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The Effect of Audio-Visual Education on Foot Care Knowledge in Preventing Diabetic Foot Ulcers among Patients with Diabetes Mellitus at Pekauman Primary Health Center, Banjarmasin

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ABSTRACT/ ABSTRAK

ABSTRACT. *Diabetes mellitus can lead to serious complications, including diabetic foot ulcers (DFUs), which carry a high risk of disability and amputation. This study aimed to analyze the effect of audio-visual education on foot care knowledge among patients with diabetes mellitus at the Pekauman Primary Health Center, Banjarmasin. This study employed a quasi-experimental one-group pretest–posttest design and involved 103 patients selected from a population of 215 patients (December 2024) using accidental sampling. Inclusion criteria comprised newly diagnosed or follow-up patients, individuals with compos mentis status, and adults. The research instrument was the Nottingham Assessment of Functional Footcare (NAFF) questionnaire consisting of 29 items, which was validated and found to be reliable. The intervention consisted of a ±10-minute animated video demonstrating six steps of diabetic foot care. Data were analyzed using the Wilcoxon signed-rank test to assess changes in knowledge levels. The results showed a significant improvement in knowledge ($p < 0.001$): prior to the intervention, 98.1% of respondents had "Poor" knowledge, whereas after the intervention, 99.0% demonstrated "Good" knowledge. Therefore, audio-visual education is effective in improving foot care knowledge and can be implemented as a primary health promotion strategy to prevent diabetic foot ulcers.*

Kata kunci:

Audio Video Visual, Diabetes Melitus, Edukasi, Pengetahuan, Perawatan Kaki, Ulkus Kaki Diabetik

ABSTRAK. Diabetes melitus dapat menimbulkan komplikasi serius, termasuk ulkus kaki diabetik (UKD), yang berisiko menyebabkan kecacatan dan amputasi. Penelitian ini bertujuan menganalisis pengaruh edukasi berbasis media audio-video visual terhadap pengetahuan perawatan kaki pasien diabetes melitus di Puskesmas Pekauman, Banjarmasin. Metode penelitian menggunakan desain quasi-eksperimen *one-group pretest-posttest*, penelitian melibatkan 103 pasien dari populasi 215 pasien (Desember 2024) yang dipilih dengan *accidental sampling*. Kriteria inklusi meliputi pasien baru atau kontrol, kondisi kompos mentis, dan kategori dewasa. Instrumen berupa kuesioner Nottingham Assessment of Functional Footcare (NAFF), 29 item, valid dan reliabel. Intervensi berupa video animasi ±10 menit yang menampilkan enam langkah perawatan kaki diabetik. Analisis data menggunakan uji Wilcoxon untuk menilai perubahan pengetahuan. Hasil penelitian menunjukkan peningkatan signifikan ($p < 0,001$): sebelum intervensi 98,1% responden memiliki pengetahuan "Kurang Baik", sesudah 99,0% menjadi "Baik". Sehingga, dapat dikatakan bahwa edukasi audio-video visual efektif meningkatkan pengetahuan dan dapat diterapkan sebagai strategi promosi kesehatan primer untuk mencegah UKD.

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INTRODUCTION

Diabetes mellitus (DM) is a chronic metabolic disease characterized by persistent hyperglycemia. When sustained over a prolonged period, this condition may lead to various serious complications affecting the heart, blood vessels, eyes, kidneys, and nervous system. The most prevalent type of DM is type 2 diabetes mellitus (T2DM), which commonly occurs in adulthood as a result of insulin resistance or the body's inability to produce sufficient amounts of insulin. Over the past three decades, the prevalence of T2DM has increased significantly across countries with different income levels (World Health Organization, 2025).

One of the most frequent and severe chronic complications of T2DM is diabetic foot ulcers (DFUs). This condition is primarily caused by diabetic neuropathy and peripheral vascular disease, which are commonly observed in patients with diabetes. DFUs contribute substantially to increased morbidity and mortality due to the high risk of infection, amputation, and even death. In addition to their clinical impact, DFUs impose a considerable socioeconomic burden on both patients and healthcare systems, making effective prevention and management essential components of diabetes care (Laing, 1998; Alexiadou & Doupis, 2012; Vileikyte, 2001; Armstrong et al., 2023).

In Indonesia, the prevalence of DFUs is relatively high. Several studies have reported a prevalence rate of approximately 12% among patients with T2DM in certain regions (Yusuf et al., 2016), which is markedly higher than the global average of 6.3% (Zhang et al., 2017). DFUs not only affect biological aspects but also influence patients' psychological, socioeconomic, and spiritual well-being, ultimately leading to a decline in overall quality of life (Hanlon et al., 2024; Aljohary et al., 2025). The lifetime risk of developing foot ulcers in patients with DM is estimated to range from 15% to 25%, positioning DFUs as a serious public health concern (Fakhrizal & Moulidiya, 2025; Wadhawan et al., 2025).

At the local level, Banjarmasin City records DM as the disease with the highest prevalence, at 20.12 per 1,000 population, followed by arthritis and lipidemia. Data from the Pekauman Primary Health Center indicate that DM is among the ten most prevalent diseases, with cases continuously increasing from 15,006 in 2021 to 15,931 in 2023. These data highlight the importance of active patient and family involvement in DM management, particularly through appropriate foot care practices as a preventive measure against DFUs.

Findings from a preliminary study conducted at the Pekauman Primary Health Center between 16 and 19 December 2024 involving ten patients with DM and random blood glucose levels ranging from 200 to 500 mg/dL revealed that most patients had never received education related to foot care. Only a small proportion of patients routinely performed foot inspections, washed their feet with clean water, or used moisturizers. This low level of understanding may increase the risk of further complications such as neuropathy, retinopathy, cardiovascular disease, and renal disorders (Astuti, 2021).

Conventional educational methods, such as lectures and leaflets, have been considered less effective in improving patients' knowledge of foot care. Differences in educational background and experience may cause some patients to experience difficulties in understanding information delivered verbally or in written form. Therefore, more interactive, engaging, and easily comprehensible educational approaches are needed for patients with diverse characteristics.

One alternative that has increasingly been implemented is audio-visual education. The use of educational videos has been shown to improve patients' understanding by 40–90% and to assist them in performing foot care correctly and consistently (Florenza Laowo et al., 2021). Delivering information through a combination of visual and auditory elements allows patients to comprehend foot care procedures more concretely, thereby enhancing adherence and self-care independence.

Based on the above considerations, this study aimed to analyze the effect of audio-visual education on foot care knowledge among patients with diabetes mellitus at the Pekauman Primary Health Center, Banjarmasin. This study is expected to provide empirical evidence regarding the effectiveness of audio-visual media as a primary health promotion strategy in primary healthcare settings and to serve as a basis for developing routine educational programs to prevent serious complications such as diabetic foot ulcers.

RESEARCH METHOD

This study employed a quantitative approach using a quasi-experimental one-group pretest–posttest design to examine the effect of audio-visual education on patients' foot care knowledge in preventing diabetic foot ulcers among individuals with diabetes mellitus. The study was conducted at the Pekauman Primary Health Center, Banjarmasin, from April to May 2025. The study population consisted of 215 patients with diabetes mellitus, from which a sample of 103 respondents was determined using the Slovin formula with a 10% margin of error and selected through accidental sampling. Inclusion criteria included newly diagnosed or follow-up patients who agreed to participate, were in a compos mentis condition, and belonged to the adult age category. Exclusion criteria were patients who did not attend the study stages, had cognitive impairment, or refused to participate.

The research instrument was the Nottingham Assessment of Functional Footcare (NAFF) questionnaire, consisting of 29 items covering foot inspection, hygiene, nail trimming, footwear maintenance, and injury prevention and management. An ordinal scale was applied, with a score of 10 assigned for correct responses and 0 for incorrect responses. Reliability testing showed a Cronbach's alpha of 0.53 and a reliability coefficient of 0.83, indicating that the instrument was acceptable.

The intervention was conducted once using an animated video with a duration of approximately 10 minutes, demonstrating six steps of diabetic foot care: daily foot inspection, maintaining foot hygiene, lotion application, nail trimming, footwear maintenance, and cleaning the inside of shoes. Respondents completed pretest and posttest questionnaires to assess changes in knowledge.

Data were coded, scored, and analyzed using SPSS version 27, including editing, tabulation, data entry, and data cleaning. Normality was assessed using the Kolmogorov–Smirnov test, and bivariate analysis was performed using the Wilcoxon signed-rank test to measure differences in knowledge before and after the intervention. The study received ethical approval from the Ethics Committee of Universitas Muhammadiyah Banjarmasin (KEPK: 0128226371, April 7, 2025). All respondents provided informed consent, confidentiality was maintained, and the study was conducted in accordance with the principles of beneficence and justice.

RESULTS

Univariate Analysis

Table 1. Distribution of Respondents by Gender

No.	Gender	Frequency (f)	Percentage (%)
1	Female	77	74.8
2	Male	26	25.2
	Total	**103**	**100**

Based on Table 1, the majority of study respondents were female, totaling 77 individuals (74.8%), while male respondents accounted for 26 individuals (25.2%).

Table 2. Distribution of Respondents by Marital Status

No.	Marital Status	Frequency (f)	Percentage (%)
1	Widowed	10	9.7
2	Divorced	4	3.9
3	Married	89	86.4
	Total	**103**	**100**

Based on Table 2, most respondents were married, with 89 individuals (86.4%). Respondents who were widowed numbered 10 individuals (9.7%), while those who were divorced accounted for 4 individuals (3.9%).

Table 3. Distribution of Respondents by Educational Level

No.	Educational Level	Frequency (f)	Percentage (%)
1	Elementary School	5	4.9
2	Junior High School	17	16.5
3	Senior High School	76	73.8
4	Bachelor's Degree	5	4.9
	Total	**103**	**100**

Based on Table 3, the majority of respondents had completed senior high school education, totaling 76 individuals (73.8%). Respondents with elementary school education and a bachelor's degree each accounted for 5 individuals (4.9%), while those with junior high school education numbered 17 individuals (16.5%).

Table 4. Distribution of Respondents by Occupation

No.	Occupation	Frequency (f)	Percentage (%)
1	Housewife	68	66.0
2	Laborer	4	3.9
3	Private Sector Employee	12	11.7
4	Self-Employed	13	12.6
5	Civil Servant	6	5.8
	Total	**103**	**100**

Based on Table 4, most respondents were housewives, totaling 68 individuals (66.0%). Respondents who were self-employed numbered 13 individuals (12.6%), private-sector employees 12 individuals (11.7%), civil servants 6 individuals (5.8%), and laborers 4 individuals (3.9%).

Table 5. Level of Foot Care Knowledge Before the Intervention

No.	Knowledge Level	Frequency (f)	Percentage (%)
1	Good	2	1.9
2	Poor	101	98.1
	Total	**103**	**100**

Based on Table 5, prior to receiving audio-visual education, the majority of respondents demonstrated a low level of foot care knowledge for preventing diabetic foot ulcers among patients with diabetes mellitus. Only 2 respondents (1.9%) had "Good" knowledge, whereas 101 respondents (98.1%) were categorized as having "Poor" knowledge.

Table 6. Level of Foot Care Knowledge After the Intervention

No.	Knowledge Level	Frequency (f)	Percentage (%)
1	Good	102	99.0
2	Poor	1	1.0
	Total	**103**	**100**

Based on Table 6, following the provision of audio-visual education, almost all respondents showed a significant improvement in foot care knowledge for preventing diabetic foot ulcers among patients with diabetes mellitus. A total of 102 respondents (99.0%) demonstrated "Good" knowledge, while only 1 respondent (1.0%) remained in the "Poor" knowledge category.

Bivariate Analysis

Table 7. Comparison of Foot Care Knowledge Levels Before and After the Intervention

Knowledge Level	Pretest (f)	Pretest (%)	Posttest (f)	Posttest (%)	Difference (f)	Wilcoxon Test	p-value
Good	2	1.9	102	99.0	+100		
Poor	101	98.1	1	1.0	−100	< 0.001	< 0.001
Total Respondents	103	100	103	100			

The results of the Wilcoxon signed-rank test indicated a statistically significant difference in patients' foot care knowledge before and after the audio-visual education intervention. The data showed that the proportion of respondents with "Good" knowledge increased from 2 respondents (1.9%) at pretest to 102 respondents (99.0%) at posttest, representing an increase of 100 respondents. Conversely, the "Poor" knowledge category decreased from 101 respondents (98.1%) to 1 respondent (1.0%). The Wilcoxon signed-rank test yielded a p-value of < 0.001, which was lower than the significance level of 0.05 (α = 0.05). Therefore, it can be concluded that the audio-visual education intervention significantly improved patients' foot care knowledge among individuals with diabetes mellitus.

DISCUSSION

Characteristics of Respondents Based on Gender, Marital Status, Education, and Occupation and Their Association with Foot Care Knowledge Among Patients with Diabetes Mellitus

The results of this study indicate that the majority of respondents were female (77 individuals; 74.8%), married (89 individuals; 86.4%), had completed senior high school education (76 individuals; 73.8%), and were housewives (68 individuals; 66.0%). These characteristics suggest that most patients had a secondary education background and occupations that may limit access to formal health information.

From a gender perspective, previous research has shown that women tend to have better knowledge regarding foot care and diabetes-related complications compared to men. Studies have reported that female patients achieve higher knowledge scores related to foot care practices and the consequences of diabetes, including the risk of hyperglycemia and its systemic effects (Santos et al., 2014). In contrast, male patients often demonstrate deficiencies in foot care practices, such as inadequate drying of interdigital spaces and suboptimal foot hygiene behaviors (Rossaneis et al., 2016). These findings highlight the need for educational strategies tailored to gender differences in order to improve understanding and self-care practices among patients with diabetes mellitus.

In addition, several studies have emphasized that women experience different risks in the development and management of diabetes mellitus compared to men. Contributing factors include hormonal changes, particularly the decline in estrogen levels during menopause, which may reduce insulin sensitivity and increase the risk of type 2 diabetes mellitus. Women also tend to have higher body fat distribution, which can influence insulin resistance. Furthermore, the basal caloric requirement in women is approximately 25 kcal per kilogram of body weight per day, which is lower than that of men and may affect weight management and diabetes risk (Sari, 2021). According to Making et al. (2023), the prevalence of diabetes is strongly influenced by gender-related variations in cholesterol levels, daily physical activity, and lifestyle choices. Body fat composition ranges from 15 to 20 percent in men and 20 to 25 percent in women, making women more likely to experience higher fat accumulation and have a three- to seven-fold greater risk of developing diabetes mellitus compared to men.

Marital status also plays an important role in foot care knowledge. Married individuals generally have better social support, which positively influences health behaviors and their ability to obtain information related to foot care (Alshammari et al., 2019). Marital status has also been associated with better foot care practices due to shared responsibility in managing health conditions and encouragement from spouses to consistently apply health-related information (Pourkazemi et al., 2020). Family support is recognized as one of the strongest factors in promoting self-care behaviors among patients with diabetes, including dietary reminders, monitoring physical activity, and adherence to routine treatment (Hensarling, 2021).

Educational level is a significant determinant of foot care knowledge and practices. Patients with higher levels of education tend to have better access to health information and relevant resources, resulting in more optimal knowledge and practices (Hasnain & Sheikh, 2009; Goweda et al., 2017). Conversely, patients with secondary education, such as senior high school graduates, may face limitations in accessing formal health information, which

can affect the quality of their foot care knowledge and practices (Berardis et al., 2005). Individuals with higher educational attainment generally demonstrate better understanding of self-care in the management of diabetes mellitus (Saputra et al., 2023).

In addition to education, occupation also influences foot care knowledge. Specifically, working as a housewife may limit access to formal health education and resources, thereby affecting patients' knowledge levels (Hasnain & Sheikh, 2009). Nevertheless, housewives can still acquire knowledge through flexible educational media, such as audio-visual education, which allows for self-directed learning that can be adapted to their daily schedules and routines.

Occupation is also related to productivity and an individual's ability to manage diabetes. Demanding or inflexible work conditions may serve as barriers to adopting healthy lifestyles necessary for effective diabetes mellitus management (Hartanti, 2022; Febrinasari et al., 2021). Therefore, understanding respondent characteristics, including gender, marital status, education, and occupation, is essential as a foundation for designing effective educational interventions. Audio-visual media, in particular, offer a suitable approach to reaching individuals across different literacy levels while delivering practical and consistent information on proper foot care.

Effectiveness of Audio-Visual Education in Improving Foot Care Knowledge

The results of this study indicate that education using audio-visual media is effective in improving patients' knowledge of foot care in diabetes mellitus. Analysis using the Wilcoxon signed-rank test demonstrated a statistically significant increase in knowledge ($p < 0.001$), with almost all respondents shifting from the "Poor" knowledge category to the "Good" category. These findings confirm that audio-visual media are capable of delivering health information clearly and in a manner that is easily understood by patients, making them a relevant and effective educational strategy in the context of diabetic foot care.

Audio-visual media combine auditory and visual elements simultaneously, allowing the presented material to be more easily understood and remembered. In this study, the intervention was delivered through an animated video that included six essential steps of foot care, namely foot inspection, maintaining foot hygiene, nail care, appropriate footwear use, and inspection of the inside of shoes. Visual presentation enables respondents to directly observe the procedures to be performed, thereby enhancing comprehension and facilitating the independent implementation of proper foot care practices (Ichsan et al., 2021; Meidiana et al., 2022).

These findings are consistent with the study by Sri (2022), which reported an increase in the mean knowledge score from 65.17 before video-based education to 76.50 after the intervention. This evidence reinforces that audio-visual media not only capture patients' attention but also enhance information retention more effectively than conventional learning methods (Aeni & Yuhandini, 2021).

The mechanism underlying knowledge improvement through audio-visual media can be explained by Cognitive Load Theory and Multimedia Learning Theory. Presenting information through visual and auditory channels simultaneously helps minimize cognitive load, thereby maximizing memory retention and comprehension of the material (Mayer, 2009). Visual demonstrations of foot care procedures also allow respondents with secondary-

level education to connect theory with practice, as they can observe and replicate correct techniques, thus improving their ability to perform foot care independently.

In addition, audio-visual media increase learning motivation and patient engagement. Videos provide a more comprehensive, engaging, and varied learning experience, allowing respondents to replay content as needed, adjust playback speed and audio volume, and understand the material more critically (Meidiana, 2023; Mubarak, 2023). This approach offers an interactive and enjoyable learning experience, which subsequently enhances the application of appropriate foot care practices in daily life (Hendrarinii, 2023).

The effectiveness of audio-visual media in health education is further supported by previous studies. Corbett (2003) demonstrated that educational interventions, including audio-visual media, significantly improved patients' knowledge and self-care practices, leading to better foot care behaviors. Kafaie et al. (2012) reported significant improvements in foot care practices, including better lesion and nail conditions. A meta-analysis by Feeley et al. (2022) found that the use of animation had a significant positive effect on comprehension and information retention across various health contexts, including diabetes. Rahaman et al. (2018) also confirmed that audio-visual education significantly improved patients' knowledge scores compared to control groups.

Patient-centered educational approaches have also been shown to be effective. Makiling and Smart (2020) reported that educational materials tailored to patients' needs, including the use of visual aids, significantly improved understanding of preventive foot self-care. Supit et al. (2018) further noted that combining educational videos with focus group discussions resulted in greater improvements in knowledge among patients with type 2 diabetes mellitus, utilizing the strengths of visual media alongside interactive learning.

Overall, the findings of this study indicate that educational interventions using audio-visual media are effective in improving foot care knowledge among patients with diabetes mellitus. This approach not only facilitates the delivery of information but also supports the correct application of foot care practices, thereby reducing the potential risk of complications such as diabetic foot ulcers.

Study Limitations and Considerations in Interpreting the Findings

This study employed a one-group pretest-posttest design and therefore did not include a control group. This limitation implies that external factors, such as patients' prior experiences or exposure to information from other sources, could not be fully controlled. Consequently, although the Wilcoxon signed-rank test demonstrated a statistically significant improvement in knowledge, the findings should be interpreted with caution.

In addition, the study sample was limited to patients attending the Pekauman Primary Health Center, which restricts the generalizability of the findings to broader populations. Future studies are recommended to include a control group or to apply more robust experimental designs to evaluate the long-term effectiveness of audio-visual education. Potential confounding variables, such as age, duration of diabetes mellitus, and previous experience with foot care practices, should also be considered in subsequent analyses.

Implications of the Study Findings for Nursing Practice, Health Education, and Policy

The results of this study indicate that education using audio-visual media can be implemented as a health promotion strategy in primary health care facilities. The application of this approach may assist patients in understanding and applying proper foot care practices, thereby preventing complications such as diabetic foot ulcers.

For health care professionals, the use of audio-visual media represents an efficient, engaging, and repeatable educational method that can be tailored to patients' needs. In nursing education, this media can be utilized to enhance the quality of learning related to self-care practices. From a policy perspective, these findings underscore the importance of developing audio-visual-based educational programs in primary health care settings to improve health literacy among patients with diabetes mellitus and to reduce the risk of long-term complications.

CONCLUSION

Based on the findings of this study on the effect of audio-visual education on foot care knowledge in preventing foot ulcers among patients with diabetes mellitus at the Pekauman Primary Health Center in Banjarmasin, it can be concluded that the use of audio-visual-based educational media is effective in improving patients' understanding of diabetic foot care. This intervention not only helps patients obtain clear and easily understood information but also enhances their ability to independently apply preventive foot care measures. The observed improvement in knowledge has significant practical implications, as it may reduce the risk of complications among patients with diabetes mellitus and improve the quality of primary health care services. From a scientific perspective, these findings confirm that audio-visual media represent an effective educational method for patients with diverse literacy levels and educational backgrounds, while also reinforcing Multimedia Learning Theory and Cognitive Load Theory in the context of health education.

It is recommended that video-based education be integrated into routine services for patients with diabetes mellitus. Such media can be displayed in waiting areas or distributed in digital formats, allowing patients flexible access and the opportunity to review the material as needed. This implementation is expected to enhance the effectiveness of health education and minimize the risk of diabetes-related complications.

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