diabetic patient after giving foot massage and range of motion. Research from (Falah et al., 2024) found that range of motion exercise carried out regularly by diabetes patients can reduce the symptoms of neuropathy, one of which is by increasing foot sensitivity and reducing cramps. Another research from (Falah et al., n.d.) explained that foot massage can decrease peripheral neuropathy of diabetic patient. Research from (Al-Fahham et al., 2023) and (N. L. P. I. Agustini et al., 2019) also exposed significant impact of giving foot massage to decreasing of neuropathy symptom diabetic patient.

Giving combination between foot massage and range of motion can increase circulation on extremity of diabetic patient, that can reduce neuropathy symptom (Zamaa, 2016) . Massage is done at balance points on the feet with the aim of improving blood circulation. Massage therapy is carried out to facilitate blood circulation with effects in the feet so that sugar deposits do not occur in the blood and the blood carries oxygen and nutrients which will be delivered to all parts until the tips of the toes can flow. So that all parts of the foot will receive an adequate supply of oxygen, the tingling and numbness which are signs and

symptoms of diabetic neuropathy will decrease or decrease (Zuryati, 2018). Neuropathy is caused by the accumulation of sarbitol and fructose in nerve cells which will cause nerve edema and result in obstruction of myoinositol from entering the nerve cells. The decrease and accumulation of sarbitol will cause osmotic stress which will damage mitochondria and stimulate protein kinase C (PKC). PKC activity will suppress the function of Na-K-ATP-Ase, so that intracellular Na levels are excessive, this will result in obstruction of myoinositol from entering nerve cells and result in disrupted signal transduction in the nerves. Beside foot massagem range of motion also can being prioritized therapies because it has a function that focuses on contraction and relaxation of the calf muscles through muscle and bone movements . Contraction and relaxation of the calf muscles is calf pumping which plays an important role in restoring venous return which has a positive impact on reducing edema and facilitating diffusion of oxygen and nutrition. Muscle contractions have insulin-like properties (insulin like effect) during exercise muscle cells use more glucose and other nutrient fuels to carry out contractile activities, the rate of glucose transport into exercising muscles increases 10 times even without insulin, and membrane permeability to glucose increases in contracting muscles, insulin resistance is reduced, on the other hand, insulin sensitivity increases, this results in the accumulation of fructose in the cells being reduced and myoinositol being able to enter the nerve cells (Djamaludin & Yulendasari, 2019).

Range of motion and foot massage interventions are carried out routinely once a week with assistance from cadres. Before and after exercise, neuropathy measurements were taken. The average decrease in neuropathy score obtained was from the severe to moderate range. There were no respondents who experienced a decline to a mild degree, possibly due to the low frequency of intervention and the average number of the sufferer already have long duration of diabetes.

## CONCLUSION

From the community services results, it can be concluded that the assistance of cadres in giving range of motion and foot massage can reduce neuropathy symptom of the diabetic patient.

## SUGGESTION

From this activity, it is hoped that primary health service providers (Puskesmas) are able to ensure the continuity of the implementation in the community by empowering health workers and health cadres, so that the non-communicable disease control program mainly diabetes disease in the community can run well. Beside that the frequency of intervention must be increase for better result. Bearing in mind that this assistance is only carried out once due to the cadres' limited time in carrying out home visits

## ACKNOWLEDGEMENT

The author would like to thank the Director of Poltekkes Kemenkes Gorontalo and all his staff who have provided support, especially the funding support for this research and the Head of the Kabila Community Health Center and health cadres who have facilitated the implementation of this research.

## REFERENCES

- Agustini, N. L. P. I., Wulansari, T. N., & Sintia, N. W. (2019). The Effect of Foot Massage on Decreasing Peripheral Neuropathy Diabetic Complaints in the Patients with Type 2 Diabetes Mellitus. *Jurnal Ners*, 14(3), 305–308. [https://doi.org/10.20473/jn.v14i3\(si\).17152](https://doi.org/10.20473/jn.v14i3(si).17152)

- Al-Fahham, T. M., Baqer, M., & Al-Jubouri, A. (2023). Effectiveness of Foot Massage on Diabetic Patients' Peripheral Neuropathy: A Randomized Controlled Trial. *Migration Letters Journal*, 20(7), 458–469. <https://www.researchgate.net/publication/375457266>
- American Diabetes Association. (2020). *Update on the 2020 Standards of Medical Care in Diabetes* (1st ed.).
- Anggraini, J. I. (2020). *Pengetahuan Dan Sikap Keluarga Tentang Pencegahan Luka Diabetes Melitus Pada Pasien Diabetes Melitus Di Wilayah Kerja Puskesmas Bulili*. Sekolah Tinggi Ilmu Kesehatan Indonesia Jaya.
- Djamaludin, D., & Yulendasari, R. (2019). *Pengaruh latihan range of motion (ROM) ankle terhadap pencegahan terjadinya neuropati dan angiopati pada klien diabetes melitus*. 13(3), 263–269.
- Falah, F., Fauzi Alamri, R., & Luawo, H. (n.d.). *Peripheral Neuropathy Symptoms Decreased in Lower Extrimity of Diabetic Patients Who Were Given Foot Massage : A Case Series*. Poltekkes Kemnkes Gorontalo.
- Falah, F., Luawo, H., & Tambuwun, G. (2024). Foot Sensitivity Increases in Diabetes Patients Who Are Given Range of Motion Exercise at Kabila Community Health Center : A Case Series. *Journal Nursing Care*, 10(1), 83–90. <https://doi.org/10.52365/jnc.v10i1.1073>
- Gorontalo, D. K. P. (2019). *Data Analisis Penyakit PTM Provinsi Gorontalo.pdf*.
- Gupta, L., Khandelwal, D., Lal, P. R., Gupta, Y., Kalra, S., & Dutta, D. (2019). Factors determining the success of therapeutic lifestyle interventions in diabetes - Role of partner and family support. *European Endocrinology*, 15(1), 18–24. <https://doi.org/10.17925/EE.2019.15.1.18>
- International Diabetes Federation. (2021). *IDF Diabetes Atlas 10th edition* (10th ed.). International Diabetes Federation. [www.diabetesatlas.org](http://www.diabetesatlas.org)
- Kamel, S., Hamdy, M., Abo, H., Ali, L., & Elkarim, A. (2018). Clinical diagnosis of distal diabetic polyneuropathy using neurological examination scores: correlation with nerve conduction studies. *Egyptian Rheumatology and Rehabilitation Journal*, 11(42), 128–136. <https://link.springer.com/content/pdf/10.4103/1110-161X.163945.pdf>
- Kohar. (2008). *Terapi Pijat Pada Pasien- Pasien Kronis*. Mekar Sari.
- Mark, S. (2008). *Kesembuhan Melalui Pijat Refleksi*. Bumi Aksara.
- Nurmalisa, B. E., Pangaribuan, H., Hanum, & Siregar, H. (2023). Edukasi Perawatan Kaki Diabetes kepada Kader Kesehatan. *JurnalPengabdian Masyarakat Lentor*, 3(1), 1–8. <https://jurnal.poltekkespalu.ac.id/index.php/jpml/article/view/2015/949>
- Putriyani, N., Mulyaningsih, M., & Hartutik, S. (2020a). Range of Motion (ROM) Aktif Kaki Meningkatkan Sensitivitas Kaki pada Penderita Diabetes Melitus. *ASJN (Aisyiyah Surakarta Journal of Nursing)*, 1(1), 21–24. <https://doi.org/10.30787/asjn.v1i1.650>
- Putriyani, N., Mulyaningsih, M., & Hartutik, S. (2020b). Range of Motion (ROM) Aktif Kaki Meningkatkan Sensitivitas Kaki pada Penderita Diabetes Melitus. *ASJN (Aisyiyah Surakarta Journal of Nursing)*, 1(1), 21–24. <https://doi.org/10.30787/asjn.v1i1.650>
- Radhika, J., Poomalai, G., Nalini, S. J., & Revathi, R. (2020). Effectiveness of buerger-allen exercise on lower extremity perfusion and peripheral neuropathy symptoms among patients with diabetes mellitus. *Iranian Journal of Nursing and Midwifery Research*, 25(4), 291–295. [https://doi.org/10.4103/ijnmr.IJNMR\\_63\\_19](https://doi.org/10.4103/ijnmr.IJNMR_63_19)
- Riskesdas. (2018). *Laporan Provinsi Gorontalo RISKESDAS 2018*. 65–108.
- Rivani, D., Widiastuti, & Lestari, D. N. (2024). Edukasi Perawatan Harian Kaki Diabetik secara Mandiri Kader Kesehatan Pimpinan Cabang 'Aisyiyah Moyudan Yogyakarta. *Jurnal Inovasi Pengabdian Dan Pemberdayaan Masyarakat*, 4(1), 81–88. <https://publications.id/index.php/jippm/article/view/432/262>
- Shauly, Aharonov, M., Shafrir, A., Paltiel, O., Calderon-Margalit, R., Safadi, R., Bicher, R., Barenholz-Goultschin, O., & Stokar, J. (2021). Both high and low pre-infection glucose levels associated with

increased risk for severe COVID-19: New insights from a population-based study. *PLoS ONE*, 16(7 July), 1–11. <https://doi.org/10.1371/journal.pone.0254847>

Surianti, S., Majid, A., & Puspitha, A. (2017). The Effect of Active Range of Motion Exercise on Sensory Neuropathy in Diabetes Mellitus Patients. *Indonesian Contemporary Nursing Journal* , 1(2), 101–109. <https://journal.unhas.ac.id/index.php/icon/article/view/3593>

Windani Mambang Sari, C., Yamin, A., & Prista Sari, S. (2023). Edukasi Berbasis Masyarakat untuk Deteksi Dini Diabetes Edukasi Berbasis Masyarakat untuk Deteksi Dini Diabetes Melitus Tipe 2. *MKK Journal*, 1(1), 29–35.

Zamaa, M. S. (2016). Pengaruh Kombinasi Latihan Range of Motion Ankle Dorsolfeksi Dan Foot Massage Terhadap Nilai Ankle Brachial Index Pada Pasien Diabetes Melitus Tipe 2. *Jurnal Mitrasehat*, 6(1).

Zuryati, M. (2018). Pengaruh Terapi Pijat Menggunakan Vco (Virgin Coconut Oil) Terhadap Penurunan Neuropati Perifer Pada Klien Diabetes Melitus Tipe 2. *Indonesian Journal of Nursing Sciences and Practice*, 1(2), 18–26. <https://doi.org/10.24853/IJNSP.V1i2.18-26>

## APPENDIX



**FIGURE 2.** Demonstration Range of Motion Exercise



**FIGURE 3.** Demonstration of Foot Massage



**Figure 4.** Cadre Assistant on Diabetic Patient