

Knowledge of Diabetic Foot Exercises for Diabetic Foot Ulcer Prevention Among Patients with Type 2 Diabetes Mellitus at Purbalingga Community Health Center

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Abstract

Type 2 diabetes mellitus risks causing diabetic foot ulcer complications. Diabetic foot exercise is a preventive measure to improve blood circulation and reduce the risk of diabetic foot ulcers. However, no specific data describes patients' knowledge level regarding diabetic foot exercise at Purbalingga Primary Health Center. The purpose of this study is to describe the knowledge level of type 2 diabetes mellitus patients regarding diabetic foot exercise as prevention of diabetic foot ulcers at Purbalingga Primary Health Center. The method used is quantitative descriptive with a cross-sectional approach. The population consisted of all type 2 diabetes mellitus patients in the Prolanis program at Purbalingga Primary Health Center. A sample of 31 respondents was selected using purposive sampling. Data were analyzed univariately. The results showed most respondents were aged 45–59 years (54.84%), had senior high school education (41.94%), and had suffered from diabetes mellitus for 5–10 years (41.94%). Most respondents had good knowledge (58.06%), moderate (32.26%), and poor (9.68%). The conclusion of this study is that most patients have good knowledge regarding diabetic foot exercise as prevention of diabetic foot ulcers.

Keywords: Knowledge, Type 2 Diabetes Mellitus, Diabetic Foot Exercises.

A. INTRODUCTION

Diabetes mellitus (DM) is a non-communicable disease that remains a major public health concern due to the increasing number of cases and the risk of complications (Ningrum et al., 2022). This condition is characterized by elevated blood glucose levels resulting from impaired insulin production or the body's inability to use insulin effectively (Rahmadianty et al., 2025). In its early stages, diabetes mellitus often presents with no obvious symptoms and is therefore sometimes referred to as a silent killer (Nopriani, 2021). The World Health Organization (WHO 2024) defines diabetes as a metabolic disorder that occurs when the body cannot produce insulin or use it effectively.

Globally, the number of people with diabetes mellitus continues to increase. According to the WHO (2024), the prevalence of diabetes increased from 7% in 1990 to 14% in 2022. The disease was also responsible for approximately 1.6 million deaths, with 47% occurring before the age of 70. The International Diabetes Federation (IDF, 2025) reported that approximately 11.1% of adults aged 20–79 years worldwide were living with diabetes. In Southeast Asia, the prevalence of diabetes was estimated at 13.2%, with 42.7% of cases remaining undiagnosed (IDF, 2025). In Indonesia, approximately 19.47 million people were living with diabetes in 2021, making the

country the fifth highest worldwide in terms of the number of people with diabetes (Ministry of Health of the Republic of Indonesia, 2025). In Central Java, diabetes mellitus ranked third among non-communicable diseases, while the total number of newly recorded cases of non-communicable diseases reached 624,082 (Central Java Provincial Health Office, 2023). In Purbalingga Regency, the number of people with diabetes mellitus was estimated at 13,759 (Purbalingga Health Office, 2024).

Data from Purbalingga Community Health Center in 2025 recorded 541 patients with diabetes mellitus. These figures indicate that diabetes mellitus remains a health problem requiring particular attention, especially regarding the prevention of complications. One of the common complications of diabetes mellitus is a diabetic foot ulcer, which is associated with impaired blood circulation and nerve damage or neuropathy (Sandy et al., 2023). Neuropathy resulting from uncontrolled blood glucose levels can cause loss of sensation in the feet, preventing patients from recognizing injuries or wounds (Bima et al., 2023). The global prevalence of diabetic foot ulcers is estimated at 19–34% among people with diabetes, while the estimated prevalence in Indonesia is approximately 15% (Diah et al., 2024). These figures highlight the importance of preventive measures through improved patient knowledge and appropriate foot care practices.

Diabetes mellitus management includes education, dietary regulation, physical activity, pharmacological therapy, blood glucose monitoring, and foot care (Purnamaalam et al., 2025). One form of foot care is diabetic foot exercise, a simple physical activity intended to improve peripheral blood circulation, strengthen foot muscles, and help prevent diabetic foot ulcers (Aprilia et al., 2025). Diabetic foot exercise may also contribute to blood glucose control (Fauzia et al., 2022). Adequate knowledge of diabetic foot exercise can influence patients' attitudes and self-care practices, thereby supporting efforts to prevent diabetes-related complications (Tinuwo et al., 2025). Conversely, limited knowledge may result in inadequate foot care and neglect of essential preventive measures.

Previous studies have demonstrated the benefits of education and diabetic foot exercise for people with diabetes mellitus. Talitha et al. (2025) found that foot exercise education for older adults with diabetes mellitus increased the mean knowledge score from 67.5 to 94.5 and contributed to a reduction in random blood glucose levels. Dewi et al. (2024) reported that a 12-week foot exercise program improved the Ankle-Brachial Index (ABI), enhanced protective sensation in the feet, and supported blood glucose control. Similarly, Arafah & Agustin (2025) explained that regular diabetic foot exercise could improve peripheral circulation and help reduce blood glucose levels in patients with diabetes mellitus. However, these studies primarily examined the effects of education or foot exercise on patient knowledge and physiological outcomes. The level of knowledge among patients with type 2 diabetes mellitus regarding diabetic foot exercise as a preventive measure against diabetic foot ulcers at Purbalingga Community Health Center has not been specifically described.

Based on this background, this study aimed to describe the level of knowledge among patients with type 2 diabetes mellitus regarding diabetic foot exercise as a

preventive measure against diabetic foot ulcers at Purbalingga Community Health Center. It also aimed to describe respondents' characteristics according to age, educational level, and duration of diabetes mellitus, as well as to identify their knowledge levels by category. The findings are expected to provide useful information for healthcare professionals in developing educational programs tailored to patients' needs, particularly to improve understanding of diabetic foot exercise as one of the preventive measures against diabetic foot ulcers.

B. METHODS

This study employed a quantitative descriptive design with a cross-sectional approach, in which data were collected at a single point in time to describe respondents' levels of knowledge without administering any intervention (Eka et al. 2023). The study was conducted at Purbalingga Community Health Center on May 20, 2026. The study population consisted of patients with type 2 diabetes mellitus aged 45–80 years who participated in the Chronic Disease Management Program (*Program Pengelolaan Penyakit Kronis*, Prolanis) at Purbalingga Community Health Center. Participants were selected using purposive sampling based on predetermined criteria (Ksanjaya & Rahayu, 2022). The inclusion criteria were patients with type 2 diabetes mellitus aged 45–80 years who had no diabetic foot ulcers, were willing to participate by signing an informed consent form, and were able to communicate, read, write, and complete the questionnaire independently. The exclusion criteria included patients with type 1 diabetes mellitus, those outside the specified age range, those with existing diabetic foot ulcers, those who were absent during data collection, and those unable to complete the questionnaire adequately.

The study variable was the level of knowledge among patients with type 2 diabetes mellitus regarding diabetic foot exercise. Data were collected using an 11-item knowledge questionnaire adapted from Yuva (2023), covering the definition, benefits, frequency, and procedures of diabetic foot exercise. Responses were scored using the Guttman scale, with one point assigned to each correct answer and zero points to each incorrect answer (Mulia & Heru, 2023). The knowledge score was calculated as a percentage using the following formula (Melaniawati et al., 2021):

$$P = \frac{f}{n} \times 100\%$$

Where (P) represents the percentage of knowledge, (f) represents the number of correct answers, and (n) represents the total number of questions. Knowledge levels were classified as good (80–100%), moderate (60–79%), and poor (below 60%) (Ketut Swarjana, 2022). The study used primary data obtained directly from respondents through questionnaires. Documentation was also used as a supplementary data source to obtain information regarding the number of patients with type 2 diabetes mellitus at Purbalingga Community Health Center (Arvyanda et al., 2023). The research procedures included obtaining research permission, coordinating with the community health center, explaining the study to prospective participants, obtaining

informed consent, distributing the questionnaires, and checking the completeness of the collected data.

The data were analyzed using univariate analysis to describe respondents' characteristics, including age, educational level, and duration of diabetes mellitus, as well as their knowledge of diabetic foot exercise. The results were presented as frequency distributions and percentages, accompanied by descriptive explanations (Senjaya et al., 2022).

The study adhered to the ethical principles of health research, including respect for persons, beneficence and non-maleficence, justice, and confidentiality (Lusi & Nur, 2024). Participation was voluntary, and informed consent was obtained from all respondents. Respondents' identities were kept confidential, and the collected data were used solely for research purposes.

C. RESULTS AND DISCUSSION

1. Respondent Characteristics

The findings regarding respondent characteristics are presented in the following table and narrative.

Table 1. Frequency Distribution of Respondent Characteristics by Age, Educational Level, and Duration of Type 2 Diabetes Mellitus among Participants in the Diabetes Mellitus Chronic Disease Management Program (Prolanis) at Purbalingga Public Health Center in 2026

Characteristics	Number of Respondents	Percentage (%)
Age		
45–59 years	17	54.84
60–74 years	12	38.71
75–80 years	2	6.45
Total	31	100.00
Educational Level		
Elementary school	11	35.48
Junior high school	4	12.90
Senior high school	13	41.94
Higher education	3	9.68
Total	31	100.00
Duration of Diabetes Mellitus		
Less than 5 years	12	38.71
5–10 years	13	41.94
More than 10 years	6	19.35
Total	31	100.00

The analysis of Table 4.1 shows that the majority of respondents were aged 45–59 years, accounting for 17 respondents (54.84%), while the smallest proportion was aged 75–80 years, comprising 2 respondents (6.45%). In terms of educational level, most respondents had completed senior high school, accounting for 13 respondents

(41.94%), whereas only 3 respondents (9.68%) had attained higher education. Regarding the duration of type 2 diabetes mellitus, the largest group had been living with the disease for 5–10 years, comprising 13 respondents (41.94%), while 6 respondents (19.35%) had had the disease for more than 10 years.

a. Respondent Characteristics Based on Age

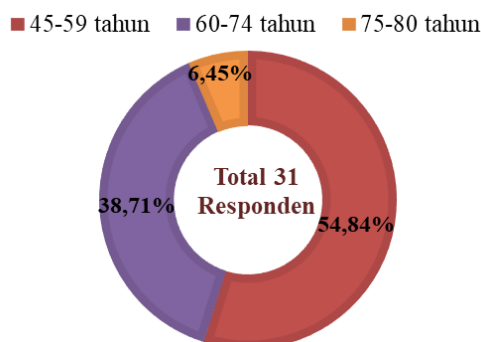


Figure 1. Respondent Characteristics by Age Group

As shown in Figure 1, the majority of respondents were aged 45–59 years, comprising 17 respondents (54.84%). According to the age classification established by the Indonesian Ministry of Health (Kemenkes RI 2025), this age range is classified as the pre-elderly group. Increasing age is associated with various physiological changes, including declining pancreatic function, reduced insulin sensitivity, and alterations in glucose metabolism, which may increase the risk of developing type 2 diabetes mellitus (Rosyidah & Cahyono, 2025).

These findings are consistent with the study by Neupane et al. (2024), which found that the prevalence of type 2 diabetes mellitus increases with age, with older individuals demonstrating a higher risk than younger individuals. Their findings indicate that age is an important risk factor for the development of diabetes mellitus.

b. Respondent Characteristics Based on Educational Level

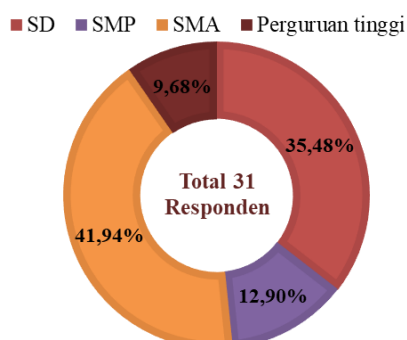


Figure 2. Respondent Characteristics by Educational Level

As shown in Figure 2, the majority of respondents had completed senior high school, accounting for 13 respondents (41.94%). Educational attainment is one of the factors that may influence an individual's knowledge. Higher educational attainment is associated with a greater ability to obtain, understand, and use health information. Therefore, education plays an important role in developing knowledge related to health maintenance (Shi et al., 2024).

The predominance of respondents with a senior high school education suggests that many participants may have had an adequate ability to receive and understand information about diabetes mellitus management, including diabetic foot exercises as an effort to prevent diabetic foot ulcers. This finding is supported by Javier & Alfaya (2024), who explained that secondary education can facilitate an individual's ability to obtain, understand, and process health information.

The finding that most respondents had completed senior high school and demonstrated a good level of knowledge suggests that formal education may contribute to health knowledge. However, knowledge may also be influenced by other factors, including personal experience, access to information, and social support, which can further strengthen respondents' understanding of diabetes management (Shao et al., 2025).

c. Respondent Characteristics Based on the Duration of Type 2 Diabetes Mellitus

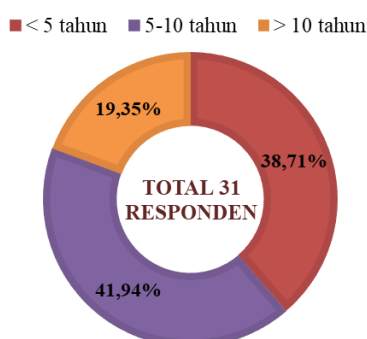


Figure 3. Respondent Characteristics by Duration of Diabetes Mellitus

As shown in Figure 3, the majority of respondents had been living with type 2 diabetes mellitus for 5–10 years, accounting for 13 respondents (41.94%). In contrast, the smallest group consisted of respondents who had been living with the disease for more than 10 years, comprising 6 respondents (19.35%).

The duration of diabetes mellitus may influence an individual's experience in managing the disease. The longer a person has lived with diabetes mellitus, the greater the opportunity to gain experience in medication management, blood glucose control, foot care, and complication prevention. Such experiences may contribute to improved knowledge and self-care abilities (Mukheli et al., 2025).

Mukheli et al. (2025) reported that patients with a longer duration of diabetes had better knowledge and practices regarding the prevention of diabetic foot complications, potentially because they had gained more experience in managing their condition.

The finding that most respondents had been living with type 2 diabetes mellitus for 5–10 years suggests that they had considerable experience managing the disease and had more opportunities to obtain information about diabetes management and complication prevention. These experiences may have contributed to their knowledge of diabetic foot exercises as a preventive measure against diabetic foot ulcers.

2. Knowledge Level of Patients with Type 2 Diabetes Mellitus Regarding Diabetic Foot Exercises

The findings concerning patients' knowledge of diabetic foot exercises are presented in the following table and narrative.

Table 2. Frequency Distribution of Knowledge Levels Regarding Diabetic Foot Exercises as an Effort to Prevent Diabetic Foot Ulcers among Patients with Type 2 Diabetes Mellitus at Purbalingga Public Health Center

Knowledge Level	Number of Respondents	Percentage (%)
Good	18	58.06
Moderate	10	32.26
Poor	3	9.68
Total	31	100.00

The analysis of Table 2 indicates that the majority of patients with type 2 diabetes mellitus had a good level of knowledge regarding diabetic foot exercises, accounting for 18 respondents (58.06%). Meanwhile, 10 respondents (32.26%) had a moderate level of knowledge, and 3 respondents (9.68%) had a poor level of knowledge.

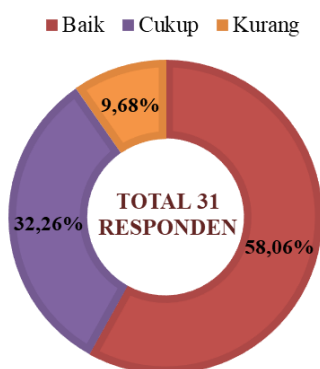


Figure 4. Respondents' Knowledge Levels Regarding Diabetic Foot Exercises

The findings indicate that the majority of respondents had a good level of knowledge, comprising 18 respondents (58.06%). This was followed by 10 respondents (32.26%) with a moderate level of knowledge and 3 respondents (9.68%) with a poor level of knowledge, as illustrated in Figure 4.4.

The high proportion of respondents with good knowledge indicates that most patients with type 2 diabetes mellitus had a good understanding of the benefits of diabetic foot exercises as one approach to preventing diabetic foot ulcers. Such knowledge may be obtained through education provided by healthcare professionals, experiences during treatment, participation in the Chronic Disease Management Program (Prolanis), information media, and interactions with other individuals living with diabetes mellitus (Ambarwati & Adinata, 2024).

These findings are consistent with those of Rahbar et al. (2024), who explained that health education, access to information, and social support play important roles in improving knowledge and self-care behaviors among patients with type 2 diabetes mellitus. Furthermore, a study conducted by Hijazi et al. (2025) demonstrated that

education on diabetic foot care can improve patients' knowledge, understanding, and foot care practices. Patients with adequate knowledge may be better equipped to undertake foot care independently and consistently. This is particularly important in supporting efforts to prevent diabetic foot complications.

D. CONCLUSION

The findings showed that the majority of respondents were aged 45–59 years (54.84%), had completed senior high school (41.94%), and had been living with diabetes mellitus for 5–10 years (41.94%). Most respondents demonstrated a good level of knowledge regarding diabetic foot exercise as a preventive measure against diabetic foot ulcers (58.06%). However, 32.26% had a moderate level of knowledge, while 9.68% had a poor level of knowledge. One limitation of this study was that questionnaire completion took longer than anticipated because some older respondents required additional explanations to understand the questions. Therefore, Purbalingga Community Health Center and healthcare professionals are encouraged to provide regular educational sessions using simple, clear language and practical demonstrations of diabetic foot exercises, particularly for patients with moderate or poor knowledge. These efforts may improve patients' understanding of diabetic foot exercise and support the prevention of diabetic foot ulcers.

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