REVIEW ARTICLE

Education program to prevent diabetic foot ulcer in patient with diabetes: A scoping review

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Abstract

Program-based education has emerged as a crucial strategy in preventing diabetic foot ulcers (DFUs) and related complications. This scoping review aims to assess the program-based education interventions in preventing DFUs in patients with diabetes. A comprehensive search was conducted across major electronic databases, including PubMed, ProQuest, Scopus, and CINAHL. The primary outcome measure was foot self-care behaviors, while secondary outcomes included foot-related knowledge, self-efficacy, and quality of life. The studies encompassed diverse educational programs, such as structured foot care education, and multidisciplinary interventions. In total, 135 articles regarding Program-based education to prevent Diabetic Foot Ulcer on patient with diabetes were found in the literature. However, 18 articles that met the study criteria were reviewed. The results highlight the effectiveness of combining education with follow-up sessions to enhance self-care behavior, self-efficacy, knowledge, self-management, and quality of life in patients with diabetes mellitus (DM). *(Afr J Reprod Health 2024; 28 [10s]: 397-410).*

Keywords: Education; program; diabetic foot ulcer

Résumé

L'éducation basée sur les programmes est devenue une stratégie cruciale dans la prévention des ulcères du pied diabétique (UPD) et des complications associées. Cette revue de la portée vise à évaluer les interventions éducatives basées sur des programmes pour prévenir les UUP chez les patients diabétiques. Une recherche complète a été effectuée dans les principales bases de données électroniques, notamment PubMed, ProQuest, Scopus et CINAHL. Le critère de jugement principal était les comportements en matière d'auto-soins des pieds, tandis que les critères de jugement secondaires incluaient les connaissances liées aux pieds, l'auto-efficacité et la qualité de vie. Les études englobaient divers programmes éducatifs, tels qu'une éducation structurée aux soins des pieds et des interventions multidisciplinaires. Au total, 135 articles concernant l'éducation basée sur un programme pour prévenir l'ulcère du pied diabétique chez les patients diabétiques ont été trouvés dans la littérature. Cependant, 18 articles répondant aux critères de l'étude ont été examinés. Les résultats mettent en évidence l'efficacité de la combinaison de l'éducation avec des séances de suivi pour améliorer le comportement d'autosoins, l'auto-efficacité, les connaissances, l'autogestion et la qualité de vie des patients atteints de diabète sucré (DM). *(Afr J Reprod Health 2024; 28 [10s]: 397-410).*

Mots-clés: Éducation ; programme; ulcère du pied diabétique

Introduction

Various complications can arise in diabetes mellitus sufferers. Poor DM management in the long term can cause from acute and chronic complications. Serious complications in DM sufferers include microvascular complications and macrovascular complications[1]. Of all these complications, diabetic foot ulcers (DFU) are one of the most common DM complications experienced by DM patients.

Diabetic foot ulcers (DFU) are common complications of diabetes that can lead to serious health problems. A recent meta-analysis found a 6.3% global prevalence of DFU among adults with diabetes, which equates to approximately 33 million people affected by DFU[2]. The lifetime risk of

developing a diabetic foot ulcer is estimated to be between 19% and 34%[3]. The prevalence of DFU can vary depending on factors such as age, gender, race/ethnicity, geographic location, and comorbidities such as peripheral arterial disease and neuropathy. In Indonesia, the prevalence of diabetic foot ulcers ranges from 7.3% to 16.2% in hospital settings and may be higher in community settings[4,5]. DFU can negatively impact the patient's quality of life, as well as increase healthcare costs [2,3]. Therefore, it is important to prevent and manage DFU in people with diabetes.

The prevention of diabetic foot ulcers is a critical aspect of diabetes management. Several behaviours have been identified to help prevent diabetic foot ulcers. These include daily foot inspection, daily foot hygiene, avoiding any potential damaging activity, using appropriate footwear, and toenail care[6]. In addition, smoking cessation, glycemic control, and lipid management are parts of DM management that are fundamental in preventing DFU[7–9]. Nevertheless, absence of appropriate DFU prevention behaviours has been reported to be the most common challenge in DFU prevention[10].

Several DFU prevention programs have been scientifically evaluated. A systematic review has identified several programs that are effective for preventing DFU, such as foot pressure measurement[11], psychosocial intervention[12], technology-based prevention programmes[13,14], physical activity[15] and education based program[16,17]. However, some reviews have had different outcomes and inclusion criteria. Furthermore, some reviews do not describe the conceptual framework and the detailed programme stages used in the research. Such analysis is necessary to appropriately inform caregivers of effective preventive treatments. The aim of this article, specifically, is to systematically review the literature to investigate the effectiveness program-based education on foot care knowledge, foot self-care behaviour, and self-efficacy of treatment in individuals with diabetes.

Methods

A comprehensive scoping review to identify program-based education to prevent Diabetic Foot Ulcer in patients with diabetes was undertaken by following the scoping review guideline developed by Mak and Thomas[18].

Step 1: Identifying the research question

The review aimed to answer the following question: "What evidence is available regarding programme-based education intervention to prevent diabetic foot ulcer in patient with diabetes mellitus"?

Step 2: Identifying relevant studies

The following databases were used in the search: PubMed/Medline, ProQuest, and Scopus. MeSH (Medical Subject Heading) was used to determine the vocabulary used. The following search terms were used: Diabetes OR Diabetes Mellitus OR Type 2 Diabetes AND education program OR Training Programs OR Educational activities AND Foot Self-Care Behavior OR foot care behavior. In addition, only articles available and published after January 1, 2014 were included. Only articles published in English and were potentially relevant to the topic were reviewed. Figure 1 summarizes the literature search and study selection process. In December 2023, researchers conducted a literature search and found 10 RCT articles and 10 quasi experimental articles that met the criteria (Table 1).

Step 3: Selecting studies to be included in the review

The inclusion criteria were 1) clinical trial published between 2014 to 2024; 2) educational programmes;3) population of patients with DM; and 4) articles published in English language. The articles that did not mention diabetic foot care behaviors and primary or secondary outcomes including foot-related knowledge, self-efficacy, and quality of life were excluded from this review.

An initial search found a total of 135 articles. However, 27 articles were removed from the records due to duplication. Based on checking the suitability of the titles and abstracts, 89 articles were removed from the data record. As shown in Table 1, the total number of articles excluded from the review were 116 articles. Figure 1

Step 4: Charting the data

The information derived from the studies included in the analysis was organized into a Table following the guidelines outlined in scoping review steps developed by Mak and Thomas[18]. This table encompasses details from each article, including

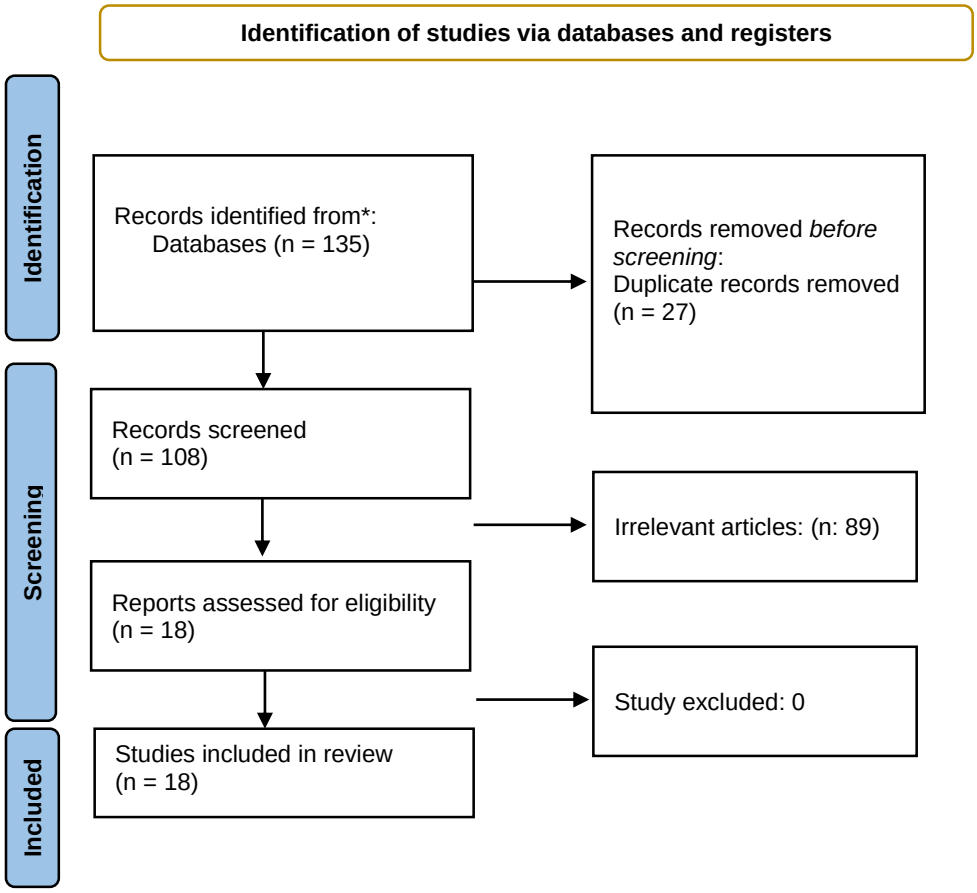

Figure 1: PRISMA flow diagram. PRISMA, preferred reporting items for systematic review and meta-analysis

Table 1: Literature found on database

Database	Keyword	Articles found	Article used in this review
ProQuest	Diabetes OR Diabetes Mellitus OR Type 2 Diabetes AND education program OR Training Programs OR Educational activities AND Foot Self-Care Behavior OR foot care behavior	52	4
PubMed	Diabetes OR Diabetes Mellitus OR Type 2 Diabetes AND education program OR Training Programs OR Educational activities AND Foot Self-Care Behavior OR foot care behavior	66	**13**
Scopus	Diabetes OR Diabetes Mellitus OR Type 2 Diabetes AND education program OR Training Programs OR Educational activities AND Foot Self-Care Behavior OR foot care behavior	9	**0**
MEDLINE	Diabetes OR Diabetes Mellitus OR Type 2 Diabetes AND education program OR Training Programs OR Educational activities AND Foot Self-Care Behavior OR foot care behavior	29	**1**
Total		135	18

author, year, geographical location, design, duration, study population, implementation, questionnaire, and the main results (Table 1). Table 2

Step 5: Collating, summarizing, and reporting the results

Results

Model of the study

There were 12 articles using group based educational programmes: small group discussion[19],

Table 2: Program-based education to prevent Diabetic Foot Ulcer on patient with diabetes

No	Author & Year	Geographical Location	Design, Duration, Study population	Implementation and Questionnaire	Main result
1	Nguyen et al., (2019)	Vietnam	Design: Quasi experimental Duration: 6 months Sample: 28 patients each group	Implementation: - This included 60-75 minutes of small group multifaceted education and hands-on skills session - follow-up phone calls over six months (at week 2, 10 and 20) Questionnaire: Foot Self-Care Behaviour (FSCB)	Outcome: Self-care behavior Conclusion: The intervention group had significantly improved outcomes following aspects: improved preventive foot care behaviour (p=0.001); and decreased prevalence of foot risk factors for ulceration
2	Heng et al., (2020)	Singapore	Design: RCT Duration: 12 weeks Sample: 42 Diabetic patients who developed DFU	Implementation: collaborative communication - Enquire patient's problems - Reflect back - Acknowledge any attempted solutions - Reinforce knowledge and affirm efforts Questionnaire: Foot Self-Care Behaviour (FSCB)	Outcome: Self-care behavior Knowledge a Self-efficacy Conclusion: The use of a collaborative approach in patient education was able to produce significantly greater increase in knowledge retention and self-care behaviours, without the need for additional consultation time in a podiatry clinic.
3	Ebadi Fardazar et al., (2018)	Iran	Design: Quasi experimental Duration: 3 months Sample: 52 patients each group	Implementation: - patients were divided into four groups of 13 - empowerment session held weekly in 4 sessions - refilled questionnaire in 1 and 3 months after intervention	Outcome: Diabetic foot care behavior Patients' empowerment to prevent DFU Conclusion: The empowerment of diabetic patients is effective in promoting foot care behavior, and implementation of empowerment programs in diabetes clinics in this city is recommended.
4	Ahmad Sharoni et al., (2018)	Malaysia	Design: RCT Duration: 12 weeks Sample: 38 patients each group	Implementation: - four fieldwork visits, screening and baseline assessment	Outcome: - Self-care behavior - Knowledge of foot care - Quality of life

No	Author & Year	Geographical Location	Design, Duration, Study population	Implementation and Questionnaire	Main result
				- the intervention/ health education program was conducted within one month after baseline assessment - follow ups at week-4 and week-12 Questionnaire: - Foot Self-Care Behaviour Scale	Conclusion: Foot self-care behaviour, foot care self-efficacy (efficacy expectation), foot care outcome expectation and knowledge of foot care improved in the intervention group compared to the control group ($p < 0.05$)
5	Kes et al., (2022)	Turkey	Design: RCT Duration: 6-month period Sample: intervention group (n = 25) and control group (n = 26)	Implementation: - the intervention/ health education program was conducted within six months Questionnaire: - Foot Self-Care Behaviour Scale	Outcome: - Self-efficacy, foot self-care behavior Conclusion: the intervention group's the diabetic foot care self-efficacy scale scores increased significantly at 3 and 6 months, Similarly, the intervention group's the foot self-care behavior scale scores also increased significantly at 3 months and 6 months.
6	Moreira et al., (2020)		Design: RCT Duration: 15 days Sample: Treatment Group (TG) (n= 55), and Control group (CG) (n= 54)	Implementation: - The intervention was conducted through operative group (5 Group) twice a week, in six sessions - Follow up after 15 days Questionnaire: - Tissue Integrity Evaluation Scale: Feet Skin and Mucosae	Outcome: - foot self-care Conclusion: The foot self-care educational intervention though operative group was shown to have the potential of improving feet self-care for type 2 Diabetes Mellitus patients, contributing to reduce the risk of complications in their feet
7	Heng et al., (2020)		Design: RCT Duration: 20-30 Minutes Sample: Group A (intervention): 36 subjects and Group B (control): 24 subjects.	Implementation: - The intervention collaborative communication was delivered within the typical wound consultation and treatment duration of 20 to 30 minutes. Questionnaire: brief self-administered questionnaire	Outcome: - knowledge, self-care behaviour and self-efficacy Conclusion: The use of a collaborative approach in patient education was able to produce significantly greater increase in knowledge retention and self-care behaviours, without the need for additional consultation time in a podiatry clinic.

No	Author & Year	Geographical Location	Design, Duration, Study population	Implementation and Questionnaire	Main result
8	Kilic & Karadağ, (2020)	Turkey	Design: RCT Duration: 24 weeks Sample: 44 in the experimental group and 44 in the control group	Implementation: - The application was designed as a web-based mobile app. - The user panel has a home screen interface, 8 interfaces, and 8 sub interfaces - There are "get information" and "prevention" interfaces that provide the text that contains information about the definition of diabetic foot, risk factors, and proper foot care for prevention. - Patients with diabetes used the mobile app for 24 weeks Questionnaire: - The Diabetic Foot Knowledge Form - Foot Self Care Behaviours Scale	Outcome: - Self-care behavior - Knowledge of foot care - Quality of life Conclusion: the present study did not find a significant difference in post-study behavior and self-efficacy scores between participants who did or did not use the app, there was a significant increase in knowledge level, behavior, and self-efficacy scores in both the experimental and control groups.
9	Damhudi et al., (2021)		Design: quasi-experimental Duration: 8 Weeks Sample: of 30 patients in the intervention group and 30 patients in the control group.	Implementation: - Participants took part in the first 2 h education session for 8 weeks, which used facilitated/interactive learning and a lecture style PowerPoint presentation with Q and A - Two months later, participants returned to reply to class questionnaires - The participants then returned 1 month later for standard follow-up consultations and completed the surveys a 3rd time Questionnaire: - Foot Self Care Behaviours Scale - SF-36	Outcome: - Self-care behavior - Quality of Life Conclusion: The primary outcome analyses indicate that the adapted DSMES was more effective than standard care at improving self-care and QoL and decreasing DFU degree in this sample of Indonesians with DFU, both immediately after and 3 months after the intervention.
10	Moradi et al., (2019)	Iran	Design: quasi-experimental Duration: 80 cases were randomly assigned as intervention group and 80 patients as the control one	Implementation: - Educational intervention was performed on the intervention group and the control group, received only routine training. - Within 3 months 90 text messages were sent as a message per day for each patient in the intervention group.	Outcome: - Self-care behavior Conclusion: The findings indicate that educational intervention based on short message service (SMS),

No	Author & Year	Geographical Location	Design, Duration, Study population	Implementation and Questionnaire	Main result
				Questionnaire: - Foot Self Care Behaviours Scale	resulting in improve foot care knowledge, foot care practices and metabolic control in patients with diabetes type 2
11	Ferreira et al., (2023)		Design: RCT Duration: 3 Months Sample: 20 in each group (3 Group)	Implementation: - Group 1 watched video in six minutes - Group 2 read leaflet with guidance of health provider - Group 3 only receive the standard care - Questionnaire: Foot Self Care Behavior Questionnaire	Outcome: - Adherence to diabetic foot care behaviors Conclusion: -
12	Hadi Sulistyo et al., (2018)	Indonesia.	Design: A two-group pre- and post-test quasi-experimental Duration: 3 Months Sample: 35 in the control group and 37 in the experimental group	Implementation: - First day: a 1-hour group-based educational session by lecture format and having the participants watch a diabetic foot care video - Second day: a 1-hour practice session regarding desired DFCB - Brief counselling via telephone was conducted once a week to assess participants' foot care concerns and foot care on a daily basis Questionnaire: Modified Diabetic Foot Care Knowledge and Behaviors	Outcome: Diabetic Foot Care Knowledge and Behaviors Conclusion: The FC camp was found to enhance DFCK and DFCB among diabetic patients.
13	Mosaad Ali & Elsayed Ghonem, (2019)		Design: A two-group pre- and post-test quasi-experimental Duration: 150 minutes Sample: 68 patients in control group and 64 patients in intervention group	Implementation: - The self-care educational program was implemented in 4 sessions - Each session took about 25 to 30 minutes - The instructional booklet was given to each patient under the study as well as care givers were involved in order to help for reviewing and support teaching at home Questionnaire: -Structured knowledge questionnaire -The foot care confidence Scale -The Diabetes Foot	Outcome: Diabetic Foot Care Knowledge and Behaviors Conclusion: The effectiveness of self-care educational program was approved in improving patients' knowledge, self-care confidence, behavior and in return lowering the risk of developing foot ulcer.

No	Author & Year	Geographical Location	Design, Duration, Study population	Implementation and Questionnaire	Main result
				Self-Care Behavior	
14	Mohammad & Khresheh, (2018)		Design: A two-group pre- and post-test quasi-experimental Duration: 1 day Sample: group 1 (n = 30) which was the 'intervention' group and group II (n = 30) which was the control group	Implementation: 1st session: introduce aim from the meeting, some sessions 2nd session: health education and discussion. 3rd session: discussion and asking questions. 4th session: discussion includes daily foot care, toenail care, footwear and socks, follow up care plan 5th session: summary Questionnaire: - Structured knowledge questionnaire - The Diabetes Foot Self-Care Behavior	Outcome: Diabetic Foot Care Knowledge and Behaviors Conclusion: The result of the present study concluded that implementation of the developed educational program showed significant improvement in the patients' level of knowledge, patients' ability to perform self-foot care and level of patient awareness after program implementation.
15	Vakilian et al., (2021)		Design: clinical trial Duration: 50 days Sample: intervention (n = 37) and control (n = 37)	Implementation: In the intervention group, education was performed through lectures, individual and group discussion After completing four sessions, the researcher asked the participants some questions about the educational content every 15 days on the phone (within 50 days after the intervention, the researcher made three phone calls to each individual patient) Questionnaire: - Diabetes Foot Care Self-Efficacy Scale and Health-Promoting Lifestyle Profile Questionnaire	Outcome: Diabetic Foot Care self-efficacy Conclusion: Educational intervention based on the Pender's HPM can promote the self-efficacy, lifestyle, and its dimensions in the patients with diabetic foot ulcers.

No	Author & Year	Geographical Location	Design, Duration, Study population	Implementation and Questionnaire	Main result
16	Subrata *et al.*, (2020)	Indonesia	Design: RCT Duration: 3 Months Sample: 27 in the experimental group and 29 in the control group	Implementation: The program duration was fifty minutes per session with two sessions per week for three months. The family management program consists of three topics that focused on strengthening the family responsibilities to deal with DFU, establishing family roles in DFU care, and active involvement in DFU care. Questionnaire: - Diabetes Mellitus Self-Management - Questionnaire The Diabetes Family Behavior Checklist	Outcome: Diabetic Foot Care self-management, Diabetes Family Behavior Conclusion: With regard to the result of the study, implementing the 3-month self- and family management support programs improves the patients' and families' abilities to perform diabetic foot ulcer care at home
17	Rahaman *et al.*, (2018)	India	Design: RCT Duration: 3 Months Sample: intervention (n = 63) and control groups (n = 64)	Implementation: Both groups received routine care In addition, the intervention group was shown a short audio-visual display and given a pamphlet on diabetic foot care. After 1 month, both groups once again filled up the questionnaire At 3 months, both groups filled up the questionnaire for the third time Questionnaire: - Knowledge on foot care practices Questionnaire	Outcome: Foot care knowledge and practice Conclusion: Audio-visual foot care patient education module in outpatient setting is an effective means to improve foot care knowledge and practice in patients with diabetes.
18	Toygar *et al.*, (2022)	Turkey	Design: Quasi-experimental design Duration: 3 Months Sample: intervention (n = 56) and control groups (n = 53)	Implementation: The education consisted of one session; Sessions took about 1 hour per patient. Data were collected with face-to-face interviews before and 1 month after education. Questionnaire: Diabetic Foot Care Self-Efficacy Scale	Outcome: self-efficacy Conclusion: Educational intervention was found to be an effective way to improve foot care self-efficacy, perceived knowledge level on diabetic foot, perceived health status, and perceived quality of life.

Table 3: Summary of included study

No	Authors (year)	Model		Methods								Follow-up method		Duration of the study			Outcome						
		Group	Individual	Education	Skill training	Counseling	Motivation	Mobile app/mobile	Leaflet / Booklet	Video		Telephone	When patient's check-up	< 3 months	3 Months	>3 Months	Knowledge	Behavior	Skill	Incident of foot ulcer	Clinical data	Self-Efficacy	Quality of life
1	Nguyen *et al.*, (2019)	√		√								√				√		√					
2	Ebadi Fardazar *et al*., (2018)	√					√								√			√					
3	Ahmad Sharoni *et al*., (2018)	√		√	√		√					√	√		√		√	√				√	√
4	Kes *et al.*, (2022)	√		√											√	√		√				√	
5	Moreira *et al*., (2020)	√		√									√	√								√	
6	Heng *et al.*, (2020)		√	√		√								√			√	√				√	
7	Kilic & Karadağ, (2020)		√					√								√	√	√				√	
8	Subrata *et a*l., (2020)	√		√	√		√								√				√		√		
9	Damhudi *et al*., (2021)	√		√									√	√				√					√
10	Moradi *et al*., (2019)		√					√							√		√	√			√		
12	Ferreira *et al*., (2023)		√	√		√			√		√	√			√		√	√					
13	Hadi Sulistyo *et al*., (2018)	√		√	√							√			√		√	√					
14	Mosaad Ali & Elsayed Ghonem, (2019)	√		√					√					√			√	√					
15	Mohammad & Khresheh, (2018)	√		√										√			√	√					
16	Vakilian *et al.*, (2021)	√	√	√								√		√								√	
17	Rahaman *et al*., (2018)		√						√		√				√		√		√				
18	Toygar *et al*., (2022)	√	√	√		√							√		√							√	

lecture[21–23,26,29], operative groups[24]. On the other hand, 6 articles used individual approach to deliver education namely individual consultation[20,28,35], and education via mobile apps[25,27].

Intervention method

Across the studies, various intervention methods were identified. Of the 18 articles that were reviewed, health education was the approach most often used. Health education provided was carried out by the main researchers, where they were generally professionals in the health sector[22]. The consultation approach identified in the review of the literature was by means of face-to-face education which contained questions related to health[28]. Some studies not only provided health education directly, they also provides leaflets or booklets to make it easier for respondents to remember the information provided[28,30].

Follow-up method

We assessed the long-term impact of the intervention included how they, gathered additional data, reinforced key messages, addressed any lingering questions or concerns, and sustained behaviour change. Five articles researched follow up sessions. In Ferreira and Nguyen *et al*., follow-up sessions were carried out using telephone calls[19,28], while Ahmad Sharoni *et al*., held meetings at weeks 4 and 12 to listen to experiences and examine the problems faced by respondents[22]. Subrata et al., also conducted follow-up sessions but did not clearly specify the methods used[33].

Duration of the study

The duration of research in the reviewed articles varied between 1 month to 6 months. One of the articles did not clearly state how long the intervention lasts and when follow-up activities were carried out[35]. The research conducted by Nguyen *et al*., took the longest time, because there were 2 follow-ups, namely at 3 months and 6 months[19]. Meanwhile, 3 articles stated that 3 months was enough to carry out follow-up on the interventions[22,28,33].

Outcome

Diabetic foot care knowledge and behaviour were the most frequent outcome found in the review. Nguyen et al., in their research stated that measuring knowledge of diabetic foot care was to measure respondents' literacy skills regarding physical problems that cause diabetic foot ulcers[19]. Meanwhile, diabetic foot care behaviour was used to measure respondents' behavior in checking the soles of their feet, toe spaces, washing feet, applying moisturizer, inspecting the insides of shoes, and trying on shoes[26].

Discussion

This review proves that the combination of education accompanied by follow-up sessions for DM patients has proven effective in improving diabetic foot self-care behaviour, self-efficacy, diabetic foot care knowledge, diabetic self-management and quality of life. However, this review indicated insufficient robust evidence to establish that education alone can effectively prevent or reduce rates of Diabetic Foot Ulcers (DFU) and amputations. Even though numerous studies have highlighted the positive impact of education, none of the studies proved effected in preventing the incidence of diabetic foot ulcers in the respondents studied. These findings align with the limitations of Ahmad Sharoni *et al*., and; Toygar *et al*., studies stated that their study needed a longer time to prove that the education provided could prevent the emergence of diabetic foot ulcers[22,35].

Follow-up sessions are a crucial component of research regarding behaviour change, as they help to assess the maintenance of behavioral interventions over time. The importance of follow-up sessions is supported by several findings. A study by Nguyen *et al.*, conducted follow up sessions after one, three and six months[19]. The findings showed that the more frequently respondents had follow-up sessions, the more DFU behavior increased. Follow-up sessions are essential for assessing the maintenance of behavior change and long-term effects of behavior change interventions. Researchers should plan for long-term follow-up by specifying clear interventions and considering measurement issues.

The absence of standardized assessment tools can result in difficulties in consistently measuring the impact of health education. Without clear standards, it is difficult to make comparisons between different research results or identify consistent trends. Therefore, unstandardized

assessment tools make interpretation and analysis difficult. Low data uniformity can reduce confidence in the findings and conclusions drawn. Limitations in assessment tools can make it difficult to measure long-term changes in foot care knowledge and behaviour. In fact, these long-term changes may be more relevant in the context of preventing diabetic foot wounds.

The duration of a study's impact on research quality is not explicitly detailed in the provided search results. However, the concept of study limitations and their potential influence on research quality is discussed in the context of research methodology and design. For example, the study from Mosaad Ali & Elsayed Ghonem, investigates the impact of education on diabetic foot ulcer behaviors in patients with DM[30]. This study highlights the importance of duration of the study in behaviour change. The study showed that there are significant differences within behaviors scores in different experimental time table (1 month, 3 month and 6 month). This study's findings demonstrate the importance of considering various factors that may influence research quality, such as number of follow up session.

Education using conventional approaches such as face to face consultation, lectures and small group discussions has been proven to improve the knowledge, behavior and even skills of DM patients to prevent the emergence of DFU. Even so, the role of the latest technology is needed to make the education provided easier and more effective. Kilic & Karadağ, in their research used a mobile application approach to make it easier for education providers[25]. Although the study did not observe a noteworthy distinction in post-study behavior and self-efficacy scores among participants who utilized the app and those who did not, both the experimental and control groups exhibited a marked improvement in knowledge, behavior, and self-efficacy scores. Mobile health applications could prove beneficial for individuals with hectic work schedules. Research indicates that patients express high satisfaction with these apps, with the most preferred features encompassing portability, accessibility, educational content, audiovisual richness, and a facilitating role in learning.

Study strengths and limitations

The study on educational programs for preventing diabetic foot ulcers (DFU) in patients with diabetes demonstrates several strengths and limitations. One significant strength is the comprehensive review of various educational interventions, encompassing diverse strategies like structured foot care education and multidisciplinary approaches. Additionally, the study acknowledges the role of modern technology, such as mobile health applications, in enhancing patient education, which can potentially increase accessibility and satisfaction. However, the study also identifies several limitations. The absence of standardized assessment tools is a notable drawback, leading to inconsistencies in measuring the impact of health education across different studies. This lack of standardization makes it challenging to draw definitive conclusions and compare results.

Conclusion

The review highlights the effectiveness of combining education with follow-up sessions to enhance self-care behavior, self-efficacy, knowledge, self-management, and quality of life in patients with diabetes mellitus (DM). However, standardized tools are needed to consistently measure the impact of health education. Additionally, the latest technology is required to increase the accessibility and convenience of obtaining health education. Nevertheless, it is crucial to modify the approach to yield a more significant impact in preventing diabetic foot ulcers (DFU).

Contribution of authors

Angger Anugerah Hadi Sulistyo: conceptualized and designed the study
Jayanti Dian Eka Sari: editing manuscript
Ferry Efendi: reviewed empirical studies and expert consultant
Ira Nurmala: monitoring and supervision
Inge Dhamanti: monitoring and supervision.

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