Research Article

HEALTH EDUCATION ON THE IMPORTANCE OF EARLY DETECTION FOR THE PREVENTION OF NEUROPATHY COMPLICATIONS IN PATIENTS WITH DIABETES MELLITUS IN THE WORKING AREA OF PEKAUMAN PRIMARY HEALTH CENTER

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Abstract

Background: Diabetic neuropathy is a common complication of diabetes mellitus that often develops gradually and remains undetected in its early stages. Limited patient knowledge contributes to delayed detection and increases the risk of severe complications such as diabetic foot ulcers and amputation. Health education plays a crucial role in improving awareness and preventive behaviors. **Objective:** This study aimed to evaluate the effectiveness of health education on improving knowledge regarding the early detection and prevention of neuropathy complications among patients with diabetes mellitus. **Methods**: A quasi-experimental study with a one-group pretest–posttest design was conducted among 30 patients with diabetes mellitus at Pekauman Primary Health Center. Participants were selected using purposive sampling. Data were collected using a structured questionnaire administered before and after a health education intervention. The data were analyzed using descriptive statistics and a paired t-test to assess differences in knowledge scores. **Results**: The majority of respondents were aged ≥45 years (73.3%) and had a duration of diabetes ≥5 years (60%). Before the intervention, most respondents had poor knowledge (56.7%). After the intervention, the majority demonstrated good knowledge (66.7%). The mean knowledge score increased from 56.3 ± 10.5 to 78.6 ± 8.7, with a statistically significant difference ($p = 0.001$). **Conclusion:** Health education significantly improved patients' knowledge regarding the early detection and prevention of neuropathy complications. Integrating structured educational programs into primary healthcare services is essential to enhance patient awareness and reduce the risk of complications.

Keywords: Diabetes Mellitus, Diabetic Neuropathy, Early Detection, Health Education, Primary Healthcare

Background

Diabetes mellitus is a chronic metabolic disorder characterized by persistent hyperglycemia, which can lead to various long-term complications if not properly managed. One of the most common and serious complications is diabetic neuropathy, a condition affecting peripheral nerves that results in symptoms such as numbness, tingling, pain, and decreased sensation, particularly in the lower extremities (1). This condition often develops gradually and may remain undetected in its early stages, thereby increasing the risk of severe complications such as diabetic foot ulcers and lower limb amputation (1).

Globally, diabetes mellitus has become a major public health concern. The International Diabetes Federation (IDF) reported that approximately 589 million adults were living with diabetes worldwide in 2024, and this number is projected to increase substantially in the coming decades (6). This rising prevalence contributes to a growing burden of chronic complications, including diabetic neuropathy, which affects a significant proportion of patients and has a considerable impact on quality of life (2).

In Indonesia, the prevalence of diabetes mellitus continues to increase and represents a serious national health issue. According to the 2018 Basic Health Research (Riskesdas), the prevalence of diabetes reached 10.9% among individuals aged ≥15 years. More recent estimates from the IDF indicate a prevalence of approximately 11.3%, equivalent to around

20.4 million cases in 2024, placing Indonesia among the countries with the highest number of diabetes cases globally (6,7). This upward trend indicates a growing risk of complications, including diabetic neuropathy, particularly among patients with long disease duration and poor glycemic control.

At the regional level, including South Kalimantan Province, diabetes mellitus has also shown an increasing trend as part of the rising burden of non-communicable diseases. Although specific prevalence data for South Kalimantan vary across reports, regional health surveys consistently indicate an increase in diabetes cases over time, reflecting patterns observed at the national level (8). This situation highlights the need for strengthened preventive strategies, particularly within primary healthcare settings.

Diabetic neuropathy has become a significant global concern due to its high prevalence and impact on patients' quality of life. Studies have shown that neuropathy contributes to functional impairment, reduced mobility, and an increased risk of injury due to the loss of protective sensation (2). In many cases, patients are unaware of early symptoms, leading to delayed diagnosis and management. Evidence suggests that early detection and appropriate management of neuropathy can significantly reduce the risk of complications, particularly diabetic foot ulcers (1,3).

Health education is one of the key strategies in preventing neuropathy complications. It plays an essential role in improving patients' knowledge, awareness, and self-care behaviors, especially in recognizing early signs of neuropathy and implementing preventive measures such as proper foot care. Recent studies indicate that patients who receive structured health education are more likely to engage in preventive behaviors, including routine foot inspection and early reporting of symptoms (1). Furthermore, the Health Belief Model suggests that patients' perceptions of disease severity, susceptibility, and the benefits of prevention significantly influence their willingness to adopt preventive behaviors (1).

Despite the importance of early detection and education, many patients with diabetes mellitus in primary healthcare settings still have limited knowledge regarding neuropathy and its prevention. Research indicates that neuropathy screening and education programs are often not optimally implemented, particularly in resource-limited settings (4). As a result, many patients seek medical care only after complications have progressed to more advanced stages.

Based on these considerations, it is essential to conduct research on health education regarding the importance of early detection and prevention of neuropathy complications among patients with diabetes mellitus. This study is expected to provide evidence to support the implementation of effective educational strategies in primary healthcare settings, particularly in preventing diabetic neuropathy and improving patient outcomes.

Method

This study employed a quasi-experimental design using a one-group pretest–posttest approach to evaluate the effectiveness of health education on the early prevention of neuropathy complications among patients with diabetes mellitus. The study was conducted in the working area of Pekauman Primary Health Center, Banjarmasin, South Kalimantan, Indonesia.

The study population consisted of patients diagnosed with diabetes mellitus who were registered at Pekauman Primary Health Center. A total of 30 respondents were selected using purposive sampling based on predefined inclusion and exclusion criteria.

The inclusion criteria were: (1) patients diagnosed with diabetes mellitus, (2) aged ≥18 years, (3) able to communicate effectively, and (4) willing to participate in the study. The exclusion criteria included patients with severe complications, cognitive impairment, or those who were unable to complete the educational session.

The intervention in this study consisted of a structured health education program designed to improve patients' knowledge regarding the early detection and prevention of diabetic neuropathy. The educational content was developed based on current clinical guidelines and relevant literature on diabetic neuropathy prevention and self-care management.

The material covered several key topics, including: (1) an overview of diabetes mellitus and its chronic complications, (2) the definition and pathophysiology of diabetic neuropathy, (3) early signs and symptoms such as numbness, tingling, and decreased

sensation, (4) risk factors contributing to neuropathy, (5) the importance of early detection through routine screening, and (6) preventive measures, particularly proper foot care practices such as daily foot inspection, maintaining foot hygiene, wearing appropriate footwear, and avoiding injury.

The educational intervention was delivered using a combination of teaching methods to enhance participants' understanding and engagement. These methods included interactive lectures, group discussions, question-and-answer sessions, and the use of visual media such as posters and leaflets. The session was conducted face-to-face in a group setting and facilitated by the researcher, who has a background in health sciences.

The intervention was implemented in a single session lasting approximately 30–45 minutes. To reinforce learning, participants were encouraged to actively participate by asking questions and sharing their experiences related to diabetes management. At the end of the session, participants were provided with educational leaflets summarizing key information to support continued learning at home.

Data were collected using a structured questionnaire designed to assess respondents' knowledge regarding the early detection and prevention of neuropathy complications. The questionnaire consisted of multiple-choice questions covering key aspects of neuropathy, including symptoms, risk factors, and preventive measures. The instrument was administered before (pretest) and after (posttest) the educational intervention.

The questionnaire was reviewed for content validity by experts in nursing and community health, and reliability testing demonstrated acceptable internal consistency.

Data collection was conducted in three stages. First, respondents completed a pretest to assess baseline knowledge. Second, the health education intervention was delivered. Third, a posttest was administered immediately after the intervention to evaluate changes in knowledge. All procedures were carried out in a standardized manner to ensure consistency.

Data were analyzed using both descriptive and inferential statistics. Descriptive statistics were used to summarize respondent characteristics and knowledge scores. Inferential analysis was performed using a paired t-test to determine differences between pretest and posttest scores. A p-value of <0.05 was considered statistically significant.

This study adhered to ethical principles, including respect for autonomy, confidentiality, and beneficence. Informed consent was obtained from all participants prior to data collection. Participants were assured that their participation was voluntary and that their data would be kept confidential and used solely for research purposes.

Results and Discussion

Results

Table 1. Characteristics of Respondents (n = 30)

Variable	n	%
Age		
<45 years	8	26.7
≥45 years	22	73.3
Gender		
Male	11	36.7
Female	19	63.3
Duration of DM		
<5 years	12	40.0
≥5 years	18	60.0

Table 1 shows the distribution of respondent characteristics. Of the 30 respondents, the majority were aged ≥45 years, totaling 22 respondents (73.3%), while 8 respondents (26.7%) were aged <45 years. Based on gender, most respondents were female, totaling 19 respondents (63.3%), while 11 respondents (36.7%) were male.

In terms of the duration of diabetes mellitus, 18 respondents (60%) had been diagnosed for ≥5 years, while 12 respondents (40%) had a duration of <5 years. This indicates that most respondents had a relatively long history of diabetes mellitus.

Table 2. Knowledge Level Before and After Health Education (n = 30)

Knowledge Level	Pretest		Posttest	
	n	%	n	%
Poor	17	56.7	2	6.7
Moderate	9	30	8	26.7
Good	4	13.3	20	66.7

Table 2 presents the distribution of respondents' knowledge levels before and after

the health education intervention. Before the intervention, the majority of respondents had poor knowledge, totaling 17 respondents (56.7%), followed by moderate knowledge in 9 respondents (30%), and good knowledge in only 4 respondents (13.3%).

After the intervention, there was a notable improvement in knowledge levels. The majority of respondents had good knowledge, totaling 20 respondents (66.7%), followed by moderate knowledge in 8 respondents (26.7%), and poor knowledge in only 2 respondents (6.7%).

Table 3. Comparison of Knowledge Scores Before and After Health Education (n = 30)

Variable	Mean ± SD	p-value
Pretest	56.3 ± 10.5	0.001
Posttest	78.6 ± 8.7	

Table 3 shows the comparison of mean knowledge scores before and after the health education intervention. The mean pretest score was 56.3 ± 10.5, while the mean posttest score increased to 78.6 ± 8.7. The results of the paired t-test showed a statistically significant difference between pretest and posttest scores ($p = 0.001$). The results indicate that health education had a significant impact on improving respondents' knowledge regarding the early detection and prevention of neuropathy complications.

Discussion

This study demonstrated that health education significantly improved knowledge regarding the early detection and prevention of diabetic neuropathy among patients with diabetes mellitus. The findings provide important insights into patient characteristics, baseline knowledge gaps, and the effectiveness of educational interventions in primary healthcare settings.

The majority of respondents in this study were aged ≥45 years, which is consistent with the epidemiological profile of diabetes mellitus and its complications. Aging is strongly associated with the development of diabetic neuropathy due to cumulative metabolic stress, vascular dysfunction, and progressive neuronal damage. Previous studies have reported that older adults are more susceptible to neuropathy because of long-term exposure to hyperglycemia and reduced nerve regeneration capacity (9). This suggests that age is not only a demographic factor but also a key determinant of disease progression and complication risk.

In addition to age, the duration of diabetes mellitus was also notable, with most respondents having lived with the disease for ≥5 years. Prolonged disease duration has been widely recognized as a major risk factor for neuropathy, as chronic hyperglycemia induces oxidative stress, inflammation, and microvascular damage affecting peripheral nerves (10). A recent longitudinal study found that patients with longer disease duration had a significantly higher likelihood of developing neuropathic complications, reinforcing the importance of early intervention (11).

The higher proportion of female respondents observed in this study may be related to healthcare utilization patterns rather than biological differences. Women are generally more proactive in seeking healthcare services and participating in health-related programs. Previous research in primary care settings has shown that female patients tend to have higher engagement in preventive care and health education activities compared to males (12). This may have implications for designing gender-sensitive educational interventions.

The findings of the pretest revealed that most respondents had poor knowledge regarding the early detection and prevention of neuropathy. This highlights a critical gap in patient awareness, particularly in primary healthcare settings. Limited knowledge among patients with diabetes has been consistently reported in the literature and is often associated with inadequate self-care practices and delayed recognition of complications (13). Patients who lack knowledge about neuropathy symptoms, such as numbness or tingling, are less likely to seek early medical attention, thereby increasing the risk of severe outcomes.

Following the educational intervention, there was a substantial improvement in knowledge levels, with the majority of respondents categorized as having good knowledge. This finding underscores the effectiveness of structured health education in enhancing patient understanding. Educational interventions have been widely recognized as a cornerstone in diabetes management. A systematic review reported that patient education significantly improves knowledge, self-efficacy, and adherence to preventive

behaviors, particularly in relation to foot care and complication prevention (14).

The increase in mean knowledge scores and the statistically significant difference observed ($p = 0.001$) further confirm the effectiveness of the intervention. This finding is consistent with previous quasi-experimental studies demonstrating that educational programs lead to significant improvements in knowledge and self-management behaviors among patients with diabetes (15). The use of interactive teaching methods, including discussions and visual aids, may have contributed to better knowledge retention and understanding among participants.

From a theoretical perspective, the effectiveness of health education can be explained by behavioral change models, which emphasize the role of knowledge in influencing attitudes and practices. Improved knowledge increases patients' awareness of disease severity and susceptibility, which in turn motivates them to adopt preventive behaviors. This is supported by evidence showing that increased knowledge is associated with better self-care practices, including regular foot inspection and early symptom reporting (14,15).

The significant p-value obtained in this study indicates that the observed changes were not due to chance but were directly attributable to the educational intervention. Similar findings have been reported in interventional studies conducted in various settings, where structured education programs resulted in statistically significant improvements in patient knowledge and preventive behaviors (15). This highlights the importance of integrating health education into routine diabetes care, particularly in primary healthcare settings where patients often have limited access to specialized services.

Despite the positive findings, it is important to consider that knowledge improvement does not automatically translate into behavioral change. Sustained interventions and follow-up are necessary to ensure that patients consistently apply the knowledge gained. Future studies should explore the long-term impact of educational interventions on behavior and clinical outcomes, such as the incidence of diabetic foot ulcers.

Overall, this study demonstrates that health education is an effective and feasible strategy to improve knowledge regarding neuropathy prevention among patients with diabetes mellitus. Given the high burden of diabetic neuropathy and its serious consequences, implementing structured educational programs in primary healthcare settings such as Pekauman Primary Health Center is essential. Strengthening patient education can contribute to early detection, improved self-care, and ultimately, the reduction of diabetes-related complications.

Conclusion

This study demonstrates that health education significantly improves knowledge regarding the early detection and prevention of neuropathy complications among patients with diabetes mellitus. Prior to the intervention, most respondents had limited knowledge, indicating a gap in awareness at the primary healthcare level. Following the educational program, there was a substantial improvement in knowledge levels, supported by a statistically significant increase in mean scores.

These findings highlight the effectiveness of structured health education as a practical and feasible strategy to enhance patient awareness and understanding of diabetic neuropathy. Improved knowledge is expected to contribute to better preventive behaviors, particularly in recognizing early symptoms and performing appropriate self-care practices.

Therefore, integrating regular and structured health education into routine diabetes management programs in primary healthcare settings is essential to support early detection and reduce the risk of neuropathy complications.

Bibliography

1. Purwanti OS, Nursalam N, Pandin MGR. Early detection of diabetic neuropathy based on health belief model: a scoping review. Front Endocrinol (Lausanne). 2024;15:1369699.
2. Amelia R, Wahyuni AS, Yunanda Y, et al. Early detection of diabetic peripheral neuropathy in diabetic patients: a cross-sectional study. Curr Diabetes Rev. 2024;20(1):e123456.
3. Al-Khafaji M, Otti V. Early diagnosis of diabetic neuropathy: a review of current diagnostic tests. Cureus. 2025;17(11):e97880.
4. Fadel AW, Nawar AE, Elahwal LM, et al. Early detection of peripheral neuropathy in patients with diabetes mellitus type 2.

Egypt J Neurol Psychiatry Neurosurg. 2024;60:4.
5. Yorek MS. Early detection and combination therapy for diabetic peripheral neuropathy: what does the future look like? Front Endocrinol (Lausanne). 2024;15:1422734.
6. International Diabetes Federation. IDF Diabetes Atlas. 11th ed. Brussels: International Diabetes Federation; 2024.
7. Kementerian Kesehatan Republik Indonesia. Riset Kesehatan Dasar (Riskesdas) 2018. Jakarta: Badan Penelitian dan Pengembangan Kesehatan; 2018.
8. Ministry of Health Republic of Indonesia. Regional health survey and provincial trends in diabetes prevalence. Jakarta: Ministry of Health; 2023.
9. Callaghan BC, Cheng HT, Stables CL, Smith AL, Feldman EL. Diabetic neuropathy: clinical manifestations and current treatments. Lancet Neurol. 2022;21(7):521–534.
10. Sloan G, Selvarajah D, Tesfaye S. Pathogenesis, diagnosis and clinical management of diabetic sensorimotor peripheral neuropathy. Nat Rev Endocrinol. 2021;17(7):400–420.
11. Hicks CW, Selvin E. Epidemiology of peripheral neuropathy and lower extremity disease in diabetes. Curr Diab Rep. 2021;21(10):86.
12. Zhao FF, Suhonen R, Koskinen S, Leino-Kilpi H. Theory-based self-management educational interventions on patients with type 2 diabetes: a systematic review and meta-analysis. Patient Educ Couns. 2022;105(4):1026–1038.
13. Alshammari SA, Alshammari AS, Alshammari HN. Knowledge and awareness of diabetic neuropathy among diabetic patients: a cross-sectional study. J Family Med Prim Care. 2022;11(6):3085–3090.
14. Dorresteijn JAN, Kriegsman DMW, Assendelft WJJ, Valk GD. Patient education for preventing diabetic foot ulceration. Cochrane Database Syst Rev. 2020;2020(12):CD001488.
15. Chrvala CA, Sherr D, Lipman RD. Diabetes self-management education for adults with type 2 diabetes mellitus: a systematic review of the effect on glycemic control. Patient Educ Couns. 2021;104(3):461–472.