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Preventing Diabetic Foot Complications: The Essential Role of Nurses in Early Detection and Evidence-Based Care

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ABSTRACT

Diabetic foot complications are common complications of diabetes mellitus that can lead to ulcers, infections, amputations, reduced quality of life, and increased healthcare costs. Nurses play an important role in the early detection and prevention of these complications through evidence-based care. However, knowledge and skills related to diabetic foot screening and foot care still need to be strengthened. This community service program aimed to improve nurses' competencies in the early detection and prevention of diabetic foot complications. The activity was conducted face-to-face at a private hospital, South Tangerang and involved 27 nurses from various clinical units. The program consisted of four sessions covering concepts of diabetes mellitus; diabetic foot screening and early detection; followed by an evaluation. Participants' knowledge was assessed using a diabetic foot care questionnaire. The results showed that 85.2% of participants had a high level of knowledge after attending the program. Participants also demonstrated a better understanding of foot screening, ulcer prevention, and proper foot care practices. This program effectively improved nurses' knowledge and may support efforts to prevent diabetic foot complications among patients with diabetes mellitus.

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INTRODUCTION

Diabetes mellitus (DM) is one of the most prevalent chronic metabolic diseases worldwide and represents a major public health challenge. The disease is characterized by impaired insulin secretion, insulin action, or both, resulting elevated blood glucose levels beyond normal ranges, a condition known as hyperglycemia. Type 2 diabetes mellitus (T2DM) accounts for approximately 90–95% of all diabetes cases and is strongly associated with insulin resistance. Chronic hyperglycemia contributes to long-term damage, dysfunction, and failure of various organs, including the eyes, kidneys, nerves, heart, and blood vessels, leading to significant morbidity, mortality, and reduced quality of life.

The global burden of diabetes continues to increase. According to the International Diabetes Federation (International Diabetes Federation, 2025) more than 500 million adults worldwide are living with diabetes, and this number is projected to rise substantially in the coming decades.

Indonesia is among the countries with the highest number of people living with diabetes, making diabetes prevention and management a national health priority. According to the Indonesian Basic Health Research (Riskesdas, 2018), the prevalence of diabetes mellitus in Indonesia reached 10.9%. The Special Capital Region of Jakarta reported one of the highest prevalence rates, affecting approximately 250,000 individuals aged over 15 years.

Chronic hyperglycemia resulting from poorly controlled diabetes management can lead to various organ complications. One of the most serious and costly complications of diabetes is diabetic foot disease. Diabetic foot complications develop as a result of a complex interaction between peripheral neuropathy, peripheral arterial disease, and impaired wound healing. These conditions increase the risk of foot ulceration, infection, hospitalization, and lower-extremity amputation. Diabetic foot ulcers (DFUs) affect millions of individuals worldwide and are associated with substantial physical, psychological, and economic burdens. Studies have shown that individuals with diabetes have a significantly increased lifetime risk of developing foot ulcers, and a large proportion of non-traumatic lower-limb amputations are preceded by diabetic foot ulcers (Luo et al., 2024).

Among the major risk factors for diabetic foot complications, diabetic peripheral neuropathy (DPN) plays a critical role. Diabetic peripheral neuropathy (DPN) is a highly prevalent complication of diabetes and commonly presents with symptoms such as paresthesia, particularly in the feet and hands (Farheen & Sedhunivas, 2025).DPN is characterized by progressive nerve damage resulting from prolonged exposure to hyperglycemia and metabolic abnormalities. Evidence suggests that DPN occurs in nearly 50% of individuals with long-standing type 1 and type 2 diabetes. Previous research reported that among patients with diabetic peripheral neuropathy, 36% experienced moderate neuropathy and 34% experienced severe neuropathy, with the majority presenting uncontrolled hyperglycemia (Candra et al., 2025).

Patients with DPN often experience decreased protective sensation in the feet, making them unable to detect pain, pressure, trauma, or minor injuries. Consequently, unnoticed injuries may progress into ulcers and infections. Evidence indicates that nearly half of individuals with long-standing diabetes may develop some degree of peripheral neuropathy, although many cases remain undiagnosed because symptoms may be absent during the early stages (Kurz et al., 2026)

The progression from neuropathy to foot ulceration can be prevented through timely identification of risk factors and appropriate preventive interventions. International guidelines from the International Working Group on the Diabetic Foot (IWGDF) (Schaper et al., 2024)emphasize five key strategies for preventing diabetic foot complications: identifying the at-risk foot, regular foot screening and examination, patient and family education, the use of appropriate footwear, and early management of pre-ulcerative conditions. These strategies have been shown to significantly reduce the incidence of foot ulcers and lower-extremity amputations when implemented consistently.

Nurses play an essential role in achieving these preventive goals. As frontline healthcare providers, nurses are uniquely positioned to conduct routine foot assessments, identify early signs of neuropathy and vascular impairment, provide evidence-based education, and promote self-care behaviors among individuals with diabetes. This role is consistent with the five pillars of diabetes management recommended by the Indonesian Society of Endocrinology (Perkumpulan Endokrinologi Indonesia, 2021) namely diabetes education, medical nutrition therapy, physical activity, pharmacological intervention, and regular monitoring of glycemic control and diabetes-related complications. Through comprehensive foot assessment, early detection of neuropathy, and patient education on foot self-care, nurses contribute directly to the implementation of these pillars, particularly in promoting self-management, preventing complications, and improving long-term health outcomes among individuals with diabetes.

Despite the availability of evidence-based guidelines, diabetic foot screening and foot-care education are not consistently implemented in many healthcare settings. Limited knowledge and skills among healthcare providers, including nurses, may contribute to missed opportunities for early detection and prevention. Therefore, strengthening nurses' competencies in diabetic foot assessment and evidence-based foot care is essential to improving patient outcomes.

Community service activities focused on enhancing nurses' knowledge and practical skills represent an effective strategy to bridge this gap. By providing training on diabetic foot risk

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assessment, neuropathy screening, and evidence-based foot-care practices, nurses can be better equipped to identify high-risk patients and deliver effective educational interventions. Ultimately, improving nurses' competencies in early detection and preventive care is expected to reduce the incidence of diabetic foot complications, improve quality of life among people with diabetes, and support broader efforts to reduce diabetes-related morbidity and disability.

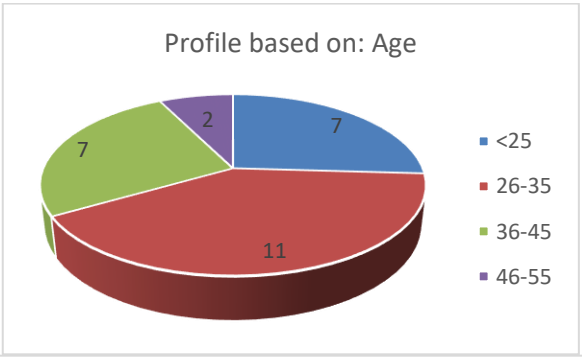
METHOD

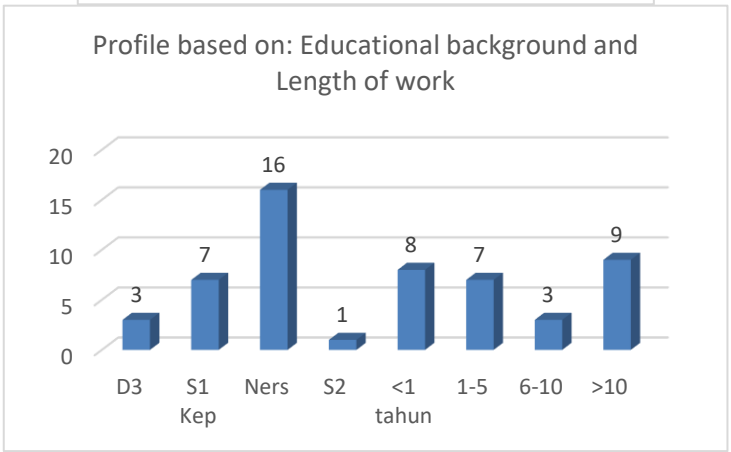
This community service was conducted using the offline method in a private hospital, Tangerang Selatan. The activity was divided into to 4 sessions, with session 1 is introduction, ice breaking and concept of DM; the second session, the participants is explained regarding Complication and mechanism of Diabetic foot ulcer formation, screening and early detection of Diabetic foot; the third session, explanation is focused on Diabetic foot care, and nutrition label interpretation followed by demonstration and re-demonstration of food label; the 4th session is post-test and evaluation. This activity was carried out in November 2025 and was attended by 27 nurses at X private hospital, South Tangerang.

RESULTS AND DISCUSSION

The community service program was conducted face-to-face on November, 2025, at one of private hospital, South Tangerang. A total of 27 nurses participated in the activity, representing inpatient units, outpatient clinics, intensive care units, and other clinical departments. The participants' characteristics are presented in Table 1, where most participants were aged 46–55 years (40.7%), held a professional nursing degree (Ners) (59.3%), and had more than 10 years of work experience (33.3%). These findings indicate that the majority of participants possessed substantial clinical experience, which may facilitate the adoption of evidence-based diabetic foot care practices.

Table 1. Distribution and Profile Participants of Community Service program, November 2025





Educational Intervention

The educational program consisted of three main topics: diabetes mellitus and its complications; diabetic foot screening and early detection; diabetic foot care and food label interpretation.

The first session focused on the basic concepts of diabetes mellitus, including its definition, classification, risk factors, signs and symptoms, and complications, particularly diabetic foot ulcers as seen on figure 1. Participants were informed that persistent hyperglycaemia contributes to microvascular and macrovascular complications, including diabetic neuropathy and diabetic foot ulcers (Ignatavicius. et al., 2021) .Diabetic foot ulcers are among the most common complications of type 2 diabetes mellitus and frequently result from peripheral neuropathy, peripheral arterial disease, or a combination of both. Previous studies have reported that approximately 25% of individuals with diabetes may develop diabetic foot ulcers during their lifetime, while 10–30% are at risk of lower-extremity amputation(Luo et al., 2024). Furthermore, diabetic foot ulcers remain a major cause of hospitalization among individuals with diabetes.

Figure.1. Introduction and 1st session of interventional Education

The second session addressed diabetic foot screening and early detection. Participants were introduced to several evidence-based screening methods commonly used in clinical practice as seen at Figure 2. One of these methods was the Ipswich Touch Test (IpTT), a simple and rapid screening tool used to identify loss of protective sensation in patients with diabetes. The examination involves lightly touching the first, third, and fifth toes of both feet to assess sensory perception (Fajriyah et al., 2020).

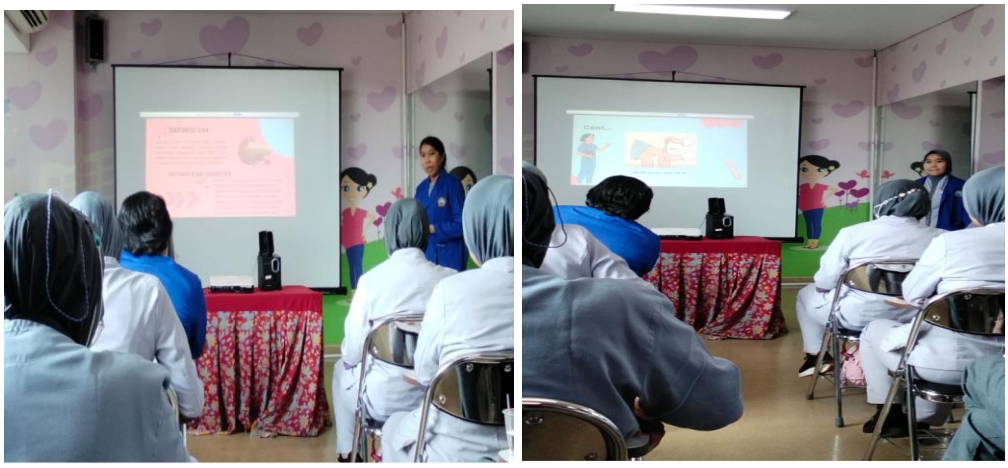


Figure 2. The 2nd session of Foot screening and early detection

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Several complementary therapies have been reported to improve lower-extremity circulation and peripheral nerve function among patients with diabetes mellitus, as assessed using the Ankle-Brachial Index (ABI), monofilament examination, and neuropathy symptom assessments. Previous research (Mataputun et al., 2020) demonstrated that warm water foot soaking and Buerger Allen Exercise significantly improved ABI scores among patients with DM when performed regularly ($p < 0.05$). Similarly, a similar study (Eppang & Prabawati, 2020) reported a significant improvement in protective foot sensation among patients with DM following effleurage massage therapy, with statistically significant differences observed before and after the intervention ($p < 0.05$).

Moreover (Candra et al., 2025)found that prior to the intervention, symptoms of peripheral neuropathy among patients with type 2 diabetes mellitus were almost evenly distributed across the mild (26.7%), moderate (30.0%), and severe (28.3%) neuropathy categories. Following the implementation of diabetes education and Buerger Allen Exercise, the mean neuropathy scores decreased, accompanied by an increase in the proportion of patients categorized as normal (41.0%) and mild neuropathy (37.5%). These findings provide evidence that complementary nursing interventions, particularly Buerger Allen Exercise, warm water foot soaking, and effleurage massage, may improve peripheral circulation, enhance protective sensation, and reduce neuropathic symptoms among patients with diabetes mellitus. Therefore, incorporating evidence-based complementary therapies into diabetes management may contribute to the prevention of diabetic foot complications and improve patients' quality of life.

Figure 3. Presentation and re-demonstration of food label interpretation

The third session focused on diabetic foot care. Participants were reminded of the important role nurses play in educating patients regarding diabetes management and prevention of diabetic foot complications. Effective glycaemic control, adherence to dietary recommendations, injury prevention, and regular foot care are essential components of diabetic foot ulcer prevention. Participants were also introduced to evidence-based foot care recommendations, including daily foot inspection, proper nail care, use of appropriate footwear, maintenance of foot hygiene, and avoidance of heat exposure that may cause unnoticed injury in patients with neuropathy (PERKENI, 2021)

To strengthen participants' practical understanding, an interactive demonstration on food label interpretation was conducted as shown at figure 3. Participants practiced identifying calorie, sugar, sodium, and fat content in commonly consumed packaged foods and beverages based on the recommendations outlined in the Indonesian Ministry of Health Regulation No. 30 of 2013. Instant noodles and bottled beverages were used as examples because they are widely consumed by the general population. Participants were encouraged to interpret nutrition labels and determine appropriate serving sizes. At the end of the session, two participants successfully demonstrated their ability to analyse the nutritional content of packaged wafer products and explain the recommended consumption portions.

Participant Engagement and Evaluation

Figure 4. Closing statemen, Q and A session

The educational sessions generated active discussion and participant engagement. Questions raised by participants included the most appropriate diabetic foot screening methods for hospital settings, management strategies for patients with existing foot ulcers, and the pathophysiological mechanisms underlying diabetic foot ulcer development. The high level of participation reflected the relevance of the topic to daily nursing practice.

To evaluate participants' knowledge of diabetic foot care, a questionnaire adapted from (Hasnain, 2009)consisting of 15 Guttman-scale items was administered. The results indicated that 85.2% of participants demonstrated a high level of knowledge regarding diabetic foot care following the educational intervention. This finding is consistent with previous community service programs reporting improvements in participants' knowledge after receiving structured education on diabetic foot prevention and management (Prabawati et al., 2021, 2024)

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Table 2. Result of the respondents regarding Diabetes foot care knowledge questionnaire, November 2025

No.	Questions	True		False	
		n	%	n	%
1	Importance of taking antidiabetic treatment to prevent complication	27	100	0	0
2	Daily washing the feet	26	96.3	1	3.7
3	Using warm water for washing/bathing	3	11.1	24	88.9
4	Checking temperature of water before using	27	100	0	0
5	Drying the feet after washing	27	100	0	0
6	Talcum powder usage for keeping interdigital spaces dry	13	48.1	**14**	**51.9**
7	Keeping skin of the feet soft to prevent dryness	26	96.3	1	3.7
8	Lotion not to be applied in the interdigital spaces	11	40.7	**16**	**59.3**
9	Daily change of socks	25	92.6	2	7.4
10	Trimming nails of feet straight with care	23	85.2	4	14.8
11	Inspection of feet once a day by respondents	20	74.1	7	25.9
12	Wearing comfortable coat shoes	26	96.3	1	3.7
13	Checking the shoes from inside before wearing	27	100	0	0
14	Not walking bare foot	26	96.3	1	3.7
15	Warning signs for which consultation is required	27	100	0	0

A detailed analysis of questionnaire responses revealed several knowledge gaps. Most participants incorrectly answered questions related to the use of warm water for foot soaking. This finding suggests that misconceptions regarding appropriate foot care practices remain prevalent among nurses. Current recommendations advise patients with diabetes to wash their feet using normal tap water and avoid exposure to excessive heat, particularly among those with peripheral neuropathy who may not perceive thermal injury.

Similarly, more than half of the participants provided incorrect responses regarding the use of foot powder and moisturizing lotion. Foot powder is generally not recommended because it may contribute to excessive skin dryness and increase the risk of skin breakdown. In contrast, moisturizing lotion is recommended for maintaining skin integrity but should not be applied between the toes. Excessive moisture in the interdigital spaces may promote microbial growth and increase the risk of infection and ulcer formation.

These findings highlight the importance of continuous professional education for nurses regarding evidence-based diabetic foot care practices. Previous study (Sinurat & Prabawati, 2025) highlighted there was a significant difference in foot care behaviour in DM patients after given health education on foot care (p = 0,000). Although overall knowledge levels were high, specific misconceptions persisted and may influence clinical recommendations provided to patients. Strengthening nurses' competencies in diabetic foot assessment, prevention, and patient education is essential for reducing the incidence of diabetic foot complications and improving outcomes among individuals with diabetes.

CONCLUSION

This community service program successfully enhanced nurses' knowledge and understanding of diabetic foot screening, early detection, and evidence-based foot care. The educational sessions increased participants' awareness of the importance of routine foot assessment, prevention of diabetic foot ulcers, and appropriate patient education strategies. Strengthening nurses' competencies in diabetic foot management is essential because nurses play a key role in identifying patients at risk and implementing preventive interventions. Continuous education and training programs are recommended to support the integration of evidence-based diabetic foot care into daily nursing practice, thereby contributing to the prevention of diabetic foot complications and improving health outcomes among individuals with diabetes mellitus.

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