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THE EFFECT OF HEALTH BELIEF MODEL BASED WEB EDUCATION ON DIABETIC FOOT CARE KNOWLEDGE, BEHAVIOURS AND SELF-EFFICACY IN INDIVIDUALS WITH TYPE 2 DIABETES

SAĞLIK İNANÇ MODELİ TEMELLİ WEB EĞİTİMİNİN TİP 2 DİYABETLİ BİREYLERDE DİYABETİK AYAK BAKIMI BİLGİSİ, DAVRANIŞLARI VE ÖZ-YETERLİLİK ÜZERİNDEKİ ETKİSİ

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ABSTRACT

Objective: The aim of this study was to evaluate the effect of web training based on the Health Belief Model on knowledge, behavior and self-efficacy in diabetic foot care in individuals with type 2 diabetes who are at low risk of diabetic foot problems.

Method: The study, conducted as a randomized controlled trial at a Family Health Center between December 2021 and May 2023, included 142 individuals with type 2 diabetes (71 in the experimental group and 71 in the control group), as determined by power analysis. The experimental group received web-based training in six modules, one every two weeks, based on the Health Belief Model, followed by a 3-month follow-up.

Results: The descriptive characteristics (gender, age, education, etc.) and disease-related variables (presence of other chronic diseases, diabetes treatment type, etc.) of both experimental and control groups were found to be homogeneous ($p>0.05$). In the analyses conducted according to the hypotheses, post-intervention diabetic foot knowledge scores ($t=7.582$; $p=0.001$), foot care behavior scores ($t=3.125$; $p=0.002$), and self-efficacy scores ($t=4.337$; $p=0.001$) showed statistically significant increases in the experimental group compared to the control group. In within-group comparisons, significant differences were observed between pre-test and post-test scores in the experimental group regarding knowledge level ($t=-7.382$; $p=0.001$), behaviors ($t=-2.100$; $p=0.039$), and self-efficacy ($t=-3.198$; $p=0.002$), while no significant changes were detected in the control group ($p>0.05$).

Conclusion: This study shows that web education based on the Health Belief Model is effective in increasing foot care knowledge, behaviours and self-efficacy of individuals with low-risk type 2 diabetes. Nurses can improve care behaviours and manage patient care more effectively by providing accessible trainings to their patients through digital education methods. Digital trainings provide an important contribution to the literature by demonstrating that it can be an effective tool in nursing practice and its potential to improve patients' care behaviours.

Key Words: Diabetes mellitus, Diabetic foot, Health belief model, Self efficacy, Web based

ÖZ

Amaç: Bu çalışmanın amacı, diyabetik ayak sorunu yaşama olasılığı düşük olan tip 2 diyabetli bireylerde Sağlık İnanç Modeli'ne dayalı web eğitiminin diyabetik ayak bakımı konusundaki bilgi, davranış ve öz yeterlilik üzerindeki etkisini değerlendirmektir.

Yöntem: Aralık 2021-Mayıs 2023 tarihleri arasında bir Aile Sağlığı Merkezi'nde randomize kontrollü çalışma olarak yürütülen bu araştırmaya, güç analizi sonucunda belirlenen 142 tip 2 diyabet hastası (deney grubu: 71, kontrol grubu: 71) dahil edildi. Deney grubu sağlık İnanç Modeline dayalı olarak iki haftada bir olmak üzere altı modül halinde web tabanlı eğitim aldı ve ardından 3 aylık bir takip gerçekleştirildi.

Bulgular: Deney ve kontrol gruplarının tanımlayıcı özellikleri (cinsiyet, yaş, eğitim vb.) ile hastalıkla ilişkili değişkenlerinin (diğer kronik hastalık varlığı, diyabet tedavi şekli vb.) homojen olduğu belirlendi ($p>0.05$). Hipotezler doğrultusunda yapılan analizlerde, deney grubunda eğitim sonrası diyabetik ayak bilgisi puanlarının ($t=7.582$; $p=0.001$), ayak bakımı davranış puanlarının ($t=3.125$; $p=0.002$) ve öz-yeterlilik puanlarının ($t=4.337$; $p=0.001$) kontrol grubuna göre anlamlı derecede arttığı görüldü. Grup içi karşılaştırmalarda deney grubunda bilgi düzeyi ($t=-7.382$; $p=0.001$), davranışlar ($t=-2.100$; $p=0.039$) ve öz-yeterlilik ($t=-3.198$; $p=0.002$) açısından pre-test ve post-test puanları arasında anlamlı farklar bulunurken kontrol grubunda bu değişim anlamlı değildi ($p>0.05$).

Sonuç: Bu çalışma, Sağlık İnanç Modeli'ne dayalı web eğitiminin, düşük riskli tip 2 diyabetli bireylerin ayak bakımı bilgisi, davranışları ve öz-yeterliliklerini artırmada etkili olduğunu göstermektedir. Hemşireler, dijital eğitim yöntemleriyle hastalarına erişilebilir eğitimler sunarak bakım davranışlarını iyileştirebilir ve hasta bakımını daha etkili yönetebilirler. Dijital eğitimler, hemşirelik pratiğinde etkili bir araç olabileceğini ve hastaların bakım davranışlarını iyileştirme potansiyelini ortaya koyarak literatüre önemli bir katkı sağlamaktadır.

Anahtar Kelimeler: Diyabetik ayak, Diabetes mellitus, Sağlık inanç modeli, Öz yeterlilik, Web temelli

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INTRODUCTION

Diabetes mellitus (DM) has emerged as one of the most significant health challenges of the 21st century due to its increasing prevalence, morbidity, and mortality risks [1]. Globally, approximately half a billion people live with diabetes, with nearly 80% of the diabetes burden borne by low- and middle-income countries, including Turkey [2]. According to the International Diabetes Federation (IDF) report, there are over 9 million diabetic patients aged 20-79 in Turkey, with an adult prevalence rate of 15.9% [3]. Diabetes is a disease that reduces the quality of life, increases the duration of hospitalisation and leads to serious complications. One of these complications is diabetic foot [4]. Which leads to reduced quality of life, frequent and prolonged hospitalizations, high costs, limb loss, and death [5]. The lifetime risk of developing diabetic foot complications for individuals with diabetes ranges between 19-34% [6], with an average prevalence of 6.4% [7]. Globally, a diabetes-related lower-limb amputation occurs every 30 seconds [8], and the 5-year mortality rate following diabetes-related amputations is estimated to be 70%, exceeding that of many common cancers such as breast and prostate cancer [9].

Good knowledge, attitudes, and practices regarding foot care are crucial in preventing foot ulcers in diabetes [10]. Prevention strategies acknowledge the importance of patient health education. It is believed that through patient education, individuals can improve their knowledge about diabetes-related foot problems, adopt better foot care practices, and consequently reduce foot complications [6]. Effective foot care education and a multidisciplinary approach can reduce diabetic foot ulcers and amputations by up to 85% [2].

One of the efforts to prevent diabetic foot problems is to meet the self-efficacy needs through diabetic foot care education [11]. Self-efficacy refers to an individual's belief in their ability to perform a specific behavior adequately [12]. In the context of diabetes, self-efficacy relates to the enhancement of self-care behaviors [13]. Self-care behaviors encompass the decisions and actions individuals take to manage their health problems [14]. Self-efficacy and self-care skills in diabetic patients can control the impact and complications of diabetes [15]. Additionally, foot care education is a suitable nursing intervention to increase patient knowledge and self-care practices [16].

Health Belief Model (HBM) serves as an effective framework for designing educational interventions and promoting preventive behaviors in the prevention and management of chronic diseases [17]. The HBM is noted for its applicability to self-care behaviors in patients with type 2 diabetes [18]. A systematic review shows that it plays an active role in diabetes management and prevention [19], identifying it as one of the most widely used models in health education and promotion [20].

It is also stated that the use of new training methods may be more effective than the use of traditional training systems [21]. The use of digital technology has been found to be particularly effective in health promotion and lifestyle changes among DM patients [22]. Web-based health education not only offers opportunities to improve diabetes self-care but also enhances patient engagement and clinical outcomes [23]. The International Diabetic Foot Study Group recommends that further research be conducted in methods and technologies to modify information and attitudes about foot care [24]. Additionally, studies indicate the need to pay more attention to the 'low-risk' patient group in terms of diabetic foot development [25].

In the literature, there are various studies on the effects of Health Belief Model (HBM) and web-based education methods on foot care knowledge, behaviour and self-efficacy of individuals with diabetes [26-29]. However, these studies have generally focused on high-risk patients, and there is a limited number of studies addressing the education of low-risk type 2 diabetic individuals on foot care [25]. This situation creates an important gap in the literature, because foot care education in low-risk individuals can play a major role in preventing complications (ulcers, amputations, etc.). This study aims to examine the effect of web-based education based on the health belief model on foot care knowledge, behaviour and self-efficacy in low-risk type 2 diabetic individuals who are likely to experience diabetic foot problems (ulcer, amputation, etc.). In this context, it is assumed that web-based diabetic foot care training based on the Health Belief Model will fulfil the following hypotheses in individuals with diabetes who are unlikely to have diabetic foot problems:

H1a: The knowledge of diabetic foot care will increase in the experimental group compared to the control group.

H1b: The foot care behaviours of the individuals in the experimental group will increase compared to the control group.

H1c: Self-efficacy level of individuals in the experimental group will increase in foot care compared to the control group.

METHOD

Study Design

This study is a randomized controlled experimental trial. The research was conducted from December 2021 to May 2023 at Tuşba Family Health Center (FHC) No. 1, under the Van Provincial Health Directorate.

Participants

The study was conducted in a Family Health Centre (FHC) in Van province between December 2021 and May 2023. under Van Provincial Health Directorate. The population of the study consisted of 155 individuals who met the inclusion criteria among 1008 individuals registered to this FHC and diagnosed with type 2 diabetes. Convenience sampling method was used for sample selection and 142 individuals agreed to participate in the study. Power analysis method was used to determine the sample size of the study. In the power analysis using Cohen's standard effect sizes, it was determined that 128 people, 64 in each group, should be reached to reach 80% power at 0.5% effect size, 0.05% margin of error level and 0.95% confidence interval [30]. However, considering the possibility of sample loss in the study, 10% more than the calculated sample was included in the randomization process. Thus, the study was conducted with a total of 142 participants, 71 in the experimental group and 71 in the control group. The sample size was deemed sufficient to detect significant differences [30]. Participants were randomly assigned to either the experimental or control group using the "Random Allocation Software" developed by Saghaei [31]. Allocation was based on participant enrollment order and the software output. The randomization process followed CONSORT (2018) guidelines, as illustrated in the Randomisation Chart (Figure 1).

Inclusion Criteria:

- Type 2 diabetes diagnosed at least one year ago
- 18 to 65 years old,
- Literate
- Using a computer or smartphone,
- Those with internet access,
- Has not participated in diabetic foot care training before
- Physically, cognitively or mentally able to answer the questions
- People who are willing to participate.
- Low risk of developing foot ulcers
- No loss of normal protective sensation
- No foot deformity
- No previous history of foot ulcer

Exclusion Criteria:

- Individuals who did not meet the inclusion criteria,
- Those with diabetic foot complications
- Foot deformities, or any other medical condition that would prevent their participation were excluded.

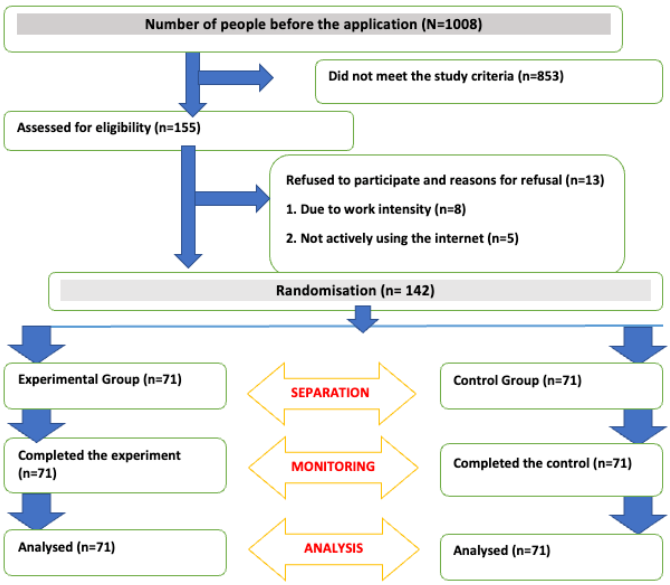

Figure 1. Consort 2018 flow diagram

Outcome Measures

Introductory Information Form: Prepared by the researchers based on a literature review [32,33]. The first section included descriptive characteristics of the participants such as age, gender, marital status, and education level. In the second part, twelve questions aimed to evaluate the participants' experiences and practices related to diabetes management, with a particular focus on foot care. These questions assessed factors such as the presence of other chronic diseases besides diabetes, types of treatment used (e.g. diet, oral medication, insulin), awareness of the impact of diabetes on foot health and regular foot checks, and seeking professional help.

Diabetic Foot Knowledge Scale (DFKS): A sub-dimension of the Diabetes Knowledge Questionnaire developed by Garcia et al. The Cronbach's alpha for the Diabetic Foot Knowledge Scale was 0.63 [34]. The Turkish version's reliability and validity were assessed by Biçer and Enç in 2011. The scale consists of five items scored as "yes," "no," and "don't know," with scores of 1 for correct answers and 0 for incorrect answers. The lowest possible score is 0, and the highest is 5. Cronbach's α value was found to be 0.58 [35]. The Cronbach's alpha for this study was 0.64 for the pretest and 0.62 for the posttest.

Foot Care Behavior Scale (FCBS): Created by Borges in 2007 to improve foot self-care behaviors in diabetes. Borges validated the scale with a podiatrist but did not conduct a reliability study [36]. The Turkish version's reliability and validity study was performed by Biçer and Enç in 2011. The scale consists of one dimension and 15 items, scored on a Likert scale from 1 (never) to 5 (always). The Cronbach's alpha was 0.83 in the Turkish study. The scale ranges from 15 to 75, with higher scores indicating better self-care behaviors [35]. The Cronbach's alpha in this study was 0.77 for the pretest and 0.76 for the posttest.

Diabetic Foot Care Self-Efficacy Scale (DFCSES): Developed by Bonnie Elliott Quarles in 2005, this scale assesses diabetic foot care self-efficacy using a Likert scale from 0 ("not at all adequate") to 10 ("very adequate") [37]. The Turkish version's reliability and validity study was carried out by Biçer and Enç in 2011. The scale includes 9 items with a maximum score of 90. The Cronbach's alpha was 0.86 in the Turkish study [35]. The Cronbach's alpha for this study was 0.79 for both pretest and posttest.his form, which was prepared by the researchers to determine the participants' sociodemographic characteristics, consists of a total of 14 questions [5,8,10].

Intervention

WEB EDUCATION DIAGRAM

Phase	Experimental Group	Control Group
Participant Assignment	"Random Allocation Software" program was used to assign participants to groups	"Random Allocation Software" program was used to assign participants to groups
↓		
Pre-Test Data Collection	Pre-test data were collected through face-to-face interviews in June and July 2022.	Pre-test data were collected through face-to-face interviews in June and July 2022.
↓		
Website Introduction	Participants were instructed on using the website https://dabe2022.atauni.edu.tr/, accessing training modules, and content update frequency.	The control group was only provided with contact information and no further intervention was made.
↓		
Training Content Development	The content was developed based on the Health Belief Model (HBM) with guidance from three subject matter experts.	Not applicable.
↓		
Training Topics	1. Definition and Importance of Type 2 Diabetes 2. Diabetic Foot Complications 3. Prevention Methods 4. Risks and Barriers 5. Self-Efficacy	Not applicable.
↓		
Training Duration	Conducted over 3 months, with one topic addressed every two weeks.	Not applicable.
↓		
WhatsApp Informational Messages	Bi-weekly informational messages sent via WhatsApp Web.	Not applicable.
↓		
Zoom Meetings	Two sessions held during the three-month period for Q&A and introductions.	Not applicable.
↓		
Monthly Reminders and Notifications	Monthly informational messages sent to encourage website engagement.	Not applicable.
↓		
Post-Test	Collected through face-to-face interviews in December 2022-January 2023.	Collected through face-to-face interviews in December 2022-January 2023.

Data Collection

Before starting the study, interviews were conducted with family physicians working in the family health center (FHC) where the study would be conducted in the last week of May 2022. A total of 8 family physicians work in the ASM in question. Family physicians were informed about the study. In addition, they were informed about the inclusion and exclusion criteria and their support was obtained in the process of determining the people to be included in the study. With the help of family physicians, data such as age, educational status and contact information of individuals with type 2 diabetes were accessed through the system in the first week of June 2022. Individuals who met the exclusion criteria were identified and excluded from the process. Individuals who met the age and education criteria were listed and the

researcher Y.S. started to call them by phone as of June 6, 2022. Individuals who did not respond to the first and second calls were considered as exclusion criteria by the researcher. The researcher made these calls systematically and efficiently by spreading these calls over certain time periods on a daily basis. During the phone calls, he introduced himself, gave brief information about the study and invited the individuals to the ASM for further evaluations. The researcher was present at the ASM during working hours four days a week (Monday, Tuesday, Thursday and Friday) throughout June and July 2022 to provide flexibility for the participants. Individuals who came to the FHC were reassessed by the researcher according to the inclusion and exclusion criteria. Individuals who met the criteria and agreed to participate in the study were divided into experimental and control groups according to the output obtained from the "Random Allocation Software" program and the order of arrival at the ASM. Pretests were administered to the individuals who agreed to participate in the study by face-to-face interview method. This process started on June 6, 2022 and was completed on July 29, 2022.

Ethical Approval

Approval was obtained from Atatürk University Faculty of Nursing Ethics Committee (date:11.05.2021, approval number: 2021-5/9). Approval was obtained from Van Provincial Health Directorate (E-73040253-129) to conduct the study in Van Tuşba Family Health Center No. 1 Patients enrolled in the study in the experimental and control groups gave written and verbal informed consent. It was also emphasized that participation would not cause any harm and was entirely voluntary. The Helsinki Declaration of Human Rights was adhered to and the protection of individual rights was prioritized. Participants gave their consent based on this information. The study was registered in ClinicalTrials.gov (NCT05395442).

Statistical Analysis

The SPSS statistical programme (SPSS-25) was utilized to analyze the data obtained in this study. The data were analysed using numbers, percentages, min/max values, mean and standard deviation. For determining the normal distribution, kurtosis-skewness value was analyzed. According to the result of the kurtosis-skewness value, the normal distribution of the data (+1.5,-1.5) was determined [38]. Cronbach-α number was used to determine the reliability of the measurement tools, categorical variables were analyzed using chi-square, Fisher-Freeman-Halton Exact Test and Fisher Halton Exact Test to determine the homogeneity of the experimental and control groups, Paired Samples t test was used to compare individuals within groups and Independent Samples t test was used to compare individuals between groups. The study accepted $p<0.05$ as statistically significant.

RESULTS

It was determined that 53.5% of the individuals with type 2 diabetes in the experimental group, who were less likely to have diabetic foot problems, were male, 83.1% were married, 31.0% were secondary education graduates, 50.7% had income less than expenses, 64.8% were non-smokers and 46.5% had a Body Mass Index between 18.50-24.99. Furthermore, the mean age was 46.59±11.82 years, the mean HbA1c was 8.47±2.36, and the mean duration of diagnosis was 7.35±6.28 years. In the control group, which was lower probability of having diabetic foot problems, 53.5% were female, 83.1% were married, 31.0% were primary school graduates, 57.7% had income below the expenditure level, 76.1% were non-smokers and 49.3% had a Body Mass Index between 18.50-24.99. Furthermore, the mean age was 47.10±11.36 years, the mean HbA1c was 8.18±2.04 and the mean duration of diagnosis was 6.46±6.19 years. Low-risk type 2 diabetic individuals in the experimental and control groups were found to be homogeneous in terms of their identifying characteristics ($p>0.05$) (Table 1).

When evaluated in terms of disease-related variables, 56.3% of the individuals in the experimental group did not have any other chronic disease other than diabetes, 53.5% had diabetes treatment in the form of oral antidiabetics, 60.6% had information about the damages caused by diabetes to their feet, 80.3% had not had their feet examined before due to DM, 77.5% did not have information about diabetic foot care, 85.9% did not have regular foot care examinations, 80. 3% did not have their feet examined by doctors or other healthcare professionals, 97.2% did not have any problems that prevented foot care, 40.8% did not check their feet for temperature, humidity, redness, wounds, discharge and calluses every day, 88.7% did not receive support while performing foot care examinations on their own, and 69.0% paid attention to shoes, socks and personal care due to DM. When evaluated in terms of disease-related variables, 47.9% of the individuals in the control group did not have any other chronic disease other than diabetes, 39.4% had diabetes treatment in the form of oral antidiabetics, 66.2% had information about the damages caused by diabetes to their feet, It was determined that 84.5% had not had their feet examined before due to DM, 76.1% did not have information about diabetic foot care, 77.5% did not have regular foot care examinations, 80.3% did not have their feet examined by doctors or other healthcare professionals. It was determined that 3% did not have foot examinations by doctors or other healthcare professionals, 97.2% did not have any problems that prevented foot care, 45.1% did not check their feet for temperature, humidity, redness, wounds, discharge and calluses every day, 88.7% did not receive support while performing foot care examinations on their own, and 69.0% paid attention to shoes, socks and personal care due to DM. Individuals with low-risk type 2 diabetes in both experimental and control groups were homogeneous in terms of disease-related descriptive characteristics ($p>0.05$) (Table 2).

When comparing the pretest scores of individuals with low-risk type 2 diabetes in the experimental and control groups, no statistically significant differences were found. For the Diabetic Foot Knowledge Scale (DFKS), the mean score was 1.35 (SD=1.51) in the experimental group and 1.15 (SD=1.27) in the control group, with no significant difference observed ($t=-0.841$, $p=0.402$). Similarly, no significant differences were found for the Foot Care Behavior Scale (FCBS) and Diabetic Foot Care Self-Efficacy Scale (DFCSES), with $t=1.557$, $p=0.122$ and $t=1.167$, $p=0.245$, respectively (Table 3).

According to the post-test results of individuals with low-risk type 2 diabetes, the experimental group showed significant improvements across all measurements compared to the control group. For the Diabetic Foot Knowledge Scale (DFKS), the mean score in the experimental group was 3.01 (SD=3.34), while in the control group it was 1.33 (SD=1.28), and this difference was statistically significant ($t=7.582$, $p=0.001$). For the Foot Care Behaviour Scale (FCBS), the mean score in the experimental group was 51.14 (SD=8.58), and in the control group it was 46.73 (SD=8.22), with a significant difference ($t=3.125$, $p=0.002$). The Diabetic Foot Care Self-Efficacy Scale (DFCSES) scores were 70.28 (SD=9.77) in the experimental group and 62.40 (SD=11.76) in the control group, with a significant difference ($t=4.337$, $p=0.001$) (Table 4).

When comparing the pre-test and post-test mean scores within the groups of individuals with low-risk type 2 diabetes, the experimental group showed significant improvements across all measurements. For the DFKS, the pre-test mean was 1.35 (SD=1.51), and the post-test mean was 3.01 (SD=3.34), with a statistically significant difference ($t=-7.382$, $p=0.001$). For the FCBS, the pre-test mean was 47.63 (SD=10.44), and the post-test mean was 51.14 (SD=8.58), with a significant difference ($t=-2.100$, $p=0.039$). For the DFCSES, the pre-test mean was 62.36 (SD=16.66), and the post-test mean was 70.28 (SD=9.77), with a significant difference ($t=-3.198$, $p=0.002$). In contrast, no significant changes were observed in the DFKS, FCBS, or DFCSES scores in the control group (Table 5).

Table 1. Comparison of control variables of individuals with low-risk type 2 diabetes in the experimental and control groups (n=142)

Variables		Experimental Group (n=71)		Control Group (n=71)		Test and p
		n	%	n	%	
Gender	Female	33	46.5	38	53.5	χ2= 0.704* p= 0.401
	Male	38	53.5	33	46.5	
Marital Status	Married	59	83.1	59	83.1	χ2= 0.000* p= 1.000
	Single	12	16.9	12	16.9	
Education Level	Literate	12	16.9	13	18.2	χ2= 0.660* p= 0.883
	Primary education	19	26.7	22	31.0	
	Secondary Education	22	31.0	18	25.4	
	University	18	25.4	18	25.4	
Income Status	Income< Expenditure	36	50.7	41	57.7	χ2= 0.800** p= 0.714
	Income= Expenditure	31	43.7	27	38.0	
	Income> Expenditure	4	5.6	3	4.3	
Smoking status	Yes	25	35.2	17	23.9	χ2= 2.164* p= 0.141
	No	46	64.8	54	76.1	
Body Mass Index	<18.50	2	2.8	1	1.4	χ2= 0.888** p= 0.844
	18.50-24.99	33	46.5	35	49.3	
	25.0-29.99	28	39.4	25	35.2	
	30.0-34.99	8	11.3	10	14.1	

Chi-square test,Fisher-Freeman-Halton Exact Test,*** Fisher Halton Exact Test*

Table 2. Comparison of disease-related control variables of individuals with low-risk type 2 diabetes in the experimental and control groups (n=142)

Variables		Experimental Group (n=71)		Control Group (n=71)		Test and p
		n	%	n	%	
A chronic disease other than diabetes mellitus	There is	31	43.7	37	52.1	χ2= 1.016* p= 0.313
	None	40	56.3	34	47.9	
Treatment in diabetes	Diet only	10	14.1	14	19.7	χ2= 6.329* p= 0.097
	Oral antidiabetic	38	53.5	28	39.4	
	Insulin only (injections)	17	23.9	14	19.7	
	Oral antidiabetic and insulin	6	8.5	15	21.2	
Knowledge about the effects of diabetes on your feet	Yes	43	60.6	47	66.2	χ2= 0.485* p= 0.486
	No	28	39.4	24	33.8	
Previous examination of the foot due to DM	Yes	14	19.7	11	5.5	χ2= 0.437* p= 0.509
	No	57	80.3	60	84.5	
Knowledge about diabetic foot care	There is	16	22.5	17	23.9	χ2= 0.039* p= 0.843
	None	55	77.5	54	76.1	
Regularly performing foot care examinations	Yes	10	14.1	16	22.5	χ2= 1.695* p= 0.193
	No	61	85.9	55	77.5	
Previous foot examination by a doctor or other health professionals	Yes	14	19.7	14	19.7	χ2= 0.000* p= 1.000
	No	57	80.3	57	80.3	
Any problem condition that prevents foot care	Yes	2	2.8	2	2.8	χ2= 0.690* p= 1.000
	No	69	97.2	69	97.2	
Check your feet daily for temperature, humidity, redness, sores, discharge and calluses	Yes	42	59.2	39	54.9	χ2= 0.259* p= 0.611
	No	29	40.8	32	45.1	
Receiving support when performing a foot care examination by yourself	Yes	8	11.3	8	11.3	χ2= 0.000* p= 1.000
	No	63	88.7	63	88.7	
Paying attention to shoes, socks and personal care due to DM	Yes	49	69.0	49	69.0	χ2= 0.000* p= 1.000
	No	22	31.0	22	31.0	

Chi-square Test,Fisher-Freeman-Halton Exact Test,*** Fisher Halton Exact Test*

Table 3. Comparison of mean pretest scores of DFKS, FCBS, and DFCSES in low-risk type 2 diabetes individuals in experimental and control groups (n=142)

Variable	Experimental Group (n=71)		Control Group (n=71)		Test and p
	Mean	SD	Mean	SD	
Diabetic Foot Knowledge Scale	1.35	1.51	1.15	1.27	t=-0.841* p=0.402
Foot Care Behaviour Scale	47.63	10.44	44.85	10.79	t=1.557* p=0.122
Diabetic Foot Care Self-Efficacy Scale	62.36	16.66	59.45	12.84	t=1.167* p=0.245

**Independent Samples t testi*

Table 4. Intergroup comparison of DFKS, FCBS and DFCSES posttest mean scores of individuals with low-risk type 2 diabetes in the experimental and control groups (n=142)

Variable	Experimental Group (n=71)		Control Group (n=71)		Test and p
	Mean	SD	Mean	SD	
Diabetic Foot Knowledge Scale	3.01	3.34	1.33	1.28	t=7.582* p=0.001
Foot Care Behaviour Scale	51.14	8.58	46.73	8.22	t=3.125* p=0.002
Diabetic Foot Care Self-Efficacy Scale	70.28	9.77	62.40	11.76	t=4.337* p=0.001

**Independent Samples t testi*

Table 5. In-group comparison of pre and post-test mean scores of individuals with low-risk type 2 diabetes in the experimental and control groups (n=142)

Scales	Experimental Group (n=71)		Test and p	Control Group (n=71)		Test and p
	Pre-test Score Mean ± SD	Post Test Score Mean±SD		Pre-Test Score Mean ±SD	Post Test Score Mean±SD	
Diabetic Foot Knowledge Scale	1.35±1.51	3.01±3.34	t =-7.382 p =0.001*	1.15±1.27	1.33±1.28	t =-0.839 p =0.404
Foot Care Behaviour Scale	47.63±10.44	51.14±8.58	t =-2.100 p =0.039*	44.85±10.79	46.73±8.22	t =-1.121 p =0.266
Diabetic Foot Care Self-Efficacy Scale	62.36±16.66	70.28±9.77	t =-3.198 p =0.002*	59.45±12.84	62.40±11.76	t =-1.456 p =0.150

**Paired Samples t testi*

DISCUSSION

This study found that the experimental group, which received diabetic foot care education, showed significant improvements in knowledge, behavior, and self-efficacy compared to the control group. After the educational intervention, the experimental group scored higher on the DFKS, FCBS, and DFCSES, while no changes were observed in the control group. These findings highlight the effectiveness of diabetic foot care education in improving knowledge and care behaviors, emphasizing its crucial role in preventing diabetes-related complications.

This study evaluated the impact of web-based education on diabetic foot care, structured around the sub-dimensions of the Health Belief Model (HBM) sensitivity, severity, benefit, barrier, and self-efficacy perception. The findings indicate a significant increase in knowledge levels regarding diabetic foot care among individuals in the experimental group who received the web-based education. In contrast, no such increase was observed in the control group. This result is consistent with literature suggesting that education based on HBM can substantially enhance knowledge, attitudes, and self-care behaviors in type 2 diabetes patients [27]. Previous studies also support this, showing that diabetic foot care education programs significantly improve foot care knowledge [35]. The web-based approach of this study contributed to a significant increase in knowledge levels due to its cross-device accessibility, no login required, and inclusion of the Health Belief Model (HBM) sub-dimensions. These factors enabled the training to reach a wider audience and users to easily access the training materials. This finding supports hypothesis H1a that web-based education has a positive effect on the diabetic foot care knowledge of individuals with low risk of diabetic foot problems. Web-based education programs can play a critical role in diabetes management by increasing individuals' knowledge and awareness levels and preventing diabetic foot complications. This is a result that emphasizes the importance of innovative and accessible educational methods in diabetes management.

Improving self-efficacy through diabetic foot care education is crucial for preventing diabetic foot problems [11]. Self-efficacy is linked to better self-care behaviors and is a significant factor influencing mortality rates in diabetic patients [13,14]. Research has identified self-efficacy as a critical determinant of self-care behaviors in diabetes patients [39]. Enhanced self-efficacy and self-care skills can help manage the effects and complications of diabetes [15]. The study demonstrated that the web-based education significantly improved foot care practices and self-efficacy in the experimental group. Similar results were found in randomized controlled trials showing significant improvements in knowledge, self-efficacy, and foot care behaviors following animated mobile diabetic foot care education [40]. In an experimental study, it was found that patient education positively affected foot care behaviours and self-efficacy levels [35]. The study supported hypotheses H1b and H1c by showing that web-based training significantly improved foot care practices and self-efficacy in individuals with type 2 diabetes. The comprehensive content of the training increased participants' knowledge and improved their perception of the sensitivity and severity of the disease. As a result, participants in the experimental group who were low likely to experience diabetic foot problems became more knowledgeable and confident in foot care practices. This suggests that web-based health belief model training is an effective tool in diabetes management and contributes to better prevention of diabetic foot complications.

The strengths of this study include its randomized controlled design and robust methodological foundation provided by a comprehensive web-based education program. The Health Belief Model-based training facilitated effective information delivery, and interactive tools like Zoom meetings supported active participant engagement in the educational process.

Limitations

Limitations of this study include the fact that the study was conducted in a single province, the results can only be generalized to this group and the lack of sustainability of the website.

CONCLUSION

These findings indicate that participants with type 2 diabetes who are low likelihood of experiencing diabetic foot problems in both the experimental and control groups were homogeneous in terms of their descriptive characteristics. The significant increase in DFCS, FCBS, and DFCSES scores in the experimental group suggests that the intervention had a positive impact on diabetes management and self-efficacy for individuals with type 2 diabetes who are low likely to experience diabetic foot problems. Based on these results, healthcare professionals should consider implementing similar interventions to improve diabetes management and enhance the quality of life of individuals with type 2 diabetes who are low likely to experience diabetic foot problems.

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