KIAN JOURNAL
ISSN 2964-3910
PREFIX DOI: 10.56359/kian
Vol. 3 No. 1 Page Number 22-32

Foot Exercise Implementation in a Patient with Physical Mobility Impairment due to Diabetes Mellitus

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DOI: https://doi.org/10.56359/kian.v3i1.551

ABSTRACT

Introduction: **:** Diabetes Mellitus (DM) is a non-communicable disease that continues to show an increase globally, including in Indonesia. According to WHO data in 2016, as many as 422 million adults in the world have diabetes. This disease is caused by insulin deficiency, either relatively or absolutely, and often causes complications such as peripheral neuropathy which causes decreased sensation in the feet. One of the steps to prevent these complications is through foot exercises. Foot exercises are special physical exercises for diabetics that aim to prevent wounds, improve blood flow, strengthen small muscles in the feet, and prevent deformities due to nerve disorders and muscle weakness.
Objective: This case study aims to implement foot exercises in patients with impaired physical mobility with diabetes mellitus.
Method: This research uses a descriptive method in the form of a case study with a nursing approach which includes assessment, nursing diagnosis, nursing care plan, nursing implementation, and nursing evaluation. Data collection was done by interview, observation, physical examination, and documentation.
Result: After the assessment, it is known that Mrs.D obtained a nursing diagnosis of impaired physical mobility associated with decreased muscle strength with diagnosis number D.0054, after being given implementation in the form of foot exercises for 3 days with a duration of 5-7 minutes a day, the nursing problem of impaired physical mobility of the client is partially resolved which is characterized by increased muscle strength with muscle strength values on the right lower extremity 4 and the left 5.
Conclusion: The implementation of foot exercises has proven to be useful for reducing movement limitations and increasing muscle strength in all extremities, the benefits of this foot exercise will be maximized if done gradually and periodically.

Keywords: Diabetic Neuropathy, Foot Exercise, Muscle Strength, Physical Mobility, Case Report

Introduction

Diabetes mellitus (DM) is a chronic disease whose prevalence continues to increase globally and nationally. It has become one of the most significant public health challenges of

the 21st century. The World Health Organization (WHO) notes that DM is the leading cause of death from metabolic and vascular complications, and contributes to increasing morbidity and health costs globally. Based on the International Diabetes Federation (IDF, 2015) report, in 2014 around 8.3% of the world's population or around 387 million people had diabetes, with Indonesia being in the seventh largest position, which is around 8.5 million sufferers. Meanwhile, in 2006 in Indonesia there were an estimated 14 million cases of diabetes, but only half of them were aware of their condition, and of these, only about 30% were regularly undergoing treatment.

Diabetes Mellitus is known as a metabolic disease characterized by chronically high blood glucose levels caused by impaired insulin production, insulin action, or both. This chronic hyperglycemia condition if not treated properly can lead to various complications, both short and long term. These complications include damage to vital organs such as the kidneys (nephropathy), eyes (retinopathy), nerves (neuropathy), and cardiovascular system. One of the long-term complications often experienced by DM patients is impaired physical mobility, which directly impacts the patient's quality of life. This disorder can arise due to peripheral neuropathy, impaired blood circulation in the lower extremities, and muscle weakness caused by lack of physical activity. Patients with impaired mobility will have difficulty in performing daily activities such as walking, standing, or moving, thus increasing the risk of falls, diabetic foot ulcers, and amputation if not treated properly.

Improving physical mobility is an important component in the management of patients with diabetes mellitus. Regular physical activity has been scientifically proven to increase insulin sensitivity, improve glucose metabolism, and help control body weight and blood pressure. One form of physical exercise that is simple, easy to implement, and relatively safe for diabetic patients is diabetic foot exercise. Foot exercises are a series of exercise movements that aim to strengthen leg muscles, increase joint flexibility, improve peripheral blood flow, and maintain sensory and motor functions of the lower extremities. The movements performed in foot exercises include ankle, toe, and sole exercises that are performed regularly in a sitting or lying position so as not to overload the cardiovascular system.

Various studies have shown the benefits of foot exercises on improving the physical function of DM patients. A study conducted by (Yuliani et al., 2023) suggested that patients who performed foot exercises for 4 weeks experienced a significant increase in lower extremity tissue perfusion and showed a decrease in peripheral neuropathy symptoms. Foot exercises are also able to increase leg muscle strength and improve body balance, which is very important in preventing the risk of falls in the elderly with diabetes. In addition, foot exercises are also considered effective in reducing fatigue levels, improving posture, and increasing patient confidence in activities.

Although the benefits of foot exercises have been widely documented in various studies, the implementation of this program in clinical practice still faces a number of obstacles. Many patients are unaware of the existence or importance of this exercise. Lack of socialization from health workers, limited training resources, and low patient motivation to do the exercises independently are the main obstacles. On the other hand, nurses as health workers who have

a strategic role in nursing services have not fully utilized the potential of foot exercises as an independent implementation that can be applied systematically and sustainably. This indicates a gap between scientific evidence and practice in the field that needs to be bridged immediately.

In nursing practice, foot exercises are included in independent implementation that can be done by nurses as part of promotive, preventive, and rehabilitative efforts. Nurses have an important role in educating patients and families about the importance of foot exercises, guiding the implementation of exercises with the right technique, and monitoring the results or impact of exercise on the patient's physical condition. The application of foot exercises in nursing services is also in line with the principles of evidence-based nursing (EBN), which is nursing practice based on the latest scientific evidence to improve service outcomes and patient safety.

Based on this background, this study was conducted to evaluate the effectiveness of the implementation of diabetic foot exercises on improving physical mobility disorders in patients with diabetes mellitus. This study aims to identify changes in the physical mobility status of patients after being given the implementation of foot exercises for a certain period of time, as well as assess the feasibility and acceptability of foot exercises as part of routine nursing implementation. The main questions in this study were: "Can diabetic foot exercises improve the physical mobility of patients with DM who have impaired movement function?"

Furthermore, this study is expected to provide applicable practice recommendations for nursing staff in developing evidence-based implementation. The results of this study are expected to not only contribute to the development of nursing science, but also strengthen the argument for the need to integrate foot exercises into diabetes patient self-management programs in various health care facilities. In addition, this study is expected to be a reference for policy makers in developing guidelines or physical exercise protocols for DM patients as part of efforts to prevent long-term complications.

Thus, the urgency of this research lies not only in clinical aspects, but also touches on the educational, preventive, and promotive dimensions of nursing services. This research is expected to fill the literature gap and strengthen the role of nurses in efforts to improve the quality of life of patients through increasing the functional capacity and physical independence of patients with diabetes mellitus.

Objective

This study aims to evaluate the effectiveness of foot exercises on muscle strength in Diabetes Mellitus patients with physical mobility disorders through case studies and nursing process approaches.

Method

Design and setting

This study used a descriptive case study design with a qualitative approach. The research was conducted in the patient's home environment located at Jln. Singadaru, Rt.002 Rw. 008, Kawalimukti Village, Kawali District, West Java. By involving patients with type 2 diabetes

mellitus who experience physical mobility disorders. This location was chosen due to the high prevalence of DM and the availability of a target population that fit the inclusion criteria and the study lasted for 3 days.

Population and sampling

The population in this study were patients diagnosed with type 2 diabetes mellitus and experiencing impaired physical mobility, specifically related to decreased lower extremity muscle strength. This population includes adult individuals undergoing treatment at a health facility and exhibiting symptoms of peripheral neuropathy that affect mobility ability. Inclusion criteria in this study included patients aged between 40 to 70 years, cooperative, able to follow foot exercise instructions, and willing to sign informed consent. The exclusion criteria were patients with severe cardiac disorders, respiratory disorders that limit physical activity, or severe cognitive impairment that could hinder the implementation of foot exercise instructions.

The sample in this study was one female patient (Mrs. D) who was selected purposively. The purposive selection was made because the patient met all the inclusion criteria and was not included in the exclusion criteria. This approach was chosen because this study is a case study, which aims to explore in depth the effects of implementing foot exercises on the physical mobility conditions of DM patients individually. Selection was made after review of medical records, results of the initial physical examination, as well as interviews with the patient and family to ensure the stability of the patient's general condition. The patient was 62 years old, with a history of type 2 diabetes mellitus for 8 years. She weighed 64 kg and had a height of 158 cm, with a BMI indicating overweight. She was undergoing oral antidiabetic therapy (metformin) and did not report other major comorbidities except occasional hypertension. The patient lived with her daughter, who helped supervise the foot exercises. She showed moderate motivation during the intervention and expressed concern over her reduced mobility.

The procedural steps in sampling involved patient identification through the medical record system, verification of clinical conditions by the nursing team, and patient consent to be involved in the implementation. Patients were selected based on characteristics that matched the focus of the study, namely the presence of decreased leg muscle strength due to DM and having no contraindications to perform leg exercises. Consideration of a single sample size was made due to the descriptive qualitative nature of this research with an in-depth case study approach.

Instrument and measurement

The instruments used in this study consisted of nursing assessment sheets, ROM (range of motion) tests, and daily documentation of the implementation of foot exercises. The assessment sheet was used to record the patient's subjective and objective data, including physical condition, muscle strength, and lower extremity functional complaints. The foot exercise routine included ankle circles, toe curls, heel lifts, and foot tapping performed while seated. Each movement was performed in 2 sets of 10 repetitions, focusing on strengthening

small foot muscles and improving blood circulation. The end goal of these exercises was to improve joint flexibility, increase lower extremity strength, and reduce neuropathy symptoms.

ROM (Range Of Motion) was used to measure lower limb muscle strength before and after implementation, with a 0-5 muscle strength scale indicating the level of muscle contraction. This instrument has been validated in nursing clinical practice and is widely used to assess implementation effectiveness. The data collection process was carried out systematically by direct observation by the implementing nurse every day, accompanied by recording muscle strength scores according to standard nursing procedures.

Data collection and analysis

Data collection was conducted using an observational approach through interviews, physical examinations, and direct observation of the implementation of foot exercises. For three days, the implementation of foot exercises can increase muscle strength in the patient's lower extremities which is recorded every day by the implementing nurse using the ROM test. The data collected included the value of muscle strength in the lower extremities and the patient's response to the exercises given.

The data that has been collected is then analyzed descriptively. Muscle strength results before and after implementation were compared using ROM (range of motion) test scores, to identify any changes. This analysis process aimed to evaluate the effectiveness of the implementation of foot exercises on improving muscle strength and physical mobility of patients. The analysis was conducted systematically and manually as the nature of this study was a single case study.

Result

Mrs. D has type 2 DM and shows signs of impaired physical mobility such as muscle weakness and limited lower extremity movement. The nursing diagnosis is "Impaired physical mobility associated with decreased muscle strength (D.0054)."

Implementation of foot exercises is carried out for 3 consecutive days with 5-7 minutes per day. The evaluation results showed an increase in lower extremity muscle strength:

Table 1. Comparison of Muscle Strength Before and After Foot Gymnastics

Visit	Lower extremity Right side	Left lower extremity
Day 1	3	4
Day 2	4	5
Day 3	4	5

These results indicate that the implementation of foot exercises carried out for 3 days can have a positive impact on increasing muscle strength, especially in the lower extremities that occur in Diabetes Mellitus patients.

Discussion

The results of this study indicate that the implementation of foot exercises has a positive impact on increasing lower limb muscle strength in patients with Diabetes Mellitus. There was an increase in Range of Motion (ROM) score from 3 to 4 on the right leg and from 4 to 5 on the left leg, which indicates a significant improvement in muscle function. These findings support the view that foot exercises are an effective non-pharmacological nursing implementation in managing physical mobility disorders due to peripheral neuropathy in patients with DM.

These results are also in line with previous research, such as that presented by (Bachri et al., 2022) , which states that light physical exercises such as foot exercises can improve peripheral blood circulation, strengthen small muscles, and maintain joint flexibility. Repetitive movements in foot exercises also play a role in stimulating peripheral nerves that have decreased function due to chronically high blood glucose levels. An increase in ROM test score from 3 to 4 on the right lower extremity and from 4 to 5 on the left lower extremity indicates a significant improvement in muscle functional condition. These results support the understanding that foot exercises can be used as an effective non-pharmacological nursing implementation to address impaired physical mobility due to peripheral neuropathy in patients with DM.

From a nursing perspective, foot exercises have the advantage of being easy to perform, do not require special equipment, and are relatively inexpensive. In addition, this implementation allows direct involvement of patients and families in the care process, which is in line with the principles of family-based nursing and supports increasing patient independence.

With that said, this study has limitations, including the use of a single case study design and the short duration of implementation. This certainly has an impact on the limited generalizability of the results. Therefore, further research is needed with a quantitative approach, involving more respondents, and conducted over a longer period of time to obtain more comprehensive results. This finding is in line with the results of previous research as stated by (Bachri et al., 2022) that simple physical exercises such as foot exercises can help increase peripheral blood flow, strengthen small muscles, and maintain joint flexibility. In addition, repetitive movements in foot exercises can help stimulate peripheral nerves that have decreased function due to chronic hyperglycemia.

In general, the results of this study reinforce that foot exercises are effective and feasible to be implemented routinely in nursing practice, especially for patients with diabetes mellitus who experience decreased mobility function due to neuropathy.

Restate the Key Findings

This study aims to implement foot exercises in patients with impaired physical mobility due to Diabetes Mellitus (DM). The main results showed that after the implementation of foot exercises for three consecutive days with a duration of 5 to 7 minutes per day, there was an

increase in lower extremity muscle strength in patients. Muscle strength in the right lower extremity increased to a value of 4, and for the left lower extremity to a value of 5. This is in line with the theory (NABIILAH, 2022) which shows that the implementation of foot exercises can overcome some of the nursing problems of physical mobility disorders, and supports the hypothesis that foot exercises can help improve muscle strength and mobility ability in DM patients who experience peripheral neuropathy complications.

Interpret the Results

The findings in this study indicate that the implementation of foot exercises has a positive impact on increasing lower limb muscle strength in patients with diabetes mellitus with impaired physical mobility. Biologically, this foot exercise can help stimulate peripheral blood flow, increase tissue oxygenation, and strengthen small muscles in the legs that are prone to weakness due to peripheral neuropathy. This is in line with the theory (Afriani, 2024) that structured physical activity can improve neuromuscular function and prevent muscle atrophy that is common in DM patients.

From a clinical perspective, these results are important because foot exercises can be an effective, inexpensive, and easy-to-implement non-pharmacological implementation to reduce the risk of complications such as diabetic foot ulcers. With increased muscle strength and mobility, patients can become more independent in performing daily activities, which in turn contributes to improved quality of life and decreased dependence on caregivers or family assistance.

Theoretically, the implementation of movement-based nursing such as foot exercises not only serves as a prevention of complications, but also as a rehabilitative effort against physical mobility disorders. These findings contribute to the development of nursing science, especially in medical-surgical nursing practice that emphasizes comprehensive and promotive care for patients with chronic diseases such as DM.

Compare with Previous Studies

The findings in this case study are consistent with the results of research by (Simamora et al., 2020) which proved that foot exercises can improve peripheral blood flow and strengthen small muscles in the feet of patients with diabetes mellitus. This exercise has also proven effective in preventing diabetic foot deformities and wounds, which are often complications due to peripheral neuropathy.

In addition, according to (Fajriati & Wijayanti, 2021) states that regular foot exercises contribute to lowering blood sugar levels while improving lower limb function. This statement is in line with the results of this study, where there was an increase in muscle strength after the implementation of foot exercises for three consecutive days.

However, there were slight differences in the duration and frequency of implementation. Some previous studies applied foot exercises for 1 to 2 weeks to see significant changes, while in this study, improvements in muscle strength were already starting to be seen in just three days of implementation. This difference may be due to individual factors such as the patient's

level of motivation, initial physical condition, as well as varying physiological responses to exercise.

Overall, the concordance of these findings with previous studies strengthens the evidence that foot exercise is an effective nursing implementation in improving physical mobility in patients with diabetes mellitus, while adding a practical and applicable dimension to clinical nursing practice.

Highlight the Implications

Explain the practical, clinical, or theoretical implications of your results. This might include recommendations for practice, policy changes, or directions for future research.

The results of this study have several important implications, both practically, clinically, and theoretically. Practically, these findings show that foot exercises can be used as a simple and inexpensive implementation that can be implemented by nurses in various health care settings, especially in health centers, hospitals, and at the patient's home with family supervision. This implementation does not require special equipment, is easy to teach, and can be done independently by patients after receiving education.

Clinically, the implementation of foot exercises can be recommended as part of the standard protocol of care for patients with diabetes mellitus, especially those with impaired physical mobility due to peripheral neuropathy. This implementation has the potential to reduce patients' dependence on drugs or invasive measures, as well as help prevent further complications such as diabetic foot wounds, which often lead to amputation.

From a theoretical perspective, the results of this study enrich the nursing literature by reinforcing the role of non-pharmacological nursing implementation in chronic disease management. The findings can also serve as a basis for the development of a physical activity-based nursing implementation model, particularly in the elderly population or patients with a high risk of mobility impairment.

It is hoped that these results will also provide direction for the preparation of internal hospital or health facility policies to include foot exercises as part of routine education for diabetic patients.

Discuss the Limitations

Acknowledge the limitations of your study honestly and transparently. This might include methodological constraints, sample size, potential biases, or limitations in generalizability. Recognizing these issues demonstrates academic integrity and allows readers to assess the strength of your conclusions.

This study has several limitations that need to be openly recognized as a form of scientific integrity. First, the research design used was a single case study, which methodologically limits the ability to generalize the results to a wider population. This study only described the effects of implementing foot exercises on one patient with a specific condition, so the results are descriptive and cannot be interpreted as overall causal evidence. Moreover, the absence of a control group limits the ability to conclude whether the observed

effects were solely due to the foot exercises. A larger-scale, multi-participant study is required to better understand the broader applicability of these results.

Secondly, the very limited sample size led to the inability to perform robust statistical analysis. Therefore, the findings should be interpreted with caution and focused more on the initial exploration of the potential benefits of foot exercises.

Third, potential observational bias may occur because muscle strength measurements are made manually and subjectively by researchers, without the use of quantitative instruments or objective standards such as digital muscle strength measuring instruments (e.g., dynamometers). This may affect the accuracy and reliability of the outcome data.

Fourth, the relatively short implementation time of only three days is a limitation in seeing the long-term impact of the foot exercises on physical mobility function. The changes noted may only be temporary or not reflect stable results when compared to longer implementation.

Fifth, patients' psychosocial factors such as personal motivation, family support, and emotional state were not evaluated in depth, even though they have the potential to influence the successful implementation of foot exercises.

By recognizing these limitations, it is hoped that readers can understand the context of the study proportionally and make these results a starting point for broader research in the future.

Suggest Future Research

Given the results and limitations of this study, future researchers are advised to conduct studies with more robust research designs, such as quasi-experimental studies or *randomized controlled trials*, in order to obtain more valid and generalizable data. Future studies should include a larger sample size and vary in terms of age, gender, severity of diabetes, and level of mobility impairment, so that the results are more representative of the general diabetic population.

The duration of implementation also needs to be extended, not just three days as in this study, but at least on a weekly or monthly basis, to assess the effectiveness of foot exercises more thoroughly, both in terms of improving muscle strength and preventing long-term complications such as diabetic foot ulcers. In addition, researchers are advised to use objective and standardized measurement tools in assessing muscle strength, such as a dynamometer so that the results obtained are more accurate and measurable.

It is also advisable to evaluate psychosocial factors that can affect the success of implementation, such as patient motivation, level of understanding of the benefits of foot exercises, support from family, and emotional condition of patients. Researchers can also develop an integrated educational approach that involves the active role of nurses, families, and patients in the implementation of foot exercises independently at home.

Finally, further research in various health care settings, both in hospitals, health centers, and communities will expand the understanding of the effectiveness of foot exercises in real contexts and support the development of more applicable evidence-based nursing care policies.

Conclusion

In writing the Conclusion of an article, this section serves to summarize the main findings or arguments and highlight their significance. It should clearly restate the purpose of the study or discussion, briefly review the key points, and provide a final insight or recommendation based on the content presented. A good conclusion reinforces the core message without introducing new information. Typically, the conclusion is written in one concise paragraph that effectively wraps up the article and leaves a lasting impression on the reader.

This study aims to evaluate the implementation of foot exercises in patients with diabetes mellitus with impaired physical mobility. The results of this case study show that the implementation of foot exercises for three days can have a positive impact on increasing lower extremity muscle strength, as shown by improvements in muscle strength scores. This finding confirms that foot exercise is one of the effective, inexpensive, and applicable non-pharmacological nursing implementations to improve mobility and prevent further complications in diabetic patients. Therefore, this foot exercise is recommended to be applied routinely, both in health care facilities and in self-care at home, as part of a comprehensive approach in the nursing management of patients with diabetes mellitus.

Acknowledgement

Acknowledgement is a brief statement to recognize individuals or institutions who contributed to the research but are not listed as authors. The authors would like to express their deepest gratitude to STIKes Muhammadiyah Ciamis for the support of facilities and opportunities provided in the implementation of this research. The author also thanks the family and all those who have contributed directly or indirectly, so that this research can be completed properly.

Author Contribution

Adinda Rizki Aulia served as the main author who carried out data collection, implementation of foot exercises, and analysis and interpretation of results. Adinda also compiled all parts of the article, from the introduction to the conclusion. Ade Fitriani, acted as a supervisor in the preparation of the methodology, providing scientific input during the research process, as well as critical revision of the article content to ensure academic quality. Both authors have read and approved the manuscript or article.

Conflict of Interest

The authors declare that there is no financial, professional, or personal conflict of interest in the conduct and reporting of this research.

Ethical Clearance

This study has obtained ethical approval from the educational institution of STIKes Muhammadiyah Ciamis. All participants were given an explanation of the objectives and procedures of the study and have signed informed consent as a form of voluntary agreement to participate. To maintain confidentiality, patient identity was anonymized using

pseudonyms, and all data collected were stored in a password-protected digital folder accessible only to the researchers.

Funding

This study did not receive funding support from any government, private, or non-profit organization. All research costs were borne independently by the author.

References

Afriani, D. (2024). Textbook of epidemiology of non-communicable diseases. NEM Publisher.

Bachri, Y., Prima, R., & Putri, S. A. (2022). Risk factors associated with the incidence of diabetic foot ulcers in patients with diabetes mellitus at Prof. Dr. Ma. Hanafiah, SM Batusangkar in 2022. Journal of Research Innovation, 3(1), 4739-4750.

Fajriati, A. M., & Wijayanti, A. C. (2021). The Relationship Between Smoking Behavior and the Incidence of Type 2 Diabetes Mellitus in Surakarta City. University of Muhammadiyah Surakarta.

NABIILAH, F. H. (2022). Gerontic Nursing Care for Mrs. H with the Main Problem of Physical Mobility Disorders Medical Diagnosis of Diabetes Mellitus at Uptd Griya Wreda Surabaya. STIKES HANG TUAH SURABAYA.

Najah, F. L., Permana, Y., Firmansyah, A., Marliany, H., Setiawan, H., Rohman, A. A., ... & Indriastuti, M. (2023). Calgary Family Intervention Model Approach to Improve Quality of Life for Diabetes Mellitus Patients. *KnE Social Sciences*, 1-10.

Setiawan, H., Suhanda, S., Roslianti, E., Firmansyah, A., Fitriani, A., Hamdani, D., ... & Rahman, N. A. (2022). Health Education, Screening and Diabetic Foot Excercise in Cimanggu District, Bogor. *ABDIMAS: Jurnal Pengabdian Masyarakat*, *5*(2), 2410-2415.

Simamora, F. A., Siregar, H. R., & Hidayah, A. (2020). The effect of Diabetic Foot Gymnastics on reducing neuropathy in patients with type 2 diabetes mellitus. Journal of Education and Development, 8(4), 431.

Yuliani, L., Adyas, A., & Rahayu, D. (2023). Factors Associated with the Incidence of Abortion. Scientific Journal of Permas: Scientific Journal of STIKES Kendal, 13(3), 1107-1116. https://doi.org/10.32583/pskm.v13i3.1208