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Effects of video-assisted diabetic foot exercises on self-efficacy and glycemic control in adults with type 2 diabetes mellitus

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Abstract

Background: Type 2 diabetes mellitus (DM) is a chronic disease characterized by elevated blood sugar levels due to insulin resistance. DM management involves more than just pharmacological therapy, but also requires non-pharmacological interventions such as physical activity. Video-assisted DM foot exercises are a simple form of exercise that can be performed independently by DM sufferers.

Purpose: To determine the effect of video-assisted DM foot exercises on random blood sugar levels in type 2 DM sufferers.

Method: A pre-experimental design with a one-group pre-test–post-test approach. The sample consisted of 25 type 2 diabetes patients selected using a purposive sampling technique. The intervention, which included video-based DM foot exercises, was administered according to established procedures. Random blood sugar levels were measured before and after the intervention. Data were analyzed using a paired t-test.

Results: The average random blood sugar level before the intervention (pre-test) was 223.88 mg/dL and after the intervention (post-test) it decreased to 185.40 mg/dL. The results of the Paired t-test showed a t value = 4.811 with a p-value = 0.000 ($p < 0.05$), which indicates a significant effect of DM foot exercise with video media on reducing random blood sugar levels.

Conclusion: DM foot exercises using video media have a significant effect on reducing random blood sugar levels in type 2 DM patients. It is recommended that DM foot exercises can be implemented routinely as a non-pharmacological intervention in primary health care.

Keywords: DM Foot Exercises; Random Blood Sugar Levels; Type 2 Diabetes Mellitus; Video Media.

INTRODUCTION

Diabetes mellitus (DM) is often referred to as the *silent killer* because many individuals are unaware that they have the disease until acute or chronic complications have already developed (Sari, Wijayanto, Subekti, Suprpti, & Maryuni, 2021). Type 2 diabetes mellitus (T2DM) is the most common form of diabetes, in which the pancreas continues to produce insulin; however, the body's tissues become resistant to its action, resulting in persistently elevated

blood glucose levels (Kriswiasitny, Hidayat, Mustofa, & Hermawan, 2022). The development of T2DM is influenced by multiple risk factors, including diets high in sugar and fat, physical inactivity, obesity, psychological stress, and a family history of diabetes (Novitasari, Ariqoh, Adriani, & Kurniasih, 2022). Modern lifestyles characterized by sedentary behavior and frequent consumption of high-calorie processed foods further accelerate the development of insulin

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resistance. In addition, limited public awareness of healthy lifestyle practices makes blood glucose control more difficult and increases the risk of chronic complications if the disease is not appropriately managed (Magliano, Boyko, & Atlas, 2021).

Globally, the prevalence of diabetes continues to increase each year. According to the World Health Organization (WHO) report in 2024, approximately 537 million adults worldwide are living with diabetes, and this number is projected to increase to 643 million by 2030. In Indonesia, data from the International Diabetes Federation (IDF) in 2024 estimated that approximately 19.5 million people were living with diabetes, making Indonesia the country with the fifth-highest number of diabetes cases worldwide. Among the 38 provinces in Indonesia, South Kalimantan reported the highest prevalence (44.13%), while Lampung Province ranked 16th with a prevalence of 29.94% (Nasution, 2024). The prevalence of physician-diagnosed T2DM in Lampung Province increased from 7.4% in 2013 to 15.10% in 2018, representing approximately 545,625 cases. By 2024, the number of reported cases had increased to 1,825,516 (28.22%), with South Lampung Regency ranking fifth among the districts with the highest prevalence (30.4%) (Nuraeni & Arjita, 2019). According to the monthly reports from the South Lampung District Health Office, approximately 1,803 patients with T2DM were registered at Tanjung Bintang Community Health Center between 2022 and 2024. In 2023, the health center ranked third in the district for the highest number of diabetes cases, with approximately 762 patients (Nurhayani, 2022). A preliminary survey conducted by the researchers at Tanjung Bintang Community Health Center showed that 409 patients with T2DM attended routine follow-up visits between January and September 2025, most of whom were aged 45–60 years. However, the majority of these patients had not participated in regular physical exercise programs such as diabetic foot exercises, despite their recognized role in improving blood glucose control.

The management of T2DM involves not only pharmacological treatment but also non-pharmacological approaches, including dietary modification, stress management, and regular physical activity. One form of low-impact exercise recommended for individuals with diabetes is diabetic foot exercise (Syaqila & Hakim, 2023). Diabetic foot

exercise is a simple exercise program specifically designed to improve blood circulation in the lower extremities, maintain joint mobility, strengthen the foot muscles, and enhance lower limb function. The exercise consists of a series of structured stretching and movement routines performed regularly (Balqis, Risanti, & Ermawati, 2025). Previous studies have demonstrated the effectiveness of diabetic foot exercise in reducing blood glucose levels. One study involving 12 patients with diabetes mellitus reported a significant reduction in mean blood glucose levels from 193.58 mg/dL before the intervention to 140.05 mg/dL after the intervention (Widiyono, Suwarni, Winarti, & Dewi, 2021). Another study involving 35 patients found that the mean blood glucose level decreased from 251.06 mg/dL before the intervention to 233.54 mg/dL after diabetic foot exercise (Khatimah, Mutmainna, & Suarnianti, 2022). Similarly, Agustina and Armiyati (2025) reported that the mean blood glucose level decreased from 179.38 mg/dL before diabetic foot exercise to 159.00 mg/dL after the intervention among 16 patients with diabetes mellitus.

Despite these benefits, many patients continue to experience difficulty learning diabetic foot exercise through conventional verbal education alone. This educational approach often results in poor retention of the exercise sequence and reduced confidence in performing the exercises independently at home. Therefore, more engaging and accessible educational media, such as instructional videos, are needed. Video-based education enables patients to observe the correct movements, repeat sections that are difficult to understand, and increase their motivation to practice independently (Rahmawati, Dewy, & Udiyani, 2024). Previous research has shown that video-assisted diabetic foot exercise education significantly reduced blood glucose levels among patients with T2DM at a community health center in Surabaya (Lestari, Rahmasari, Karyati, & Jauhar, 2024). Furthermore, patients who performed diabetic foot exercises regularly for four weeks experienced an average reduction of 25 mg/dL in fasting blood glucose levels compared with the control group (Nabila, 2025). These findings suggest that combining video-based educational media with structured physical exercise is an effective strategy for improving glycemic control among patients with type 2 diabetes mellitus (Nursa, Fauzi, & Habibi, 2022).

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RESEARCH METHOD

A quantitative experimental design using a pre-experimental one-group pretest-posttest design. Ethical approval was obtained from the Health Research Ethics Committee (HREC) of Universitas Mitra Indonesia prior to data collection. The study was conducted at Tanjung Bintang Community Health Center, South Lampung Regency, Indonesia. The study population consisted of patients diagnosed with type 2 diabetes mellitus (T2DM) who routinely attended the community health center. A total of 25 participants were recruited using a purposive sampling technique based on predetermined inclusion and exclusion criteria. The intervention consisted of diabetic foot exercises delivered through video-based educational media according to a standardized procedure. Random blood glucose (RBG) levels were measured before (pretest) and after (posttest) the intervention using standard blood glucose measurement procedures. Data were analysed using the paired t-test, with a significance level set at $p < 0.05$.

To strengthen the rationale for the study, a preliminary survey was conducted on September 8, 2025, involving 15 patients with type 2 diabetes mellitus who routinely attended Tanjung Bintang Community Health Center. The survey revealed that most participants had random blood glucose levels above the normal range. Interviews with the nurse responsible for the Non-Communicable Disease

(NCD) program indicated that the number of patients with T2DM attending the health center was relatively high, and many experienced difficulties in controlling their blood glucose levels. Diabetes management at the health center primarily focused on pharmacological treatment and general dietary education, whereas non-pharmacological interventions, particularly diabetic foot exercises, had not been implemented routinely or systematically using educational media such as instructional videos. In addition, interviews with patients revealed that most had never participated in a structured diabetic foot exercise program. Several participants reported limited understanding of the types and sequence of foot exercise movements and experienced difficulty performing the exercises independently at home due to the lack of clear visual guidance. Most participants also relied mainly on medication to control their blood glucose levels and rarely engaged in structured physical activity. These findings were supported by the preliminary random blood glucose measurements, which indicated that most participants had elevated blood glucose levels. Based on these findings, the researchers implemented a video-assisted diabetic foot exercise program as an accessible, practical, and self-directed intervention to help improve random blood glucose control among patients with type 2 diabetes mellitus at Tanjung Bintang Community Health Center, South Lampung Regency.

RESEARCH RESULTS

Table 1. Distribution of Respondent (N= 25)

Variable	Results
Age (Mean $\pm$ SD)(Range)(Year)	(56.8 $\pm$ 8.4)(42–71)
Gender (n/%)	
Male	7/28.7
Female	18/72.0
Education (n/%)	
Not Enrolled in School	2/8.0
Elementary School	9/36.0
Junior High School	5/20.0
Senior High School	9/36.0
Occupation (n/%)	

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Unemployed	4/16.0
Farmer	5/5.0
Self-Employed	6/24.0
Merchant	3/12.0
Civil Servant	4/16.0
Laborer	3/12.0

Table 1 presents the demographic characteristics of the 25 participants. The mean age of the participants was 56.8 ± 8.4 years, with an age range of 42–71 years. Most participants were female (18, 72.0%), while 7 participants (28.0%) were male. Regarding educational attainment, the largest proportions had completed elementary school and senior high school, with 9 participants (36.0%) in each category, followed by junior high school (5, 20.0%) and participants who had never attended school (2, 8.0%). In terms of occupation, the largest group was self-employed (6, 24.0%), followed by farmers (5, 20.0%), unemployed individuals and civil servants (4, 16.0% each), and merchants and labourers (3, 12.0% each).

Table 2. Mean Random Blood Glucose Levels Before and After the Intervention

Variable	Mean	SD	Min-Max	95% CI
Before	223.88	52.764	161-362	202.01-245.66
After	185.40	45.789	128-309	166.50-204.30

Table 2 presents the descriptive statistics of random blood glucose levels before and after the video-assisted diabetic foot exercise intervention among 25 participants with type 2 diabetes mellitus. Before the intervention, the mean random blood glucose level was 223.88 ± 52.76 mg/dL, with values ranging from 161 to 362 mg/dL and a 95% confidence interval (CI) of 202.01–245.66 mg/dL. After the intervention, the mean random blood glucose level decreased to 185.40 ± 45.79 mg/dL, with values ranging from 128 to 309 mg/dL and a 95% confidence interval of 166.50–204.30 mg/dL. These findings indicate a reduction in the mean random blood glucose level following the implementation of the video-assisted diabetic foot exercise intervention.

Table 3. Results of the Normality Test

Variable	P-Value
(pre-test)	0.093
(post-test)	0.105

Based on the normality test results presented in Table 3, the Shapiro–Wilk test was used because the study included fewer than 50 participants. A *p*-value greater than 0.05 indicates that the data are normally distributed, whereas a *p*-value less than 0.05 indicates a non-normal distribution. The results showed that the random blood glucose data before the intervention (*pre-test*) had a *p*-value of 0.093, while the data after the intervention (*post-test*) had a *p*-value of 0.105. Since both *p*-values were greater than 0.05, the random blood glucose data before and after the intervention were considered to be normally distributed. Therefore, the data met the assumptions for parametric statistical analysis, and a paired *t*-test was performed to determine the difference in random blood glucose levels before and after the implementation of the video-assisted diabetic foot exercise intervention.

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Table 4. The Effect of Diabetes Foot Exercises Using Video on Random Blood Glucose Levels

Variable	Mean	SD	SE	t-test	P-value
(pre-test)	223.88	39.992	7.998	4.811	0.000
(post-test)	185.40				

Based on Table 4, the analysis showed that the mean random blood glucose level among patients with type 2 diabetes mellitus before the video-assisted diabetic foot exercise intervention (*pre-test*) was 223.88 mg/dL. Following the intervention (*post-test*), the mean random blood glucose level decreased to 185.40 mg/dL. The results of the paired *t*-test revealed a standard deviation of 39.992, a standard error of 7.998, and a *t*-value of 4.811. The obtained *p*-value was 0.000 ($p < 0.05$), indicating a statistically significant difference in random blood glucose levels before and after the video-assisted diabetic foot exercise intervention. Therefore, it can be concluded that the video-assisted diabetic foot exercise intervention had a significant effect on reducing random blood glucose levels among patients with type 2 diabetes mellitus.

DISCUSSION

Based on the pre-test results, the mean random blood glucose level among patients with type 2 diabetes mellitus before receiving the video-assisted diabetic foot exercise intervention was 223.88 mg/dL, with a standard deviation of 52.764 mg/dL. The lowest random blood glucose level was 161 mg/dL, while the highest was 362 mg/dL, indicating a relatively wide range of values. The 95% confidence interval ranged from 202.01 to 245.66 mg/dL, suggesting that most participants were in a hyperglycaemic state before the intervention (Patria, Antoro, Sari, & Andora, 2023). Previous studies have reported that the mean random blood glucose level among patients with type 2 diabetes mellitus prior to physical activity interventions is generally above 200 mg/dL (Rahman, Maryuni, & Rahmadhani, 2021). Furthermore, most patients with type 2 diabetes mellitus receiving primary healthcare services have uncontrolled random blood glucose levels due to inadequate structured physical activity and insufficient ongoing health education (Soleman, 2023). Theoretically, a

random blood glucose level of ≥ 200 mg/dL is one of the diagnostic criteria for diabetes mellitus and indicates suboptimal glycaemic control (Andriani & Hasanah, 2023).

The elevated random blood glucose levels observed in patients with type 2 diabetes mellitus are primarily caused by insulin resistance and impaired insulin secretion by pancreatic β -cells, resulting in the ineffective utilization of glucose by body tissues. This condition may be further aggravated by low levels of physical activity, unhealthy dietary patterns, and poor adherence to pharmacological therapy. The relatively high standard deviation observed in the pre-test results indicates considerable variation in blood glucose levels among participants. Such variability may be influenced by differences in age, duration of diabetes, daily dietary habits, physical activity levels, and adherence to prescribed pharmacological treatment (Smeltzer & Bare, 2018). In addition, psychological factors, particularly stress, are known to contribute to elevated blood glucose levels through increased secretion of stress hormones such as cortisol and adrenaline (Defirson & Azizah, 2021).

The findings of the present study indicate that the high mean random blood glucose level during the pre-test reflects that most participants were in a hyperglycaemic condition requiring comprehensive management through both pharmacological and non-pharmacological approaches. This finding highlights the importance of implementing video-assisted diabetic foot exercises as a simple and practical intervention to promote physical activity and improve insulin sensitivity. Moreover, the pre-test findings provide an important baseline for evaluating the effectiveness of the intervention during the post-test, allowing changes in random blood glucose levels to be interpreted objectively and scientifically (Pratiwi, Hediningsih, & Isworo, 2021).

Based on the post-test results, following the implementation of the video-assisted diabetic foot

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exercise intervention, the mean random blood glucose level among patients with type 2 diabetes mellitus decreased to 185.40 mg/dL, with a standard deviation of 45.789 mg/dL. The lowest and highest random blood glucose levels were 128 mg/dL and 309 mg/dL, respectively, with a 95% confidence interval of 166.50–204.30 mg/dL. These findings indicate a reduction in random blood glucose levels following the intervention compared with the pre-test results. This finding is consistent with previous studies reporting a significant reduction in random blood glucose levels among patients with type 2 diabetes mellitus after regularly performing diabetic foot exercises (Wahyu & Nur, 2023). Furthermore, diabetic foot exercise education and training delivered through audiovisual media have been shown to be more effective in reducing blood glucose levels than conventional educational methods without multimedia support (Mustofa, Purwono, & Ludiana, 2021).

Theoretically, physical activity such as diabetic foot exercise enhances insulin sensitivity and promotes glucose uptake by skeletal muscles. Muscle contraction during exercise stimulates the translocation of glucose transporter type 4 (GLUT-4) to the muscle cell membrane independently of insulin, thereby facilitating glucose uptake into the cells for energy production (Mega, 2021). Regular physical activity has also been shown to contribute to improved glycemic control among patients with type 2 diabetes mellitus (Decroli, 2019). In addition, the use of video media plays an important role in improving the effectiveness of diabetic foot exercise interventions. Video-based education enables participants to better understand the exercise movements, increases motivation, and allows them to perform the exercises independently and repeatedly at home. According to multimedia learning theory, the combination of visual and auditory elements enhances individuals' comprehension and retention of health-related information (Ningrum, Wartini, & Isnayati, 2020).

The reduction in the standard deviation observed in the post-test compared with the pre-test indicates that the variation in blood glucose levels among participants became smaller following the intervention. This finding suggests that the video-assisted diabetic foot exercise intervention produced a relatively consistent effect across most participants, although individual factors such as dietary habits, medication adherence, and physical condition may

still have influenced the outcomes (Zatihulwani, Prawito, & Sasmito, 2024).

The findings of the present study suggest that video-assisted diabetic foot exercise is an effective and practical non-pharmacological intervention for reducing random blood glucose levels among patients with type 2 diabetes mellitus. This intervention is particularly suitable for implementation in primary healthcare settings, such as community health centers, because it is simple to perform, requires no specialized equipment, and can be adapted to patients' physical abilities. The reduction in blood glucose levels observed during the post-test also highlights the important role of nurses in providing health education and facilitating physical activity as part of comprehensive diabetes management.

The paired *t*-test analysis demonstrated that the mean random blood glucose level decreased from 223.88 mg/dL before the intervention (pre-test) to 185.40 mg/dL after the video-assisted diabetic foot exercise intervention (post-test). The statistical analysis yielded a *t*-value of 4.811 with a *p*-value of 0.000 ($p < 0.05$), indicating that the intervention had a statistically significant effect on reducing random blood glucose levels among patients with type 2 diabetes mellitus. The mean reduction of 38.48 mg/dL suggests that the intervention was not only statistically significant but also clinically meaningful. Furthermore, the standard deviation of 39.992 and the standard error of 7.998 indicate acceptable variability within the data, supporting the reliability of the findings in representing the study population (Putri, Safitri, Hamidah, & Setyaningsih, 2024).

The findings of this study are consistent with previous research demonstrating the effectiveness of diabetic foot exercises in improving glycaemic control. A pre-post-test study involving 30 patients with type 2 diabetes mellitus reported a reduction in the mean random blood glucose level from 236.4 ± 41.2 mg/dL to 198.7 ± 36.5 mg/dL, with a paired *t*-test result of $p = 0.001$ (Zatihulwani, Sasmito, & Putra, 2025). These findings indicate that diabetic foot exercises significantly reduce random blood glucose levels. Similarly, another study involving 28 patients with type 2 diabetes mellitus reported a decrease in the mean random blood glucose level from 221.6 mg/dL before the intervention to 179.3 mg/dL after audiovisual-based diabetic foot exercise, with the Wilcoxon Signed Rank Test showing a significant result ($p =$

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0.000) (Febrinasari, Sholikhah, Pakha, & Putra, 2020). These findings suggest that audiovisual media further enhance the effectiveness of diabetic foot exercise interventions. Likewise, another study using a paired *t*-test reported a mean reduction of 32.5 mg/dL in blood glucose levels after two weeks of structured physical activity ($p = 0.003$), reinforcing the role of regular low-intensity physical activity as an effective complementary therapy for patients with type 2 diabetes mellitus (Pramesti, Pranomo, & Wulandari, 2023).

Theoretically, diabetic foot exercise is a form of low-intensity physical activity that involves repeated contractions of the lower extremity muscles. These muscle contractions enhance glucose uptake by skeletal muscle cells through the insulin-independent translocation of glucose transporter type 4 (GLUT-4) to the cell membrane, thereby reducing blood glucose levels (Fadlim, Kurniasari, & Andora, 2024). In addition, regular physical activity improves insulin sensitivity and reduces insulin resistance, which is the primary pathophysiological mechanism underlying type 2 diabetes mellitus (Fauziansyah, Arifin, Pitaloka, & Miyah, 2025). The use of video media further enhances the effectiveness of diabetic foot exercise interventions. Audiovisual media enable participants to follow the exercise movements correctly, increase motivation, and facilitate independent learning and repeated practice. Multimedia-based learning has been shown to improve individuals' understanding and retention of health information by integrating visual and auditory elements, particularly among adults and older adults (Kautzky-Willer, Harreiter, & Pacini, 2016).

The consistency between the findings of the present study and those of previous studies suggests that video-assisted diabetic foot exercise is a reliable and effective intervention for reducing random blood glucose levels among patients with type 2 diabetes mellitus. The use of video media provides additional benefits by improving adherence to the exercise program and ensuring that the movements are performed correctly, particularly among participants with lower educational attainment. Therefore, video-assisted diabetic foot exercise is recommended as a sustainable component of type 2 diabetes mellitus management programs in primary healthcare centers and community-based healthcare settings (Ruben, Rottie, & Karundeng, 2016).

CONCLUSION

The results of the statistical analysis using a paired *t*-test showed a calculated *t*-value of 4.811 with a *p*-value of 0.000 ($p < 0.05$), indicating that the use of video-based foot exercises for people with diabetes had a significant effect on reducing random blood glucose levels in patients with type 2 diabetes.

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