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Physiotherapy Counseling in Cases of Type II Diabetes Mellitus with Physical Exercise for the Elderly

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ABSTRACT

Background: *Diabetes mellitus, or 'sugar diabetes', is a chronic, lifelong condition. Type 2 diabetes mellitus is caused by genetic factors, insulin resistance, and environmental factors such as obesity, an unhealthy diet, lack of physical activity, stress and ageing. Therefore, the purpose of this community service activity is to provide physiotherapy counseling in cases of Type II Diabetes Mellitus through physical exercise programs for the elderly at the Elderly Posyandu in Colomadu District.*

Methods: *This community service activity applied an educational and exercise training approach for elderly Posyandu cadres in Colomadu District, Karanganyar Regency, from April to October 2025. The program included health education on Type II Diabetes Mellitus and diabetes exercise training consisting of warm-up, core, and cool-down sessions. Evaluation was conducted through observation of participants' understanding and exercise performance.*

Results: *The community service project demonstrated a clear transition in participant outcomes. While the initial assessment showed a low level of post-intervention results showed improved knowledge and practical skills among posyandu cadres regarding diabetes prevention through physical activity, with correct performance of diabetes exercise increasing from 21.4% (3/14 cadres) before training to 92.9% (13/14 cadres) after training.*

Conclusion: *Diabetes exercise education improved participants' knowledge and skills in performing appropriate physical activity for managing Type II Diabetes Mellitus. Regular exercise may help control blood glucose levels and improve physical fitness among elderly individuals.*

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INTRODUCTION

Unhealthy lifestyle patterns associated with increasing socioeconomic development over time have contributed to the rising prevalence of degenerative diseases, including Type II Diabetes Mellitus. Diabetes Mellitus, commonly known as diabetes, is a chronic metabolic disorder characterized by elevated blood glucose levels resulting from impaired insulin secretion, insulin resistance, or both (1). This condition leads to the body's inability to metabolize carbohydrates, fats, and proteins effectively (2).

The clinical manifestations of Type II Diabetes Mellitus are not limited to hyperglycemia but can also be observed through various daily symptoms, such as

frequent urination, excessive thirst, fatigue, blurred vision, dry mouth, and increased susceptibility to infections and delayed wound healing (3). In addition, individuals with diabetes often experience neurological symptoms, including numbness and tingling sensations, due to peripheral nerve damage (4). If it is not properly managed, this condition can reduce the patient's quality of life.

The increasing number of individuals diagnosed with Type II Diabetes Mellitus, particularly among productive-age and elderly populations, has a significant impact on quality of life (5) Symptoms such as frequent urination and fatigue can interfere with daily activities. This condition occurs because body cells are unable to absorb glucose effectively, prompting the kidneys to excrete excess glucose through urine, resulting in increased urinary frequency (6). Therefore, appropriate management is required to help control blood sugar levels and prevent further complications.

According to the International Diabetes Federation (IDF), approximately 537 million people worldwide were living with diabetes in 2021, and this number is projected to increase to 643 million by 2030 and 783 million by 2045. In Indonesia, the number of individuals diagnosed with diabetes reached 19.5 million in 2021 and is expected to rise to 28.6 million by 2045 (7). These data indicate that diabetes represents a major public health concern requiring comprehensive management and preventive strategies.

If blood glucose levels remain uncontrolled for an extended period, individuals may develop severe complications, including visual impairment, nerve damage, and permanent disability. Therefore, Diabetes Mellitus is often referred to as a *silent killer*, as the disease progresses gradually but may lead to serious consequences if not properly managed (6,8). Regular monitoring of blood sugar levels is essential to prevent long-term complications (9).

Physiotherapy plays an important role in promotive, preventive, curative, and rehabilitative health services aimed at maintaining and restoring movement and functional capacity throughout the lifespan through exercise-based interventions (10). One of the effective non-pharmacological interventions in the management of Diabetes Mellitus is regular physical exercise. Regular physical exercise can help improve insulin sensitivity, improve blood circulation, maintain physical fitness, and help control blood sugar levels, thereby reducing the risk of complications in people with diabetes.

The community service project was strategically located at the Tohudan Village Hall, targeting Posyandu (Integrated Health Post) cadres in Colomadu District, Karanganyar Regency. The primary objectives were to provide comprehensive health education on Type II Diabetes Mellitus and to conduct direct physical training through diabetes exercises to prevent or slow down disease complications. An analysis of the location revealed significant challenges, specifically a low level of empowerment among Posyandu cadres regarding their knowledge of health maintenance and prevention through movement.

Additionally, the program had to address the rising prevalence of degenerative diseases in the area, which is linked to unhealthy lifestyle patterns. Despite the successful improvement in participants' skills, the project faced a limitation in duration, which restricted the evaluation to immediate knowledge and performance rather than long-term clinical outcomes like blood glucose changes. Analysis of the community service location in the Banabungi Community Health Center area shows a high prevalence of diabetes mellitus, with major challenges including low levels of physical activity and poor blood glucose control; among 50 respondents, 42 (84%) had uncontrolled blood glucose levels, and the majority had light physical activity (48 respondents, 96%), therefore, the

objective of the community service is to improve knowledge and the implementation of the four pillars of diabetes management to enhance community health outcomes (11).

METHODS

This community service project, held at the Tohudan Village Hall for elderly Posyandu cadres, was implemented in collaboration with the village midwife in the Tohudan area and cadres from seven elderly Posyandu posts, namely Senden, Bendo, Tohudan Wetan, Tohudan Kulon, Klipan, Daratan, and Kepoh. Each Posyandu was represented by two cadres, with each Posyandu serving approximately 15–20 older adults. The program began with pre-activity coordination and the development of educational materials by the Physiotherapy Department of Poltekkes Kemenkes Surakarta. The implementation followed a structured procedure involving health education on Type II Diabetes Mellitus and practical diabetes exercise training based on the F.I.T.T. (Frequency, Intensity, Time, and Type) and CRIPE (Continuous, Rhythmical, Interval, Progressive, Endurance) principles, led by qualified physiotherapy professionals. The impact was measured through a before-and-after evaluation using observation of participants' understanding and performance, which showed an improvement from limited initial knowledge to the ability to correctly perform diabetes exercises.

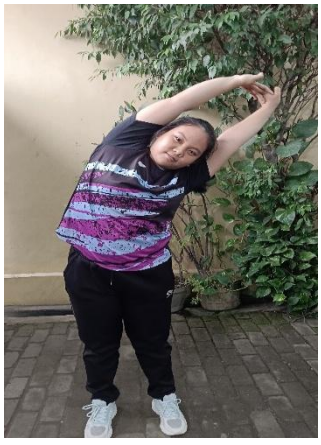
Diabetes exercises are a physical exercise program designed according to age and physical condition and form part of diabetes mellitus management. Conditions are part of the treatment of diabetes mellitus. Diabetes exercises are performed regularly for 30-60 minutes, 2-5 times a week. Research by Allen (12) shows that regular and consistent exercise can reduce insulin requirements by 30-50% and lower blood glucose levels (13). Diabetes exercises consist of a warm-up (5-10 minutes), core exercises (20-30 minutes), and a cool-down (5-10 minutes). The principles of exercise for people with diabetes must comply with CRIPE (Continuous, Rhythmical, Interval, Progressive, Endurance) (14).

1. Stretching

a. Movement 1

Feet shoulder-width apart. Place both hands above your head. Tilt your body and head to the right. Looking forward. Hold for a count of eight. Return to center and repeat on the opposite side.





b. Movement 2

Feet shoulder-width apart. Hands clenched at your sides, shoulders raised and rotated. On each count, the shoulders are lifted. Perform 4 counts of 8.





2. Warm-Up

a. Movement 1

Feet shoulder-width apart. Bend your knees and move them up and down. Hold your hands in front of your chest, waving your palms. Perform 2 x 8 counts, alternating between left, forward, and right lunges.



b. Movement 2

Feet shoulder-width apart. Knees bent, move up and down. Elbows raised to chest height with palms moving as if rolling a ball. Perform 2 x 8 counts alternately in a right, forward, and left oblique position



3. Core Movement

a. Movement 1

Raise your right knee parallel to your thigh. Straighten your left leg. Swing both elbows in front of your chest (right hand up). Alternately, lift your left knee, straightening your right leg. Swing both elbows in front of your chest (left hand up). Repeat this for a count of 1 x 8.




b. Movement 2

Step your feet shoulder-width apart. Step alternately to the left and right, one step at a time. Push your hands up and down, clenching your fists. Repeat for a count of 1 x 8.




4. Cool Down

a. Movement 1

Leg shoulder-width apart, body upright facing forward. Right hand holds left shoulder, left hand hugs right waist. Bend right leg for two counts, left leg straightened; then bend right leg for two counts, left leg straightened. Do this alternately for 1 x 8.



b. Movement 2

Step your feet shoulder-width apart, your body upright, facing forward, and your arms outstretched. Bend your right leg for two counts, straighten your left leg; then alternately bend your left leg for two counts, straightening your right leg. Repeat this for 1 count of 8.



The implementation method that will be used after education is Type II Diabetes Mellitus for the elderly. Most of the activity details will be explained as follows: (a) The first meeting, held in Colomadu District, Karanganyar Regency, will provide guidance on community service activities for the elderly and provide educational information about Type II Diabetes Mellitus for the elderly; and (b) The second meeting will provide physical exercise (diabetes gymnastics).

RESULTS

The community service project was conducted at the Tohudan Village Hall in collaboration with the village midwife and elderly Posyandu cadres from seven Posyandu areas, namely Senden, Bendo, Tohudan Wetan, Tohudan Kulon, Klipan, Daratan, and Kepoh, in Tohudan Village, Colomadu District, Karanganyar Regency. Each Posyandu was represented by two cadres, resulting in a total of 14 participants. These Posyandu posts serve approximately 15–20 older adults per post, reflecting a broad community reach for health promotion activities among the elderly.

Initial observations indicated that the implementation of elderly exercise activities varied across Posyandu, with several Posyandu already conducting routine activities while others had not yet implemented them consistently. Therefore, this program aimed to strengthen cadres' understanding and skills regarding Type II Diabetes Mellitus prevention and diabetes exercise implementation as part of healthy aging promotion. The intervention consisted of health counseling on Type II Diabetes Mellitus and practical diabetes exercise training based on the F.I.T.T. (Frequency, Intensity, Time, and Type) and CRIPE (Continuous, Rhythmical, Interval, Progressive, Endurance) principles. The training included structured warm-up, core exercise, and cool-down sessions and was delivered by physiotherapy professionals from the Physiotherapy Department of Poltekkes Kemenkes Surakarta, adjusted to the age and physical condition of older adults.

Table 1. Changes in Posyandu Cadres' Practical Skills in Performing Diabetes Exercise Before and After Training

Assessment Period	Correct Performance of Diabetes Exercise, n (%)	Incorrect Performance, n (%)	Total (n)
Before Training	3 (21.4%)	11 (78.6%)	14
After Training	13 (92.9%)	1 (7.1%)	14

Evaluation findings demonstrated improvement in cadres' practical skills and confidence in conducting diabetes exercises. Before the training, only 3 of 14 cadres (21.4%) were able to correctly demonstrate diabetes exercise movements, whereas after the intervention, 13 of 14 cadres (92.9%) were able to perform the movements correctly. In addition, cadres reported improved understanding of the role of physical activity in diabetes prevention and management. Importantly, following the intervention, diabetes exercise activities began to be implemented more routinely in elderly Posyandu activities and were positively accepted as a beneficial program for older adults in maintaining physical fitness and supporting diabetes prevention. These findings suggest that the program contributed to strengthening community-based elderly health promotion by encouraging more regular physical activity practices through Posyandu services.

DISCUSSION

The implementation of physiotherapy education and diabetes exercise training showed a positive impact on participants' knowledge and skills in managing Type II Diabetes Mellitus. The improvement in participants' ability to perform diabetes exercises indicates that combining health education with practical training is an effective approach to promoting healthy behaviors and increasing awareness of the importance of regular physical activity in preventing diabetes-related complications (15). However, several limitations were identified during the implementation of this community service program. The duration of the activity was relatively short, and the evaluation focused mainly on participants' knowledge and exercise performance rather than long-term clinical outcomes such as changes in blood glucose levels. Therefore, continuous and sustainable implementation of similar programs is recommended to achieve better long-term health benefits for individuals with Type II Diabetes Mellitus (16).

The improvement in participants' knowledge and skills observed in this community service aligns with the findings of various studies emphasizing the effectiveness of health education in managing metabolic disorders. For instance, research indicates that structured educational interventions can significantly bridge the knowledge gap among community health workers, enabling them to become more proactive in preventive care. In the context of Tohudan Village, the transition of cadres from a "low level of empowerment" to being "able to perform exercises correctly" mirrors the success of similar programs where practical training was found to be more effective than theoretical instruction alone in sustaining health-seeking behaviors.

The focus on diabetes gymnastics as a non-pharmacological intervention is supported by clinical evidence showing that regular physical activity improves insulin sensitivity. Previous studies, such as those by Allen, have demonstrated that consistent exercise can reduce insulin requirements by as much as 30-50% and significantly lower blood glucose levels. By adhering to the F.I.T.T and CRIPE principles during the training in Tohudan, this program ensures that the exercises are not only safe but also

metabolically effective for the elderly population, consistent with established physiotherapy protocols.

Furthermore, the utilization of Posyandu cadres as the primary partners in this activity is a strategic approach often cited in public health literature as a means to ensure program sustainability. Community-based interventions that empower local leaders tend to have a higher success rate in fostering long-term compliance among the elderly. This is particularly relevant given the "silent killer" nature of Diabetes Mellitus, where gradual progression requires constant monitoring and community-level support to prevent severe complications like visual impairment or nerve damage.

The positive results in Tohudan also highlight the critical role of physiotherapy in promotive and preventive health services. As noted in national health guidelines, exercise-based interventions are essential for maintaining functional capacity throughout the lifespan. By training cadres to demonstrate specific movemeculturally sensitivees and stretching routines used in this project—the program reinforces the findings of Previous research which suggests that localized, culturally-sensitive exercise programs are more likely to be adopted by elderly individuals in rural settings.

Despite these successes, the identified limitation regarding the short duration of the project echoes a common challenge found in many community service evaluations. Studies suggest that while knowledge and performance can improve rapidly, long-term clinical outcomes such as significant changes in blood glucose levels require consistent monitoring over a more extended period. Therefore, the suggestion to integrate these diabetes exercises into the routine activities of the Elderly Posyandu is a crucial step towards achieving the objective of community-based prevention and long-term health management.

The findings of this community service program are also consistent with studies highlighting the role of combined educational and behavioral interventions in improving self-management among patients with chronic diseases. Previous research has demonstrated that individuals who receive both theoretical knowledge and hands-on training tend to exhibit better adherence to lifestyle modifications, including regular physical activity and dietary control. In this context, the integration of physiotherapy education with structured diabetes exercise training in Tohudan Village reinforces the concept that experiential learning enhances both comprehension and long-term behavioral change.

In addition, the improvement in cadres' competencies aligns with evidence from community-based participatory research, which emphasizes the importance of empowering local health actors as agents of change. Studies have shown that when community leaders are equipped with practical skills and culturally appropriate knowledge, they are more effective in disseminating health information and influencing community behavior. This supports the approach used in this program, where Posyandu cadres were not only passive recipients of information but were actively trained to become facilitators of diabetes prevention activities.

Furthermore, the observed outcomes are in line with research on adult learning theory, which suggests that learning is more effective when it is problem-centered and directly applicable to real-life situations. The practical demonstration of diabetes exercises allowed participants to immediately apply the knowledge they received, thereby strengthening retention and skill acquisition (15,17,18). Similar findings have been reported in physiotherapy-based interventions, where active participation significantly improves motor learning and confidence, especially among older adults.

The emphasis on structured exercise following the F.I.T.T and CRIPE principles also reflects best practices identified in clinical and rehabilitation studies. Previous literature indicates that exercise programs that are well-structured in terms of frequency, intensity, time, and type are more likely to produce measurable physiological benefits, including improved glucose metabolism and cardiovascular endurance. By applying these principles, the program ensures alignment with evidence-based physiotherapy standards, thereby increasing the likelihood of achieving both short-term and long-term health outcomes.

Lastly, the program's focus on sustainability through cadre involvement is supported by health promotion models such as the PRECEDE-PROCEED framework (19), which underscores the importance of reinforcing and enabling factors in sustaining behavioral change. Studies have shown that interventions embedded within existing community structures, such as Posyandu, are more sustainable and scalable compared to externally driven programs. Therefore, the success observed in Tohudan Village not only validates the current approach but also provides a model that can be replicated in other communities facing similar challenges in managing Type II Diabetes Mellitus.

CONCLUSIONS AND SUGGESTIONS

The community service activity in the form of physiotherapy education and diabetes exercise training for Posyandu cadres in Tohudan Village was able to improve participants' understanding and skills in performing appropriate physical activity for individuals with Type II Diabetes Mellitus. Through direct practice and guidance, participants became more confident in carrying out diabetes exercise and more aware of the importance of regular physical activity in maintaining physical fitness and preventing complications. It is recommended that diabetes exercise programs be conducted regularly and continuously in community settings such as Posyandu to support long-term health management among elderly individuals. Future activities may include routine monitoring of health indicators, such as blood glucose levels, to evaluate the effectiveness of the program more objectively and to strengthen community-based prevention efforts.

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DECLARATION OF USE OF AI IN SCIENTIFIC WRITING

AI tools were used solely for grammar and language editing. The authors take full responsibility for the content and integrity of the manuscript.

CONFLICT OF INTERESTS

The author states that no conflicts of interest were identified in the implementation of this community service activity.

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