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EFFECTIVENESS OF HEALTH EDUCATION ON FOOTWEAR SELECTION IN REDUCING FOOT ULCER INCIDENCE AMONG PATIENTS WITH TYPE 2 DIABETES MELLITUS

Pengaruh Pendidikan Kesehatan tentang Pemilihan Alas Kaki terhadap Kejadian Ulkus Kaki pada Pasien Diabetes Tipe 2

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ABSTRACT
The incidence of diabetes mellitus in Indonesia is 10.8%. DM is a disease caused by the body's inability to produce insulin, which can lead to complications, one of the most common being foot ulcers. If foot conditions are not properly managed, they will worsen, leading to amputation. Prevention of foot ulcer. nvolves providing education on choosing footwear to reduce the incidence of foot injuries. This study aimed to determine the effect of footwear selection education on the incidence of foot ulcers among patients with type 2 diabetes mellitus.This research method a quasi-experimental design with a single intervention group. The sample used was 30 respondents, with the research instrument being the Inlow's 60-second diabetic foot screen observation sheet. This study was conducted by collecting pre-test data using the observation sheet on type 2 diabetes mellitus patients participating in Prolanis (Program Pengelolaan Penyakit Kronis), followed by education on footwear selection, evaluation, and post-test data collection over a month, with data processing using the Wilcoxon test.The results showed a decrease in the incidence of foot ulcers followinf the footwear selection education intervention. Statitical analysis indicated a significant effect of footwear selection education on reducing foot ulcer incidence among patients with type 2 diabetes mellitus ($p<0.05$). Education on footwear selection influences footwear choices among type 2 diabetes mellitus patients at the Pasar Minggu Community Health Centre. Type 2 diabetes mellitus patients are expected to implement the footwear selection provided not only for those undergoing treatment at the community health centre and prolanis but also at other healthcare facilities.

Keywords: *Health Education, Footwear Selection, Incidence of Type 2 Diabetes Foot Ulcers*

ABSTRAK
Insiden diabetes melitus (DM) di Indonesia adalah 10,8%. DM adalah penyakit yang disebabkan oleh ketidakmampuan tubuh memproduksi insulin, yang dapat menyebabkan komplikasi, salah satunya yang paling umum adalah luka kaki. Perawatan kaki yang tidak adekuat dapat memperburuk kondisi dan meningkatkan risiko terjadinya amputasi. Oleh karena itu, upaya pencegahan cedera kaki perlu dilakukan melalui edukasi yang tepat, khususnya terkait pemilihan alas kaki yang sesuai, guna menurunkan kejadian cedera kaki. Studi ini bertujuan untuk menentukan pengaruh edukasi pemilihan alas kaki terhadap kejadian ulkus kaki pada pasien diabetes melitus tipe 2. Metode penelitian ini menggunakan desain kuasi-eksperimen dengan satu kelompok intervensi. Sampel yang digunakan adalah 30 responden, dengan instrumen penelitian berupa lembar observasi skrining kaki diabetes 60 detik Inlow. Penelitian ini dilakukan dengan mengumpulkan data pre-test menggunakan lembar observasi pada pasien diabetes melitus tipe 2 yang berpartisipasi dalam Prolanis, dilanjutkan dengan edukasi pemilihan alas kaki, evaluasi, dan pengumpulan data post-test selama sebulan, dengan pengolahan data

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menggunakan uji Wilcoxon. Hasil penelitian menunjukkan penurunan kejadian ulkus kaki setelah intervensi edukasi pemilihan alas kaki. Analisis statistik menunjukkan efek signifikan dari edukasi pemilihan alas kaki terhadap penurunan kejadian ulkus kaki pada pasien diabetes melitus tipe 2 ($p<0,05$). Pendidikan tentang pemilihan alas kaki memengaruhi pilihan alas kaki di kalangan pasien diabetes melitus tipe 2 di Puskesmas Pasar Minggu. Pasien diabetes melitus tipe 2 diharapkan menerapkan pemilihan alas kaki yang diberikan tidak hanya bagi mereka yang menjalani pengobatan di puskesmas dan prolanis, tetapi juga di fasilitas pelayanan kesehatan lainnya.

Kata kunci: *Pendidikan Kesehatan, Pemilihan alas kaki, Kejadian ulkus kaki diabetes Tipe 2*

INTRODUCTION

Diabetes mellitus or DM is a condition that arises from the body's limited ability to produce enough insulin, leading to increased blood sugar levels (Khair, 2024). Diabetes has several types, including type 1 diabetes mellitus, which occurs due to an autoimmune response to cell proteins, and type 2 diabetes mellitus, which is caused by genetic factors combined with impaired insulin function. This happens when the body is unable to respond to insulin optimally (insulin resistance), and many environmental factors can contribute, such as obesity, overeating, lack of exercise, and stress (Lestari et al., 2021).

The global prevalence of DM is expected to continue to increase. According to a report by the International Diabetes Federation (IDF), 10.5% of the adult population aged 20 to 79 years, or 537 million people, have diabetes, and nearly half of them are unaware that they have the condition. The International Diabetes Federation estimates that the number of people living with diabetes will increase to 643 million by 2030 and 783 million by 2045. The prevalence of diabetes in Indonesia itself currently stands at 10.8% of adults with 19,465,102 cases (IDF, 2024). The prevalence of diabetes mellitus in DKI Jakarta, according to research results from 2018, increased from 2.5% to 3.4%, with a total population of 250,000 out of 10.5 million people in DKI Jakarta suffering from diabetes. The number of diabetes sufferers who sought medical care at healthcare facilities was 12,775. It can be concluded that the high population density in DKI Jakarta makes it the region with the highest number of DM cases in Indonesia (Nina et al., 2023). The high incidence of diabetes mellitus results in significant illness that can lead to complications. Complications can include disorders affecting body organs, impaired glucose control, and a decline in the quality of life for people with diabetes (Prabawati and Ratnasari, 2023).

DFU or diabetic foot ulcers, is a common condition among people with diabetes. Outpatients with diabetes are at risk of developing foot ulcers. The appearance of DFU in individuals with diabetes is caused by changes in sensory function. The process of experiencing abnormal sensations due to trauma causes abnormal pressure on the bones, leading to skin damage and potentially triggering foot ulcers (Hidayat and Yusuf, 2020). The prevalence of diabetic foot ulcers in Indonesia is also estimated to be 15%, with an amputation rate of 30% and a mortality rate of 32%. The number of people with diabetic foot ulcers in Indonesia in 2002 was 8.4 million, increasing to 14 million in 2006 and reaching 21 million in 2021. The main causes of death in people with diabetes are diabetic foot ulcers and amputation (Hidayat and Masdiana, 2024).

The role of a nurse is educators in providing health education to people with diabetes to help them rebuild any misunderstandings about the disease. Providing education on footwear selection serves to improve the understanding of individuals with diabetes about their condition, thereby increasing their knowledge and reducing the risk of complications (Ariyani et al., 2023). Previous research by Hidayat et al. (2022) showed that foot care and education can prevent wounds, thus improving the quality of care for individuals with diabetes at risk of wound complications and avoiding the occurrence of wounds. Education can be used as an effort to prevent and can be applied to

individuals at risk of developing diabetic foot ulcers to prevent complications. This research was previously conducted by Luo et al. (2022). This study showed that the average footwear adherence at home was 67% initially, 90% at one week, and 56% at 3 months in the motivational interview group, and 35%, 33%, and 31% respectively in the standard education group. This data indirectly indicates that footwear compliance tends to worsen. Choosing appropriate footwear without a burden can reduce the incidence of diabetic foot ulcers, and this can gradually decrease over time. Optimal footwear replacement should be considered in terms of time, use, and frequency.

Based on interviews conducted by the researcher with DM type 2 patients participating in the chronic disease management program at Pasar Minggu Public Health Center, the results showed that educational interviews on footwear selection at Pasar Minggu Public Health Center have not been implemented. Based on observations conducted by the researcher regarding the prolanis program at Pasar Minggu Public Health Center, the activity was physical exercise. According to the results of interviews conducted with doctors who handle prolanis, the prolanis schedule is determined thru the prolanis WhatsApp group and has been set by the Pasar Minggu Public Health Center. For type 2 diabetics participating in Prolanis, examinations are conducted every six months, and specifically for diabetes mellitus patients, check-ups are done every month. The results of interviews with doctors who handle Prolanis indicate that most Prolanis participants have prevented foot ulcers because most diabetes mellitus patients exercise physically every month.

MATERIALS AND METHODS

Health Education: Choosing Footwear

The intervention provided in this study was health education on choosing the right footwear for Type 2 Diabetes Mellitus patients as an effort to prevent diabetic foot ulcers. The health education was designed in a structured manner and tailored to the patients' conditions, based on the principles of diabetic foot ulcer prevention.

The health education materials covered the basic concepts of diabetic foot ulcers, associated risk factors, the role of appropriate footwear in preventing foot trauma, and criteria for safe footwear for patients with diabetes. Patients were also provided with an understanding of the pathophysiological mechanisms underlying foot ulcer development, including peripheral neuropathy, vascular impairment, and repetitive pressure caused by inappropriate footwear.

Recommended footwear characteristics include appropriate size, soft material, sufficiently thick and non-slip soles, wide toe box, and no rough stitching on the inside. Additionally, patients were educated on the importance of wearing footwear at all times, both indoors and outdoors, and avoiding thin sandals or narrow shoes that could potentially cause blisters and wounds. Health education also includes how to choose and use the correct footwear, such as the right time to buy shoes, checking the inside of footwear before use, wearing cotton socks, and replacing damaged footwear. Health education was delivered through interactive lectures and discussions at the Pasar Minggu Public Health Center, supported by educational materials such as leaflets and examples of appropriate and inappropriate footwear. The intervention was conducted in a single session lasting approximately 30–45 minutes and was delivered by nurses as educators.

Health education evaluation is conducted by measuring patients' knowledge levels before and after the intervention, as well as observing their understanding of choosing appropriate footwear. Increased knowledge and behavioural changes in footwear selection are expected to contribute to a reduction in foot ulcer incidence among Type 2 Diabetes Mellitus patients. this study aimed to determine whether footwear selection education had a significant effect on reducing foot ulcer incidence. Although this design does not include a control group, it is suitable for evaluating the effectiveness of preventive educational interventions in real-world clinical settings. Potential limitations related to the absence of randomization and control were acknowledged and addressed through careful implementation and consistent outcome measurement.

Study design

This study employed a quasi-experimental design using a pre-test and post-test approach without a control group, in which an intervention was administered to the participants. then measure them before and after the intervention is given for 1 month. This design was selected because it allows the assesment of changes in clinical outcomes following an educational intervention without randomation, which is appropriate for community-based health service settings. All type 2 diabetes mellitus patients enrolled in the Prolanis program at the Pasar Minggu Public Health Center made up the study population. This study employed purposive sampling, a non-probability sampling technique with predefined inclusion and exclusion criteria, to select participants relevant to the study objectives. The study population consisted of 90 patients with type 2 diabetes mellitus enrolled in the Prolanis program at the Pasar Minggu Public Health Center. From this population, a sample of 30 participants who met the eligibility criteria and attended the program on December 17, 2024, was included in the study. The inclusion criteria for this study are Clinically diagnosed with type 2 diabetes mellitus. Prolanis members at Pasar Minggu Health Centre, Jakarta Able to communicate effectively and provide informed consent No active foot ulcers at baseline (to accurately measure incidence) Ready to participate in a barefoot election education intervention. Exclusion criteria participants were excluded if they had severe diabetic foot complications requiring immediate medical intervention, had cognitive impairment or conditions that hindered understanding of the educational materials and were unable to complete the follow-up assessment.

Data Collection

Data were collected at the Pasar Minggu Community Health Center after obtaining ethical approval and informed consent from all participants. Baseline data were collected using a structured questionnaire to assess demographic characteristics and foot conditions through direct observation and physical examination. Participants then received structured footwear selection education delivered by trained health personnel. After a predetermined follow-up period, post-intervention assessments were conducted using the same instruments to identify new cases of foot ulcers. All data were recorded, coded, and analyzed using standardized procedures to ensure data quality.

Data analysis

In this study, data analysis used univariate and bivariate analysis. The purpose of univariate data analysis in this study was to determine the frequency distribution of each variable. Analyse the data, including both general and specific data. In this study, the general data variables were gender, age, and education level. The specific data analysed were foot screenings before and after intervention, and bivariate analysis was used to analyse two related variables. This study examined whether there was an effect before and after education was provided, using a paired t-test and the Wilcoxon test because the data obtained were not normally distributed and the data scale was ordinal, according to the hypothesis testing table. If the data are not normally distributed, the alternative test is a non-parametric test to see if there were changes before and after the intervention.

Ethical statement

This study was approved by the Health Research Ethics Committee of Universitas Nasional Jakarta with ethical clearance number (Approval No.025/e-KEPK/FIKES/XII/2024). All participants provided written informed consent before enrollment. Data confidentiality was maintained throughout the study in accordance with the Declaration of Helsinki.

RESULT AND DISCUSSION

In this study, univariate analysis was used to describe the frequency distribution of variables and the characteristics of the study respondents. The univariate analysis of the study included gender, age, education level, and the risk of foot ulcers before and after the intervention.

Table 1. Frequency of Partisipants Gender, Age, and Education at Pasar Minggu Community Health Centre

Gender	Frequency	Precentage (%)
Man	8	26,7
Woman	22	73,3
Total	**30**	**100**
Age	**Frequency**	**Precentage (%)**
36-45 year	1	3,3
46-55 year	11	36,7
56-65 year	10	33,3
>65 year	8	26,7
Total	**30**	**100**
Education	**Frequency**	**Precentage (%)**
Elemntary school	7	23,3
Junior school	10	33,3
High School	11	36,7
University	2	6,7
Total	**30**	**100**

Based on Table 1, it is known that the majority gender is Woman with 73.3% or 22 partisipants Man with 26.7% or 8 partisipants. The most frequent age range for partisipants was 46 to 55 years old, accounting for 36.7% with 11 partisipants. The 56 to 65 age group represented 33.3% with 10 partisipants, those over 65 years old accounted for 26.7% with 8 partisipants, and the 36 to 45 age group made up 3.3% with 1 partisipants, The most frequent level of education was high school, with 11 partisipants, representing 36.7%. Junior high school education accounted for 3.3% with 10 partisipants, elementary school education for 23.3% with 7 respondents, and higher education for 6.7% with 2 partisipants,

Table 2. Frequency Distribution of Partisipants Foot Injury Occurrences Before Footwear Selection Education at Pasar Minggu Community Health Centre

Category	Frequency	Precetage (%)
Very Low Risk	6	20,0
Low Risk	15	50,0
Moderate Risk	9	30,0
Total	30	100,0

Based on Table 2 at the Pasar Minggu Community Health Centre, before receiving education, the majority of rpartisipants had foot ulcers with a low-risk category, accounting for 50.0% with 15 partisipants,, a moderate-risk category accounting for 30.0% with 9 partisipants, and a very low-risk category accounting for 20.0% with 6 partisipants,

Table 3. Frequency Distribution of Foot Wound Occurrences in Partisipants After Footwear Selection Education at Pasar Minggu Community Health Centre

Category	Frequency	Precetage (%)
Very Low Risk	23	76,7
Low Risk	7	23,2
Total	30	100,0

Based on Table 3, Partisipants at the Pasar Minggu Community Health Centre after receiving education on footwear selection, the majority of respondents had a very low risk of foot ulcers, with 23 respondents or 76.7%, and a low risk for 7 respondents or 23.3%.

Table 4. Results of the Wilcoxon Test on the Effect of Footwear Selection Education on the Incidence of Foot Ulcers in Type 2 Diabetes Mellitus Patients at the Pasar Minggu Community Health Centre

	N	Negative Rank	Positive Rank	Ties	Z	P V*alue*	Mean Rank
Before – After Treatment	30	21[a]	0[b]	9[c]	-4,245	<0.001	11,00

Based on Table 4, shows the results of negative rank data from 30 partisipants,, totalling 21a, a positive rank value of 0b, Ties with a value of 9c, Z with a value of -4.245b, Pvalue with a value of <0.001, and a mean rank of 11.00. The results of the Wilcoxon Signed Ranks Test showed a pvalue less than 0.001 or <0.05, indicating that Ha is accepted or that there is an effect of footwear selection education on the incidence of foot ulcers in type 2 diabetes mellitus patients at the Pasar Minggu Public Health Centre.

DISCUSSION

Based on the research results, it was found that out of the total respondents, 73.3% were female and 26.7% were male. The majority of respondents at the Pasar Minggu Public Health Centre were female. The research aligns with previous studies conducted by (Anggraeni et al, 2020), which showed that the majority of respondents were female (67.9%) and male (32.1%). This indicates that women are at higher risk of developing type 2 diabetes because they experience a decline in oestrogen levels during menopause, as well as reduced insulin response due to decreased progesterone and oestrogen. Consequently, foot ulcers are more common in women than in men. The majority of respondents were aged 46–55 years, indicating that middle-aged adults constituted the largest proportion of the study population. This age distribution suggests a higher prevalence of type 2 diabetes mellitus within this age group.

Most respondents had a high school education (36.7%), followed by junior high school, indicating that secondary education levels were predominant among the participants. The research results showed that the highest level of education was high school. This study is in line with previous research used by (Chloranyta et al, 2024), which found that the highest level of education among individuals with diabetes mellitus was high school, at 63.3%. This will affect understanding and accepting the information received. Education can also help someone increase their knowledge in various areas. Therefore, it can be concluded that higher education will lead to more information received and easier understanding of that information.

The results of the research conducted on the incidence of foot ulcers before the intervention showed that out of 30 respondents, 50% were at low risk, 30% at moderate risk, and 20% at very low risk. After the intervention, the incidence of foot ulcers showed that the majority of r partisipants, were at very low risk (76.7%) and low risk (23.2%). The results of this study are consistent with previous research by Ayu et al. (2024), which showed that before the intervention, the majority of partisipants, were at low risk (52.94%), and after the intervention, the results showed that 55.88% were at very low risk. This study is also consistent with previous research used by Dewi and Arisanty (2019), which showed that before the intervention, 76.7% of r partisipants, were at low risk, and after the intervention, 92.4% were at very low risk. Foot care includes checking the feet, keeping them clean, trimming nails properly, and choosing the right footwear to prevent foot wound complications.

Health education is a process to increase knowledge and resilience in order to

improve health knowledge, with the goal of increasing and facilitating the reception of information obtained (Chloranyta et al., 2024). Footwear selection education is conducted to prevent foot injuries and increase the knowledge of individuals with disabilities, as well as to motivate them to prevent foot injuries (Susilawati et al., 2024). Education using leaflets is conducted because leaflets are an information medium in the form of images or writing on folded sheets, making them easier to read. With this education on footwear selection, it is hoped that DM patients will have good knowledge about footwear selection education so that diabetic foot ulcers can be avoided (Chloranyta et al, 2024). Choosing footwear is also one of the efforts to prevent foot problems, such as neuropathy, by selecting appropriate footwear. If the wearer uses inappropriate footwear, it will cause irritation to the feet, which, if not prevented, will lead to wounds. Foot ulcers are wounds that occur in the foot area, making them difficult to heal and even chronic. If left untreated, they can lead to complications and even amputation. Therefore, individuals with foot ulcers need to protect their feet by always wearing appropriate footwear to prevent foot injuries. One factor contributing to foot ulcers is wearing shoes that are too small or using open-toed footwear (Risman et al., 2020).

Based on the Wilcoxon test results, the p-value obtained is less than 0.001 or <0.005. Bivariate analysis is used to determine the effect of footwear selection education on the incidence of foot ulcers in type 2 diabetes patients. The study found that the risk of foot ulcers before the intervention was predominantly low, at 50%, while after the intervention, the risk of foot ulcers decreased, with 76.7% being very low risk. Based on the results obtained, the p-value was <0.001, which is less than 0.05. Therefore, it was concluded that the hypothesis was accepted, meaning there was an effect before and after providing education on footwear selection on the incidence of foot ulcers in type 2 diabetes mellitus patients at the Pasar Minggu Public Health Centre. This research aligns with previous studies conducted by (Ayu et al., 2024), which showed a Wilcoxon test result of p-value 0.00 or <0.05, meaning Ha is accepted and Ho is rejected, indicating that foot care training has an effect on the incidence of diabetic foot ulcers in patients with diabetes mellitus at the Gunungsari Community Health Centre. The research aligns with previous studies conducted by (M. Shiddiq Rohmatulloh, 2024), which showed that the data processing test results using the Wilcoxon test indicated a p-value of 0.001 or <0.05, meaning Ha was accepted and Ho was rejected. This indicates that health education videos have an impact on the knowledge of foot care for DM patients in Cibolang Village.

The research aligns with previous studies conducted by (Jannah and Uprianingsih, 2020), which showed that the Wilcoxon test results indicated a p-value of 0.000 or <0.05, meaning that diabetic foot care has an impact on preventing diabetic foot ulcers. Based on the research results using the Wilcoxon test, the negative rank value was 21a, the positive rank value was 0b, and the ties value was 9c. This indicates that the larger the negative rank value compared to the positive rank value, the smaller the value after the intervention, as the measuring instrument used is one for determining the reduction in risk from urgent to very low risk. The value of the decrease in footwear selection education on the incidence of foot ulcers in type 2 diabetes mellitus patients at the Pasar Minggu Community Health Centre shows that before the intervention, 21 partisipants, experienced a decrease in the risk of foot ulcers, and after the intervention, 21 partisipants, experienced a decrease in the risk of foot ulcers. This indicates a decrease in the incidence of foot ulcer risk from before the intervention to after the intervention; there was no increase in the risk of foot ulcers before and after the intervention. Ties or similarities indicate no difference between the pretest and posttest results for the 9 partisipants, leading to the conclusion that the results remained the same before and after the intervention.

According to the researcher's assumption after conducting foot screening examinations, with the decrease in the incidence of foot ulcers before and after education on choosing footwear, it was stated that the incidence of foot ulcers in those who received footwear selection education had a reduced risk of developing foot ulcers

(Hazbiu at al. 2024). The researcher assumed that the education provided could increase community knowledge and awareness, as evidenced by the impact of footwear selection education on the importance of choosing the right and appropriate footwear to prevent foot ulcers. Effective education will have a direct impact on reducing the incidence of foot ulcers and improving the quality of life for individuals with type 2 diabetes at the Pasar Minggu Community Health Centre.

CONCLUSION

Based on the results of research conducted on a total of 30 respondents regarding the influence of footwear selection education on the incidence of foot ulcers in type 2 diabetes mellitus patients at the Pasar Minggu Community Health Center, it can be concluded that it can be concluded that footwear selection education has a positive and significant effect on reducing the incidence of foot ulcers among patients with type 2 diabetes mellitus at the community health center. The provision of structured education enabled patients to better understand the importance of selecting appropriate footwear and to apply proper footwear practices in their daily activities, which contributed to the prevention of foot injuries that may develop into foot ulcers. This study highlights the importance of preventive educational interventions as an integral component of diabetes management in primary health care settings. Incorporating footwear selection education into routine diabetes care services may help reduce the risk of diabetic foot complications and improve overall foot health among patients with type 2 diabetes mellitus. However, further studies with larger sample sizes and controlled study designs are recommended to strengthen the evidence regarding the effectiveness of footwear education in preventing diabetic foot ulcers.

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