



THE EFFECT OF HEALTH EDUCATION ON EARLY DETECTION OF DIABETIC FOOT WOUND COMPLICATIONS

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ABSTRACT

The number of Diabetes Mellitus sufferers in Aceh is 2.4%. In 2023, the prevalence of Diabetes Mellitus sufferers in Southwest Aceh Regency is 4236 sufferers. One of the impacts of diabetes mellitus with diabetic foot ulcers is a 2.5 times higher risk of death compared to diabetes mellitus patients who do not experience diabetic foot ulcers. The purpose of this study was to analyze the effect of health education on increasing early detection of diabetic foot ulcer complications at Tengku Peukan Hospital. Quantitative research with a pre-experimental design approach. The population was 531 people and a sample of 228 people, selected through consecutive sampling. The instrument used SOP, PPT media education and a questionnaire to increase early detection of Diabetic Foot Ulcer complications. The statistical test used was the Wilcoxon Sign Rank test. The results of the analysis showed that there was a difference in early detection before and after education about diabetic foot ulcer complications with a p value = 0.000 ($z = -13.091$).

Keywords: education; complications; diabetic foot ulcer; diabetes mellitus

How to cite (in APA style)

Nazifa, N., Ichwansysah, F., Nurjannah, N., Abdullah, A., & Aramico, B. (2025). The Effect of Health Education on Early Detection of Diabetic Foot Wound Complications. *Indonesian Journal of Global Health Research*, 7(6), 643–648. <https://doi.org/10.37287/ijghr.v7i6.277>.

INTRODUCTION

Diabetes Mellitus (DM) is a chronic multifactorial metabolic disorder characterized by hyperglycemia and insulin resistance. DM develops gradually and often remains unnoticed. It can cause severe and life-threatening complications. Prolonged DM may lead to multiple complications, especially vascular ones, affecting small blood vessels (microvascular), large blood vessels (macrovascular), or both (Brutsaert, 2023). The prevalence of DM affects approximately 537 million adults aged 20–79 years, meaning one in ten people has DM. This number is projected to increase to 643 million by 2030 and 783 million by 2045. In the Asian region, about 90 million people have DM, with an expected 68% increase by 2045. Indonesia has 10.5 million DM cases, ranking seventh worldwide in diabetes prevalence (International Diabetes Federation, 2021). In Aceh Province, 17,271 individuals of all ages have been diagnosed with DM, representing 2.6% of the national total (Dinkes Aceh, 2023).

Diabetic foot ulcers (DFU) are among the most common complications in DM patients, usually caused by poor glucose control, neuropathy, peripheral vascular disease, or inadequate foot care (Moa & Binus, 2018). The incidence of DFU remains high, affecting 85% of DM patients. One in every 20 hospitalized DM patients suffers from DFU, and a lower limb is lost due to DM every 20 seconds (Woda & Dikson, 2023). Early primary prevention of DFU is crucial to avoid further damage and ulceration that may lead to amputation. Even minor infections or wounds must be managed seriously (Petersmann et al., 2019). DM patients should diligently care for and inspect their feet to prevent DFU and potential disabilities. Increasing DM patients' knowledge about DFU prevention can improve their quality of life, enabling them to live normally and avoid unnecessary medical expenses. Common interventions include education on early detection of DFU complications. Education can be delivered individually to patients or involve close family members

who assist in implementing foot care instructions provided by nurses (Marbun, Aryani, & Sinurat, 2021). Research shows that education can enhance DM patients' knowledge of foot care to prevent DFU (Sabri et al, 2023). Proper management education for high-risk DFU patients is essential. Patients must understand the implications of reduced or lost foot sensation, the importance of wearing appropriate footwear, daily foot and footwear monitoring, proper nail and skin care, and selecting suitable footwear. Regular evaluation of patients' knowledge and ability to perform foot care is necessary (Sari, 2021). An initial survey conducted at Tengku Peukan Hospital found that an average of 150 DM patients visit monthly, with 40 experiencing DFU complications. Interviews revealed that among 10 DM patients, 5 had experienced DFU, 3 had never experienced DFU and were unaware of it, and 2 had never received DFU-related education from either the hospital or community health centers. The purpose of this study is to analyze the effect of health education on improving early detection of diabetic foot ulcer complications at Tengku Peukan Hospital.

METHOD

This study employed a quantitative pre-experimental design using a pre- and post-test without control group approach. The population consisted of all DM patients, totaling 531 individuals. The sample included 228 DM patients with complications, selected through consecutive sampling. The study was conducted at Tengku Peukan Hospital from December 2024 to January 2025, encompassing data collection, analysis, and report preparation. Data were collected using a questionnaire which was adopted from Supriyadi dan Dewi (2023) the table with an r value of 0.334. The statistical test used is the Wilcoxon Sign Rank test.

RESULT

Table 1.
Respondent characteristics

Characteristics	f	%
Age		
Late Adolescence	1	0,44
Early Adulthood	12	5,26
Late Adulthood	42	18,42
Early Elderly	47	20,61
Late Elderly	94	41,23
Seniors >65 years	32	14,04
Gender		
Male	145	63,6
Female	83	34,4
Education		
Primary	64	28,07
Secondary	100	43,86
Higher	64	28,07
Income		
High	80	35,09
Low	148	64,91
Family History of Diabetes		
Has Diabetes	200	87,72
No Diabetes	28	12,28
Merokok		
Merokok	135	59,21
Tidak Merokok	93	40,79
BMI		
Very Thin	9	3,95
Thin	17	7,46
Normal	143	62,72
Overweight	30	13,16
Obesity	29	12,72
Physical Activity		
Light	129	56,58
Moderate	52	22,81
Strenuous	47	20,61

Table 1 shows that of the 228 respondents, most of the 94 (41.23%) respondents were in late elderly age, most of the 145 (63.6%) respondents were male, most of the 100 (43.86%) respondents had secondary education, most of the 148 (64.91%) respondents had high income, most of the 200 (87.72%) respondents had family members with DM, most of the 135 (59.21%) respondents smoked, most of the 143 (62.72%) respondents had a normal BMI, most of the 129 (56.58%) respondents had light activity and all 228 (100%) respondents had never experienced diabetic foot ulcers.

Table 2.
Univariate analysis

Univariate analysis									
Variable				Pretest		Posttest		Mean	SD
				F	%	f	%		
Knowledge of Diabetic Foot Wound Complications									
Good				21	9,21	175	76,75	104,9	0,97
Fair				187	91,23	47	20,61		
Poor				20	8,77	6	2,63		
Behavior Regarding Diabetic Foot Wound Complications									
Good				110	48,25	196	85,96	127,9	0,93
Poor				118	51,75	32	14,04		

Table 2 shows that of the 228 respondents, before education about diabetic foot ulcer complications, most (187) (91.23%) had adequate knowledge. Meanwhile, after education about diabetic foot ulcer complications, most (175) (76.75%) respondents had good knowledge. The average knowledge score before education about diabetic foot ulcer complications was 104 (SD=0.97). Meanwhile, the average knowledge score after education about diabetic foot ulcer complications was 127.9 (SD=0.93). Table 2 shows that of the 228 respondents, before education about diabetic foot ulcer complications, most (110) (51.75%) respondents had poor behavior. Meanwhile, after education about diabetic foot ulcer complications, most (196) (85.96%) respondents had good behavior. The average behavior score before education about diabetic foot ulcer complications was 27.3 (SD=4.7). Meanwhile, the average behavioral score after education about diabetic foot ulcer complications was 32.65 (SD=5.6).

Table 3.
Data normality test

Variable	n	Kolmogorov Smirnov
Knowledge of Diabetic Foot Wound Complications		
Before	228	0,000
After		0,000
Behaviors Regarding Diabetic Foot Wound Complications		
Before	228	0,3877
After		0,000

Table 3 shows the results of the normality test on the knowledge variable before education about diabetic foot ulcer complications that is not normally distributed with a p value of 0.000 and after education about diabetic foot ulcer complications is 0.000 smaller than the α value of 0.05 which means the data is not normally distributed. Meanwhile, the behavior variable before education about diabetic foot ulcer complications is normally distributed with a p value of 0.3877 and behavior after education about diabetic foot ulcer complications is 0.000 smaller than the α value of 0.05 which means the data is not normally distributed.

Table 4.
Bivariate analysis (*wilcoxon sign rank test*)

Variable	Sum Rank	Z	P-value	Positive	Negative
Before and after educational knowledge about diabetic foot ulcer complications	0-26103	-13,091	0,000	0	0
Before and after educational behavior about diabetic foot ulcer complications	1548,5-24491,5	-11,515	0,000	0	0

Table 4 shows a difference in knowledge before and after education about diabetic foot ulcer complications, with a p-value of 0.000, less than the α value of 0.05. This result can also be seen from the z-value of -13.091, which is outside the critical value of -1.96 to 1.96, indicating a difference in knowledge before and after education about diabetic foot ulcer complications. Table 4 shows a difference in knowledge before and after education about diabetic foot ulcer complications, with a p-value of 0.000, less than the α value of 0.05. This result can also be seen from the z-value of -11.515, which is outside the critical value of -1.96 to 1.96, indicating a difference in behavior before and after education about diabetic foot ulcer complications.

DISCUSSION

Analysis of the Effect of Health Education on the Improvement of Early Detection of Diabetic Foot Ulcer Complications

The study results indicate a significant difference in knowledge before and after education regarding diabetic foot ulcer (DFU) complications at Tengku Peukan Hospital. Prior to receiving foot care education, DM patients' knowledge was categorized as poor; however, after exposure to educational videos on foot care, their knowledge improved to a good level (Setyaningrum, 2024). This finding aligns with previous research demonstrating significant increases in knowledge levels about diabetic foot ulcer prevention following health education interventions. Education is an activity aimed at individuals, groups, or communities by delivering accurate information, raising awareness, and fostering understanding of health-related recommendations (Munali et al, 2019).

Research on the effectiveness of foot care education programs among DM patients showed significant improvements in knowledge, self-efficacy, and foot care behavior after participation (Mahdalena & Ningsih, 2016). Literature reviews further reveal statistically significant reductions in DFU risk in intervention groups compared to controls, despite high heterogeneity among studies. Intensive 45-minute education sessions covering appropriate footwear use and foot hygiene were common components. A study by Gloria Green Morris (2014) confirmed that type 2 DM patients' knowledge improved following basic foot health education. Theoretically, this supports the assumption that learners are most receptive when they perceive a need to learn. Therefore, it is essential to encourage healthcare providers to periodically deliver adequate foot care education to their patients. Respondents' knowledge is influenced by factors such as limited exposure to information sources like books, mass media, the internet, or healthcare workers. Higher knowledge levels facilitate easier acceptance of information related to health topics (Hidayat et al, 2022). This is consistent with findings showing that health education positively affects DM patients' knowledge about foot care, with significant increases observed between pre- and post-tests (Meidiana, 2023).

Education and foot care enhance wound prevention and thus improve the quality of care for patients at risk of complications, increasing efficiency in managing DM patients to avoid wounds. Currently, no combined therapy of education and foot care is simultaneously implemented for wound prevention. Such a combination is expected to serve as a preventive model applicable to patients at risk of diabetic foot ulcers. Future research should be theory-based, align measurement indicators, and employ appropriate statistical methods to collect data from patients at risk, providing clearer insights into the importance of education and foot care in preventing diabetic foot ulcers. Certain characteristics of existing studies limit the strength of conclusions, with quantitative studies varying in design, some including control groups and others not. Additionally, some studies rely on samples that do not fully meet researchers' expectations (Sari et al, 2016). The researchers assume that education is crucial for DM patients to enhance their knowledge, enabling them to detect early signs of diabetic foot ulcers promptly and seek assistance, as well as to independently monitor potential ulcer development.

Analysis of the Effect of Health Education on the Improvement of Early Detection Behavior of Diabetic Foot Ulcer Complications

The study also found significant differences in knowledge before and after education on diabetic foot ulcer complications. DM management includes health education, which plays a vital role in empowering patients to self-manage their condition, including regular foot care. Health education is a persuasive or instructional effort aimed at motivating communities to take actions that maintain and improve health status (Saprianto et al, 2022). Nursing interventions to prevent diabetic foot ulcers commonly involve education or training on self-monitoring of diabetic feet. This education can be delivered individually or involve close family members who assist patients in implementing foot care instructions received from nurses (Frisca et al, 2019). Efforts to enhance patients' ability to prevent diabetic foot complications through education are necessary to enable control of risk factors and prevent ulcer development. Effective education can reduce the risk of lower limb amputation due to gangrenous wounds. Therefore, research is needed to evaluate the effectiveness of education on diabetic foot risk factors and preventive practices (Amelia, 2018).

CONCLUSION

Based on the study findings, it can be concluded that there are significant differences in knowledge and behavior before and after education on diabetic foot ulcer complications, with statistically significant p-values. The obtained z-values also indicate that these differences exceed critical thresholds, demonstrating significant changes following education.

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