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Skills in Assessing Diabetic Foot Ulcer Risk Through a Web-Based Application

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ABSTRACT

Diabetes mellitus (DM) is a chronic disease with a steadily increasing prevalence worldwide and carries the risk of serious complications, one of which is diabetic foot ulcer (DFU). Preventing such complications requires adequate education and strong assessment skills, particularly at the community level. This community engagement program aimed to improve the skills of health cadres and patients in using a web-based application to determine DFU risk levels. The methods involved a target group survey, preparation of materials, training sessions including socialization and demonstration of diabetic foot care protocols, and pre- and post-training evaluation. Most participants were aged 56–65 years (50%), female (75%), and had lived with DM for more than five years (70%). The mean skill score increased from 68.5 (pre-test) to 86.7 (post-test), with an N-Gain of 57.8% (moderate category). In conclusion, the web-based application was moderately effective in improving DFU risk assessment skills, although continuous support and the use of simple educational media are still needed, especially for older participants.

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INTRODUCTION

Diabetes mellitus (DM) is a chronic condition affecting millions worldwide. Approximately 1.5 million deaths each year are directly attributed to diabetes. Both the number of cases and the prevalence of DM have increased over the past decades. One of the most serious complications is diabetic foot, which may result in infection, ulceration, amputation, and reduced quality of life (Amrullah et al., 2022).

Globally, DM cases are projected to reach 643 million by 2030 and 783 million by 2045. Over three-quarters of adults with diabetes live in low- and middle-income countries. In 2021 alone, 6.7 million deaths (one every five seconds) were caused by diabetes. Additionally, 541 million adults have impaired glucose tolerance (IGT), placing them at high risk for type 2 diabetes (Ogurtsova et al., 2022).

Indonesia ranks third globally in prevalence (11.3%), following the North Africa–Middle East region (12.2%) and the Western Pacific (11.4%). It also ranks seventh among the top 10 countries for absolute numbers, with approximately 10.7 million cases (Ogurtsova et al., 2022). The 2018 Basic Health Research reported an increase in DM prevalence among those aged ≥15 years from 6.9% to 10.9% (Kemenkes RI, 2018a). In West Kalimantan, 28,343 DM cases were reported in 2018, with Pontianak city (3,611 cases), Kubu Raya (3,235 cases), and Sambas (3,025 cases) being the highest (Kemenkes RI, 2018b).

DFU is a common complication of DM (Pratama, Putra, et al., 2020). Peripheral neuropathy and loss of protective sensation in the distal foot are primary causes (Bondar & Popa, 2018). Untreated ulcers may develop into severe infections requiring amputation (Soelistijo et al., 2015). This underscores the importance of regular screening and foot care assessments by health workers and trained cadres.

Community health cadres play a critical role in DM care. Regular foot assessments provide valuable information for prevention, while proper foot care helps patients maintain foot health (Pratama, Suriadi, et al., 2020). However, field interviews with health cadres in Sungai Ambangah Village (Kubu Raya) revealed that 3 of 5 cadres had received information from local health centers but felt the leaflet-based materials were insufficient and difficult to apply. They also expressed difficulty in determining ulcer risk manually, and noted that in the last two months, some patients had already presented with infected ulcers.

Hence, a practical and user-friendly digital solution is needed. A web-based risk assessment application can provide automatic risk scoring and recommendations, making it easier for cadres and patients to identify early warning signs and appropriate interventions.

METHOD

The community engagement activity was conducted on February 15, 2024, in Sungai Ambangah Village, targeting 40 DM patients. The approach included. The target group survey consists of preliminary mapping and assessment of the community needs with assistance from local cadres. Preparation of materials consists of identifying and preparing facilities, the venue, and the necessary tools. Training and demonstration consist of the core activity, including socialization and hands-on training for community leaders, cadres, families, and patients at risk for DFU. Participants were introduced to and practiced using the web-based risk assessment application. Nursing students assisted as part of their wound care practicum. Evaluation consisted of skills that were assessed using pre- and post-tests via questionnaires on DFU risk assessment and foot care.

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RESULT AND DISCUSSION

Participant Characteristics

TABLE 1. Frequency distribution of participants based on age, gender, and duration of diabetes mellitus (n = 40)

Variable	f	%
Age		
46–55 years	7	17.5
56–65 years	20	50.0
> 65 years	13	32.5
Gender		
Female	30	75.0
Male	10	25.0
Duration of Diabetes History		
< 5 years	12	30.0
> 5 years	28	70.0
Total	40	100.0

Source: Primary Data, 2025

Based on Table 1 above, the frequency distribution shows that most participants were aged 56–65 years, 20 participants (50%), female, 30 participants (75%), and had been living with diabetes mellitus for more than five years, 28 participants (70%).

Participants' Skills in Using the Web-Based Application

TABLE 2. Average pre- and post-workshop skill scores of participants in using the web-based application to assess DFU risk (n = 40)

	Post	Pre-test	Post–Pre	N-Gain Score (%)
Mean	86.70	68.50	18.20	57.8

Primary Source, February 2024

Based on Table 2, the average increase in participants' skill scores after the training was 18.20 points, with an average N-Gain score of 57.8%.

The study results showed that most participants were in the 56–65 years age range (50%), followed by the >65 years group (32.5%). This finding is consistent with the epidemiology of diabetes mellitus (DM), where prevalence increases with age due to pancreatic function decline, insulin resistance, and a higher burden of comorbidities (ADA, 2023). The majority of participants were female (75%), which may reflect the tendency for women to utilize preventive health services more frequently than men (Ministry of Health RI, 2021). Furthermore, most participants had been living with DM for more than five years (70%), indicating a higher risk of chronic complications such as neuropathy and diabetic foot ulcer (DFU), as highlighted by Boulton et al. (2020).

Regarding participants' ability to use the web-based application to determine DFU risk levels, the average pre-test score of 68.5 increased to 86.7 post-test, with a difference of 18.2 points. The calculated N-Gain Score was 57.8%, indicating a moderate improvement category (Hake, 1999). This suggests that the training and workshops were fairly effective in improving participants' skills, although

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not yet at a high level. This moderate effectiveness may be due to older participants having more difficulty adapting to digital technology, requiring repeated mentoring for skills to become more internalized.

These findings are consistent with Putra et al. (2022), who reported that digital application-based training improved DM patients' knowledge and skills in foot care, although the outcomes were strongly influenced by age and digital literacy. Similar results were found by Rahmawati & Sari (2021), who stated that technology-based education interventions in elderly DM patients increased understanding but required reinforcement with simple visual media and hands-on practice. Conversely, Lee et al. (2020) found that in younger populations with higher education levels, web-based interventions produced significant skill improvements with high N-Gain scores.

Based on these results, the researchers assume that improvements in participants' skills were strongly influenced by demographic characteristics, namely age, gender, and duration of DM. Older participants with longer disease duration tended to have limitations in learning new technologies, but simultaneously had a greater need to master DFU prevention skills. Therefore, web-based education programs should be complemented with hands-on training, continuous mentoring, and simple visual educational media to ensure skills are optimized and sustainable.

CONCLUSION

This community service activity showed that the majority of participants were older adult women with a history of diabetes mellitus for more than five years. Following socialization and training on the use of a web-based application for detecting diabetic foot ulcer risk, participants' skills improved significantly, with an average N-Gain score of 57.8% in the moderate category. This demonstrates that technology-based education can be an effective medium to enhance diabetic foot care skills among DM patients in Sungai Ambangah Village.

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