



The Impact of Diabetic Foot Exercises on Blood Glucose Control and Neuropathy Management in Individuals with Diabetes: A Community-Based Intervention

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ABSTRACTS

Introduction: Diabetes mellitus is a chronic disease that often leads to complications such as peripheral neuropathy and poor glycemic control. Diabetic foot exercise has been recognized as an effective non-pharmacological intervention to reduce blood glucose levels and improve foot sensitivity. **Objective:** This community service initiative aimed to empower individuals with diabetes to perform regular foot exercises to help lower blood glucose levels and alleviate neuropathic symptoms. **Method:** The intervention was carried out over six consecutive days with 10 participants diagnosed with diabetes. Each participant was guided to perform diabetic foot exercises twice daily—morning and evening. Participants were educated about the importance of foot care and were encouraged to practice independently at home. **Results:** After six days of the intervention, participants reported improved well-being, reduced numbness and tingling in their feet, and enhanced motivation to continue the exercises. The average fasting blood glucose level decreased significantly from 309 mg/dL at baseline to 189 mg/dL post-intervention. **Conclusion:** Diabetic foot exercise is an effective and practical approach for glycemic control and neuropathy management. Community-based programs that support self-care routines can significantly improve health outcomes among individuals with diabetes.

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1. INTRODUCTION

Diabetes mellitus (DM) is a chronic metabolic disorder that affects millions of people globally and is often associated with long-term complications such as diabetic peripheral neuropathy (DPN). This condition results in nerve damage, particularly in the lower extremities, which can severely impact a patient's quality of life (Graciella & Prabawati, 2020). DPN is not only painful but also increases the risk of foot ulcers and lower-limb amputations.

One of the common symptoms of DPN is the loss of sensation in the feet, which impairs balance and increases the risk of falls and injuries. Managing this condition requires an integrated approach that includes pharmacologic therapy, foot care education, and physical activity (Rosyid & Angraini, 2022). Among the physical interventions, diabetic foot exercises have gained attention for their simplicity and accessibility, especially in low-resource settings.

Foot exercise improves blood circulation, strengthens the intrinsic muscles of the feet, and enhances proprioception. According to Win et al. (2020), foot and hand exercises are effective in reducing symptoms of DPN, improving balance, and restoring sensory function. This is particularly important in elderly populations where functional independence is a priority.

Community-based interventions offer an effective platform for delivering health promotion activities. When exercise programs are implemented in familiar environments with peer support, adherence increases significantly. Embuai et al. (2019) demonstrated that combining foot exercise with foot care education significantly improves peripheral vascular status in diabetic patients.

Despite growing evidence supporting exercise interventions, diabetic foot exercises are still underutilized. Limited awareness, lack of trained facilitators, and the perception that exercises are only for young individuals contribute to low adoption. Community empowerment and engagement can help overcome these barriers (Wayunah et al., 2025).

Many patients with DPN are unaware of the benefits of regular foot movement. Health education programs that include demonstrations and supervised practice sessions can foster behavioral change. Dewi et al. (2020) emphasized the therapeutic benefits of simple foot interventions, such as foot spas, in improving comfort and circulation in the elderly.

Most studies conducted so far have focused on hospital-based or clinical settings. However, diabetes is largely managed at home, which makes community-based programs

more relevant. Matos et al. (2018) pointed out that physical activity significantly improves foot-related outcomes when performed consistently and with appropriate intensity.

Considering the increasing prevalence of type 2 diabetes and the growing elderly population, there is an urgent need to develop cost-effective and sustainable interventions. Exercise therapy, including foot exercises, has the potential to reduce complications, improve functional capacity, and lower healthcare costs.

This community-based intervention was designed to evaluate the impact of diabetic foot exercises on blood glucose control and neuropathic symptoms in individuals with diabetes. The study focuses on the feasibility, acceptability, and outcomes of such programs implemented in real-world settings.

By focusing on simple, low-cost interventions that can be performed at home or in community centers, this study aims to contribute to the development of localized strategies to prevent complications of diabetes, particularly in underserved populations.

2. METHODS

This study utilized a community services technique. The intervention was conducted in a rural community health post in Tangerang Regency over a period of six consecutive days. A total of 10 elderly individuals with type 2 diabetes mellitus were recruited through purposive sampling.

Inclusion criteria included being diagnosed with type 2 diabetes for at least one year, having symptoms of neuropathy (e.g., numbness, tingling), and the ability to perform physical exercise. Exclusion criteria included having foot ulcers, open wounds, or severe musculoskeletal conditions. All participants provided informed consent.

Before the intervention began, participants' fasting blood glucose levels were measured using a standardized glucometer. Neuropathy symptoms were assessed through self-report using the Michigan Neuropathy Screening Instrument (MNSI), which evaluates both symptoms and physical findings.

The diabetic foot exercise intervention included a series of structured movements designed to increase flexibility, strength, and blood flow in the lower extremities. Exercises included toe curls, ankle rotations, heel lifts, and foot tapping, based on protocols from Rosyid & Angraini (2022) and Win et al. (2020).

Participants attended 30-minute guided exercise sessions every day, led by trained community health workers. These sessions included warm-up, core exercise routines, and cool-down phases. The routine was designed to be easy, safe, and feasible for older adults to perform regularly.



Figure 1. Health Promotion Media



Figure 1. Exercise Activity

Participants were also given leaflets containing instructions and illustrations for home practice. They were encouraged to continue the exercises twice daily beyond the formal sessions. Health workers conducted daily monitoring to ensure adherence and safety.

On the seventh day, fasting blood glucose levels were measured again, and a follow-up neuropathy symptom assessment was performed. Descriptive statistics were used to compare pre- and post-intervention outcomes.

Qualitative feedback was also collected from participants regarding their satisfaction, perceived benefits, and challenges experienced during the program. This information was used to assess feasibility and to inform future program adjustments.

3. RESULTS AND DISCUSSION

Diabetes mellitus is a chronic disease that affects millions of people worldwide and is often accompanied by numerous complications, with peripheral neuropathy being one of the most common and debilitating. Neuropathy can cause a variety of symptoms, including numbness, tingling, and pain, which severely affect the quality of life of individuals with diabetes. In this study, the primary aim was to evaluate the effect of diabetic foot exercises on managing these symptoms, as well as their impact on glycemic control. The findings revealed a significant improvement in both the sensory function of the feet and the fasting blood glucose levels of the participants after just six days of foot exercise. These results align with previous studies, including Graciella and Prabawati (2020), who reported that foot exercises could improve neuropathy symptoms and lower blood glucose levels in individuals with type 2 diabetes.

The reduction in fasting blood glucose levels was substantial. Before the intervention, the average fasting blood glucose level of participants was 309 mg/dL, which is considerably higher than the target level for individuals with diabetes. Following the six-day intervention, the average fasting blood glucose decreased to 189 mg/dL, which is a marked improvement and indicates that the foot exercises contributed to better glycemic control. This decrease in blood glucose levels supports findings from Rosyid and Angraini (2022), who found that exercise interventions, including foot exercises, were effective in improving blood glucose regulation in diabetes patients.

In addition to improving blood glucose levels, the foot exercises also had a positive impact on the sensory function in the lower extremities of the participants. Diabetic neuropathy typically leads to a loss of sensation in the feet, which increases the risk of injuries and infections. Participants in this study reported a significant reduction in symptoms such as tingling, numbness, and pain after performing the foot exercises consistently. These findings are consistent with those of Win et al. (2020), who found that hand and foot exercises significantly improved sensory neuropathy symptoms in diabetes patients. The improvement in foot sensitivity is crucial for preventing complications, such as foot ulcers, which are common in individuals with diabetes.

One of the most notable effects of the intervention was the enhanced motivation and self-management among the participants. Many individuals with diabetes struggle to adhere to their treatment regimens, including exercise and lifestyle changes. However, participants

in this study demonstrated increased motivation to continue the exercises independently after the intervention. They reported feeling more in control of their health and expressed greater confidence in managing their diabetes. This improvement in self-efficacy is in line with research by Ferreira et al. (2020), who noted that engaging in self-care practices, such as regular foot exercises, can help diabetes patients take a more active role in managing their condition.

Furthermore, the psychological benefits of the foot exercises were apparent. At the end of the intervention, participants reported feeling less anxious and more positive about their ability to manage their diabetes. Exercise, including foot exercises, has long been known to have a positive effect on mental health by reducing stress and improving mood. As highlighted by Matos et al. (2018), physical activities can significantly improve the mental health of individuals with chronic conditions, such as diabetes. This psychological boost is essential for maintaining long-term adherence to health behaviors and improving overall well-being.

The results of this study also suggest that foot exercises can serve as a cost-effective and low-risk intervention for managing diabetes-related complications. Unlike pharmacological treatments, which often come with side effects and high costs, foot exercises can be performed at home with minimal equipment. This makes them an accessible option for individuals with diabetes, particularly in low-resource settings. The low-cost nature of foot exercises further underscores their potential as a viable intervention for diabetes management in community settings, especially in rural or underserved areas.

The six-day intervention in this study demonstrates that even short-term engagement in foot exercises can lead to meaningful improvements in both glycemic control and neuropathy management. However, it is important to note that the long-term effects of this intervention were not measured in this study. Future research should explore the sustained impact of foot exercises over a more extended period to better understand their long-term benefits and potential for reducing diabetes-related complications. Akbari and Naimi (2022) suggest that exercise therapy's long-term benefits include improving balance and reducing the risk of falls, which should be further investigated in future studies.

One limitation of the current study is the small sample size, which may affect the generalizability of the findings. With only 10 participants, the results may not fully represent the broader population of individuals with diabetes. Additionally, a larger and more diverse

sample would provide more robust data on the effectiveness of foot exercises in different demographic groups, such as those with varying degrees of neuropathy or different cultural backgrounds. Future studies should aim to include a larger, more diverse cohort to strengthen the evidence for the effectiveness of foot exercises in managing diabetes complications.

Despite the small sample size, the study's results are promising and suggest that foot exercises can be incorporated into diabetes management programs. These exercises can be easily taught by healthcare providers and performed independently by individuals at home, making them an excellent addition to the standard treatment regimen for diabetes. The integration of foot exercises into diabetes education programs could empower patients to take control of their health and improve their overall quality of life. As pointed out by Dewi et al. (2021), integrating non-pharmacological interventions like exercise into care plans can be an effective strategy for enhancing patient outcomes and preventing complications.

Moreover, the findings from this study highlight the importance of community-based interventions in managing chronic diseases like diabetes. By engaging participants in community settings, healthcare providers can deliver effective interventions that empower individuals to take charge of their health. This community-based approach has the potential to reach a wide population of individuals who may not otherwise have access to specialized care or medical resources. As shown in this study, when individuals with diabetes are educated about self-care practices, such as foot exercises, they are more likely to incorporate these practices into their daily routines.

The role of healthcare workers in educating patients about diabetes management and self-care practices cannot be overstated. The success of this intervention was largely due to the active involvement of healthcare providers, who guided the participants through the foot exercises and provided ongoing support and education. Future programs should focus on training healthcare workers to deliver similar interventions and encourage patients to engage in regular physical activities. This could lead to a significant reduction in the burden of diabetes-related complications, such as neuropathy and poor glycemic control.

The study also emphasizes the need for further research into non-pharmacological interventions for diabetes management. While medication plays a crucial role in controlling blood glucose levels, combining pharmacological treatments with lifestyle changes, such as exercise, can lead to better overall health outcomes. As noted by Rosyid and Angraini (2022), incorporating exercise interventions into diabetes care could reduce the need for medication

and minimize the risk of side effects. Exploring these complementary treatments could provide new avenues for improving diabetes care.

4. CONCLUSION

In conclusion, this study demonstrates that diabetic foot exercises are a promising intervention for improving blood glucose control and managing peripheral neuropathy in individuals with diabetes. The findings support the incorporation of foot exercises into diabetes management programs, as they offer a low-cost, effective, and accessible way to reduce diabetes-related complications. As the global prevalence of diabetes continues to rise, non-pharmacological interventions like foot exercises could play an essential role in reducing the burden of this chronic disease and improving the quality of life for individuals living with diabetes.

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