Proceedings
The International Conference of Advancements in Nursing Care (ADNURS)
Volume 3 Issue 1 (2026)
E-ISSN: 3110-0120

Section: General Nursing

Diabetic foot exercise to reduce acute pain in patient with type 2 diabetes

Imaratul Hikmah, Sumarno Adi Subrata, Robiul Fitri Masithoh, Estrin Handayani

Authors information
Department of Nursing, Universitas Muhammadiyah Magelang, Indonesia

Contactable email: imarotul23@gmail.com / Article DOI: *On process*

Abstract
Diabetes mellitus is a metabolic disease characterized by chronic hyperglycaemia resulting from defects in insulin secretion, insulin action, or both. Over time, persistent elevation of blood glucose can lead to serious, life-threatening systemic complications, with diabetic neuropathy being one of the most widespread. Diabetic neuropathy involves progressive peripheral nerve dysfunction that affects sensory, motor, and autonomic nerves in the extremities—most commonly in the legs and feet. Patients with this condition frequently experience distressing symptoms such as burning, stabbing, tingling, abnormal heat or cold sensations, itching, and numbness. Proper foot care is vital for preventing further damage in diabetic patients who have already developed neuropathy. A primary nursing care approach for managing this condition involves diabetic foot exercises, a non-pharmacological intervention designed to strengthen lower-limb muscles and enhance peripheral blood circulation. In this clinical case evaluation, the primary objective was to describe the nursing care approach using diabetic foot exercises to reduce acute pain in a patient with type 2 diabetes mellitus accompanied by neuropathy. The intervention was implemented for patient over three consecutive days, with each daily session lasting between 15 and 30 minutes. Following the three-day exercise routine, the patient's self-reported pain score significantly decreased on the numeric pain rating scale, dropping from a moderate level 4 to a mild level 1. Ultimately, this outcome demonstrates that structured diabetic foot exercises are an effective nursing intervention for reducing acute neuropathic pain and supporting lower-extremity health in patients with type 2 diabetes.

Keywords: Diabetes, exercise, nursing care, pain management, prevention

Introduction
Diabetes mellitus is a metabolic disease characterized by an increase in blood glucose levels (hyperglycaemia), which occurs due to impaired insulin secretion, impaired insulin activity, or both (Banday et al., 2020). The rise in blood glucose levels triggers the production of insulin hormone by the pancreas gland. This condition is related to continuously elevated blood glucose levels, resulting in damage to blood vessels, nerves, and other internal structures (American Diabetes Association Professional Practice Committee for Diabetes, 2026). Complex substances consisting of glucose within the blood vessel walls cause the vessels to thicken. As a result of this thickening, blood flow decreases, especially to the skin and nerves. Based on data from the International Diabetes Federation in 2022, there are globally 537 million people aged 20 to 79 who have diabetes. By 2030, the number of affected adults is estimated to increase to 643 million (Sun et al., 2022). Furthermore, by 2045, this figure is projected to rise to 784 million. In 2021, diabetes mellitus caused approximately 6.7 million deaths. About 44% of the adult population, or around 240 million people, have undiagnosed diabetes. Approximately 541 million adults worldwide have impaired glucose tolerance, increasing their vulnerability to type 2 diabetes. The increasing prevalence of diabetes worldwide is driven by a complex interaction of social, economic, demographic, environmental, and genetic factors. This continuous rise is largely caused by an increase in type 2 diabetes and related risk factors, which include rising obesity rates, unhealthy diets, and physical inactivity. People living with diabetes are at risk of experiencing a number of serious and life-threatening complications. One of the most common complications of diabetes is diabetic neuropathy (Zhu et al., 2024). It is estimated that 50% of people with diabetes mellitus suffer from diabetic neuropathy, and the global prevalence of diabetic neuropathy among diabetes patients reaches as high as 88.7%. Poorly managed diabetic neuropathy can cause nerve damage, especially in the feet, which increases the risk of developing diabetic ulcers.

Non-pharmacological therapies that can be used as management for patients with diabetes mellitus include education on healthy eating patterns, which consists of educating about types of food, meal schedules, and the calorie content of foods. In addition, people with diabetes can also be encouraged to increase physical activities such as running, brisk walking, casual cycling, and swimming (Dhouibi et al., 2025). Patients with diabetes who have developed neuropathy are required to perform regular foot care by doing foot exercises known as diabetic foot gymnastics. Diabetic foot exercises are beneficial for improving blood circulation in the feet, enhancing overall blood flow,

strengthening the muscles of the feet, increasing the strength of the calf and thigh muscles, and overcoming joint movement limitations (Dewi & Husein, 2025). One of the studies showed that after being given foot exercises there was a decrease in the pain scale (Dewi & Husein, 2025). A study on the effect of diabetic foot exercises on the status of sensory peripheral neuropathy in diabetic patients and found that diabetic foot exercises can improve the recovery of nerve function in the feet of people with diabetes mellitus, as indicated by an improved sensory peripheral neuropathy (NPS) status in diabetic patients (Dewi & Husein, 2025).

At PKU Muhammadiyah Hospital Wonosobo in February 2025, there were 92 patients diagnosed with type 2 diabetes mellitus, of whom 11 experienced diabetic neuropathies. Non-pharmacological therapy management at PKU Muhammadiyah Hospital Wonosobo for diabetic patients with neuropathy and complaints of pain usually involves teaching deep breathing relaxation techniques, while other non-pharmacological therapies, such as diabetic foot exercises, have not yet been implemented. Based on the explanation above, the author is interested in providing nursing care to a patient with type 2 diabetes mellitus who is experiencing acute pain due to neuropathy through the application of diabetic foot exercises.

Case Description

In this case study, the author uses one respondent, namely Mrs. K, aged 67 years, female, Muslim, with a junior high school education, a housewife, medical record number 127xxx, medical diagnosis of Type 2 Diabetes Mellitus and viral infection. Mrs. K's main complaints are weakness, fever, nausea, loss of appetite, dizziness, as well as pain and tingling in both soles of her feet. Mrs. K was brought to the hospital because she had been experiencing a fever for 5 days, especially at night, headache, weakness, nausea, loss of appetite, pain and tingling in both soles of her feet. The pain in her feet has been present for approximately the last month and decreases when walking. The pain is intermittent and appears when Mrs. K lies down or sits for too long and has little activity. Provokes: physiological injury agent (inflammation), quality: stabbing, region: both soles of the feet, scale: 4, time: intermittent. Mrs. K has a history of diabetes mellitus since 2020 and usually takes metformin 2x500 mg daily. She also routinely goes for monthly check-ups at the community health center (puskesmas). The therapy she received during her hospital stay included an infusion of 0.9% NaCl at 20 drops per minute, broadced antibiotic injection 1 gram every 12 hours, omeprazole injection 40 mg every 12 hours, paracetamol injection 500 mg every 8 hours, mecobalamin injection 500 mcg every 12 hours, novorapid injection using a sliding scale, levemir injection, and analsix tablets 2x1 tablet.

The results of the physical examination and interview with Mrs. K revealed that the patient's lip mucosa appeared dry, and her skin felt warm to the touch. During abdominal palpation, there was tenderness in the epigastric region. At night, Mrs. K reported sleeping only briefly, frequently waking up due to dizziness and pain in both soles of her feet. Vital signs examination showed blood pressure of 123/74 mmHg, pulse 107 beats per minute, body temperature 37.8°C, respiration rate 20 breaths per minute, and oxygen saturation of 98%. Laboratory tests showed HbA1C of 10.1%, creatinine of 1.3 mg/dL, and random blood glucose of 333 mg/dL. Based on the assessment results obtained, the primary nursing diagnosis was established as acute pain related to physiological injury agent (inflammation), evidenced by the patient complaining of pain in both soles of the feet, tingling, pain scale of 4, loss of appetite, sleeping only briefly, frequent awakenings, and a pulse rate of 107 beats per minute. The intervention used to address the acute pain diagnosis follows the nursing outcome standard for decreased pain level (L.08006), with outcome criteria of decreased pain complaints, decreased difficulty sleeping, and improved pulse rate. The interventions carried out by the author to reduce the patient's pain include identifying the location, characteristics, duration, frequency, quality, intensity, and pain scale; providing non-pharmacological techniques to reduce pain; teaching non-pharmacological techniques to the patient; and collaborating on providing analgesics. The non-pharmacological technique that will be given to the patient is diabetic foot exercises.

The implementation was carried out for 3 consecutive days, from October 15 to 17, 2024. The intervention used to relieve pain in Mrs. K's soles was diabetic foot exercises. Mrs. K performed the diabetic foot exercises once a day for 3 consecutive days. On the first day, October 15, 2024, the diabetic foot exercises were done at 10:00 AM and lasted approximately 15 minutes because the patient still complained of dizziness and weakness. On the first day, the author and the patient performed the exercises together, and the patient still had difficulty since she had never done diabetic foot exercises before. On the second day, October 16, 2024, the exercises were done at 9:00 AM and lasted about 30 minutes. On the second day, the patient still remembered the movements from the previous day's exercises and did not have difficulty performing them. On the second day, the author and the patient still did the diabetic foot exercises together. On the third day, October 17, 2024, the exercises were performed at 9:00 AM. On the third day, the patient was able to perform the exercises independently with guidance from the nurse. The evaluation for the acute pain diagnosis in Mrs. K was conducted over 3 days, from Tuesday, October 15, 2024, to Thursday, October 17, 2024. On the first day of evaluation, there was no significant change in the pain experienced by Mrs. K. She still complained of pain in both soles of her feet and tingling, although the pain somewhat decreased after being taught diabetic foot exercises. Provokes: physiological injury agent (inflammation), quality: stabbing, region: both soles of the feet, scale: 3, time: intermittent. The second evaluation was done on October 16, 2024, at 3:00 PM, and data showed that Mrs. K's pain complaints in both soles had started to decrease compared to the previous day. The pain now occurred less frequently and appeared when Mrs. K lay down too often and moved her feet infrequently. Provokes: physiological

injury agent (inflammation), quality: stabbing, region: both soles of the feet, scale: 2, time: intermittent. The third evaluation took place on October 17, 2024, at 2:00 PM, revealing that Mrs. K's pain complaints in both soles had further decreased and rarely appeared because she had been more active, such as sitting and walking. Provokes: physiological injury agent (inflammation), quality: throbbing, region: both soles of the feet, scale: 1, time: intermittent. On the third day of evaluation, the patient also no longer experienced difficulty sleeping, and her pulse rate had returned to normal at 78 beats per minute.

Discussion

Based on the results of nursing care that has been carried out for 3 consecutive days, data was obtained that after being given diabetic foot exercises with a duration of 15-30 minutes every day, the pain scale felt by Mrs. K decreased from a pain scale of 4 to 1. The use of diabetic foot exercises for patients experiencing neuropathic pain. Data collection in their study began with measuring the neuropathic pain score before the diabetic foot exercises on day 1 and after the exercises on day 4. The exercises were performed for 4 days, each session lasting 30 minutes. The results of their study showed a decrease in pain scores in both respondents: the first respondent's pain score decreased from 7 to 5, and the second respondent's pain score decreased from 6 to 4. Diabetic foot exercises can be given to people with type 2 diabetes mellitus as an early preventive measure starting from the time of diagnosis (Kluding et al., 2017). Diabetic foot exercises are a simple form of exercise suitable for those with diabetes mellitus and have been shown to be effective when performed regularly (Zilliox & Russell, 2019). Diabetic foot exercises should be performed 3-4 times a week for effective results. The movements in these diabetic foot exercises can reduce symptoms of sensory neuropathy, such as aches and tingling in the feet. Another benefit of diabetic foot exercises is that they increase calf and thigh muscle strength and can cause the muscles in the affected areas to contract. This muscle contraction opens ion channels, allowing positive ions to enter. This influx of positive ions improves blood flow and nerve impulse transmission, which impacts peripheral blood circulation, especially in the feet, and can prevent diabetic complications such as neuropathy. The purpose of providing diabetic foot exercises is to help divert the respondent's attention from the pain being experienced (Pebrianti et al., 2024). During the exercise, the body becomes more relaxed, which stimulates the production of endorphins. These hormones function to block the release of substance P (a neuropeptide) that acts as a pain trigger. As a result, the transmission of pain impulses in the spinal cord can be inhibited, leading to a reduction in the intensity of diabetic neuropathic pain in the extremities.

On the first day of implementation of diabetic foot exercises, the patient's family was still hesitant because they were afraid that if the patient was told to do foot exercises, they were worried that the patient would become exhausted so that the recovery process would be long, but after it was explained that diabetic foot exercises were done with the patient in a sitting position and only the feet were moved and had the benefit of increasing blood flow and increasing insulin sensitivity to control blood sugar and prevent chronic complications, the patient's family finally allowed the patient to be taught diabetic foot exercises. The diabetic foot exercise begins by first asking the patient for their willingness and readiness to participate. After that, the necessary equipment is prepared, namely a chair. Once the chair is available, the patient is asked to sit with their feet flat on the floor and perform clawing movements, in which the toes of both feet are stretched upward and then bent downward. Next, with the heel of one foot placed on the floor and the sole lifted upward, the other foot places the toes on the floor with the heel lifted, and the movement is done alternately. The following movement involves placing the heel on the floor, lifting the front of the foot upward, and making circular motions using the ankle. Then, with the toes on the floor and the heel lifted, circular motions are again made using the ankle. Each of the movements described above is performed 10 times. The next exercise involves straightening and lifting one leg, then rotating the foot at the ankle and drawing numbers in the air from 0 to 10 with the foot. This is done alternately for each leg. The final movement involves placing a sheet of newspaper on the floor. Tear the paper in half, then use both feet to form the pieces into a ball. After that, unfold the ball back into a flat sheet using both feet. This step is performed only once. Diabetic foot exercises can be performed for 30–60 minutes, 3–5 times per week.

The nurse's role in this case study is to demonstrate the diabetic foot exercises and guide the patient in performing them so that the patient can eventually do the exercises independently (Dailah, 2024). In administering diabetic foot exercises to the patient, the family should also be directly involved so that they can supervise and accompany the patient when performing the exercises at home. Additionally, before the patient is discharged, the nurse must educate both the patient and the family on the importance of regularly and independently performing the diabetic foot exercises at home, with family support, to help prevent complications of type 2 diabetes mellitus if the exercises are done consistently.

Conclusion

The results of this case study indicate that diabetic foot exercises can reduce pain complaints that arise in patients with type 2 diabetes mellitus with neuropathy. Diabetic foot exercises were given for 3 consecutive days with a duration of 15-30 minutes. After the implementation of diabetic foot exercises, Mrs. K's pain scale decreased from a pain scale of 4 to 1. The benefit of this case study is that it can serve as a reference when a nurse will provide nursing care to patients with type 2 diabetes mellitus with neuropathy who still have acute pain complaints by applying

evidence-based practice as a reference in providing non-pharmacological therapy.

References

American Diabetes Association Professional Practice Committee for Diabetes* (2026). 2. Diagnosis and Classification of Diabetes: Standards of Care in Diabetes-2026. Diabetes care, 49(Supplement_1), S27–S49. https://doi.org/10.2337/dc26-S002

Banday, M. Z., Sameer, A. S., & Nissar, S. (2020). Pathophysiology of diabetes: An overview. Avicenna journal of medicine, 10(4), 174–188. https://doi.org/10.4103/ajm.ajm_53_20

Dailah H. G. (2024). The Influence of Nurse-Led Interventions on Diseases Management in Patients with Diabetes Mellitus: A Narrative Review. Healthcare (Basel, Switzerland), 12(3), 352. https://doi.org/10.3390/healthcare12030352

Dewi, L. K., & Husain, F. (2025). Penerapan senam kaki untuk menurunkan kadar glukosa darah pada penderita diabetes mellitus tipe II. Jurnal Ilmiah Kesehatan Mandira Cendikia, 4(7), 202–213. https://doi.org/10.70570/jikmc.v4i7.1767

Dhouibi, J., Migaou, H., Chaabeni, A., Kalai, A., Salah, S., Boudokhane, S., Ben Salah Frih, Z., & Jellad, A. (2025). Physical Activity in the Management of Diabetic Neuropathic Pain: A Narrative Review of Mechanisms, Evidence, and Clinical Perspectives. Cureus, 17(10), e94960. https://doi.org/10.7759/cureus.94960

Kluding, P. M., Bareiss, S. K., Hastings, M., Marcus, R. L., Sinacore, D. R., & Mueller, M. J. (2017). Physical Training and Activity in People With Diabetic Peripheral Neuropathy: Paradigm Shift. Physical therapy, 97(1), 31–43. https://doi.org/10.2522/ptj.20160124

Pebrianti, S., Maulana, I., Shalahuddin, I., Eriyani, T., & Nugraha, B. A. (2024). Physical Activity to Reduce Pain Scale in Diabetic Neuropathy Patients: A Scoping Review. Diabetes, metabolic syndrome and obesity : targets and therapy, 17, 4079–4089. https://doi.org/10.2147/DMSO.S483941

Sun, H., Saeedi, P., Karuranga, S., Pinkepank, M., Ogurtsova, K., Duncan, B. B., Stein, C., Basit, A., Chan, J. C. N., Mbanya, J. C., Pavkov, M. E., Ramachandaran, A., Wild, S. H., James, S., Herman, W. H., Zhang, P., Bommer, C., Kuo, S., Boyko, E. J., & Magliano, D. J. (2022). IDF Diabetes Atlas: Global, regional and country-level diabetes prevalence estimates for 2021 and projections for 2045. Diabetes research and clinical practice, 183, 109119. https://doi.org/10.1016/j.diabres.2021.109119

Zhu, J., Hu, Z., Luo, Y., Liu, Y., Luo, W., Du, X., Luo, Z., Hu, J., & Peng, S. (2024). Diabetic peripheral neuropathy: pathogenetic mechanisms and treatment. Frontiers in endocrinology, 14, 1265372. https://doi.org/10.3389/fendo.2023.1265372

Zilliox, L. A., & Russell, J. W. (2019). Physical activity and dietary interventions in diabetic neuropathy: a systematic review. Clinical autonomic research : official journal of the Clinical Autonomic Research Society, 29(4), 443–455. https://doi.org/10.1007/s10286-019-00607-x