Indonesian Journal of Global Health Research
Volume 7 Number 5, October 2025
e-ISSN 2715-1972; p-ISSN 2714-9749
http://jurnal.globalhealthsciencegroup.com/index.php/IJGHR

HOW EFFECTIVE DIABETIC FOOT CARE IS IN PREVENTING ULCERS: LITERATURE REVIEW

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ABSTRACT
Diabetic foot ulcers are a serious complication of diabetes that can lead to severe infections and even amputation. Proper foot care is a key prevention strategy, although the effectiveness of interventions varies in practice. Objective: This study analyzes the effectiveness of foot care interventions in preventing ulcers in diabetic patients through a systematic literature review. A Systematic Literature Review was conducted following the PRISMA guidelines and the PICO approach (Population: type II diabetes patients; Intervention: foot care interventions; Comparison: standard education or no specific intervention; Outcome: prevention of foot ulcers). Article searches were conducted using the PubMed and Google Scholar databases from 2020 to 2025 using the keywords: diabetic foot care, foot ulcer prevention, and foot care education. The initial search yielded 268 articles, comprising 212 articles from Google Scholar and 56 articles from PubMed. Further screening was conducted by reading the titles and abstracts, removing duplicates and irrelevant articles, leaving 98 articles. During the eligibility stage, the full texts were thoroughly read and selected based on the established criteria, ultimately yielding 10 articles that met the criteria for further analysis. The methodological quality of the articles was assessed using the JBI Critical Appraisal Tools. A review of 10 articles showed that various interventions, including behavior-based education and technology models, were effective in improving foot care and significantly reducing the risk of ulcers ($p < 0.05$) across all studies.

Keywords: diabetic foot care; diabetic foot self-care behavior; foot care education; foot ulcer prevention

How to cite (in APA style)
Hermansyah, D., Wahyuni, S., Sulistyaningsih, D. R., & Amal, A. I. (2025). How Effective Diabetic Foot Care is in Preventing Ulcers: Literature Review. Indonesian Journal of Global Health Research, 7(5), 559-568. https://doi.org/10.37287/ijghr.v7i5.6884.

INTRODUCTION

Diabetes mellitus is a global health problem with a growing prevalence, causing a variety of serious complications, including diabetic foot ulcers (Faswita & Herawati, 2022). Diabetic foot ulcers are a common complication that can lead to infection, amputation, and even death, resulting in significant economic and social burdens for patients, families, and healthcare systems. Data shows that prevention is the most effective strategy for reducing the incidence of diabetic foot ulcers. (van Netten et al., 2024). Although the importance of foot care in the prevention of SED has been widely emphasized, patient adherence to proper foot self-care practices remains a challenge (van Netten et al., 2024). Various factors, such as lack of knowledge, motivation, social support, and self-efficacy, often prevent patients from performing optimal foot care. Several studies have tested educational and support interventions to improve foot care behaviors, such as peer group-based training, transtheoretical model-based foot care programs, and education by specialist nurses. However, there are still gaps in the understanding of the specific effectiveness of various foot care programs in the context of foot ulcer prevention in people with diabetes, especially in different medical resource settings (Hidayat et al., 2022; Mulyaningsih et al., 2022; Jamaluddin & Wahdaniah, 2024). Therefore, this study aims to review articles that discuss the effectiveness of foot care on foot ulcer prevention in people with diabetes. By better understanding the most effective interventions, it is hoped that better prevention strategies can be developed to reduce the incidence of foot ulcers and improve the quality of life of people with diabetes.

METHOD

This study used a systematic literature review design to assess the effectiveness of foot care interventions in preventing foot ulcers in patients with diabetes mellitus. The review was conducted based on PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines and the PICO (Population, Intervention, Comparison, Outcome) approach. The literature search was conducted systematically through two main databases, namely Google Scholar and PubMed, with a range of publication years between 2020 and 2025. The keywords used included: “diabetic foot care”, ‘foot ulcer prevention’, ‘foot care education’, and ‘diabetic foot self-care behavior’, which were combined using Boolean operators (AND, OR).The search strategy focused on scientific articles that met the inclusion criteria, namely: discussed foot care interventions or education in the prevention of ulcers in patients with diabetes mellitus, were quantitative studies (experimental, quasi-experimental, or observational), available in full-text, written in Indonesian or English, and published within 2020-2025. The initial stage of the search resulted in 268 articles, consisting of 212 articles from Google Scholar and 56 articles from PubMed. Further screening was carried out by reading the titles and abstracts, as well as removing duplicates and irrelevant articles, leaving 98 articles. At the eligibility stage, a thorough reading of the full text and selection based on predetermined criteria was carried out, until finally 10 articles were eligible for further analysis.

All selected articles were then critically analyzed using the JBI Critical Appraisal Tools to assess methodological quality, internal validity, data reliability, and appropriateness of study design to the review objectives. The articles reviewed included various forms of foot care interventions such as education based on behavioral models (HBM, TTM, BASNEF, IMB), education by specialist nurses, and the use of technology such as thermography. The results of the 10 articles formed the basis for synthesizing the findings of this literature review.

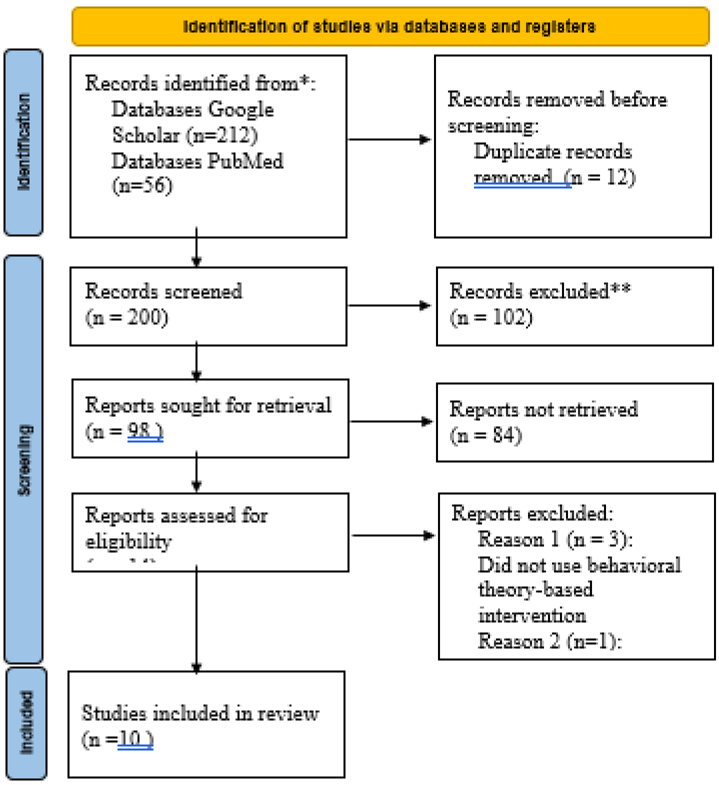

Diagram of PRISMA

RESULT

The article search process began with the identification of 268 articles from Google Scholar (n=212) and PubMed (n=56). After initial screening of the titles and abstracts of 200 articles, 102 articles were eliminated due to duplication and irrelevance. A total of 98 articles were then evaluated for eligibility through full-text reading. From this stage, 84 articles could not be downloaded while 14 articles were successfully downloaded, but only 10 articles met the inclusion criteria and were further analyzed in this review.

Table 1.
Article Results

Title	Author	Objective	Method	Result
The Effect of Peer Group-Based Training Using Health Belief Model on Quality of Life and Foot Ulcer Self-Care Behaviour in Patients with Type 2 Diabetes: A Randomized Controlled Clinical Trial	(Tazangi et al., 2022)	This study aims to investigate the effect of peer-based training (PGBT) using the health belief model (HBM) on quality of life (QOL) and self-care behavior for foot ulcers in patients with type 2 diabetes.	This study was a randomized controlled clinical trial conducted in patients with type 2 diabetes referred to the Diabetes Care Clinic in Shiraz (Iran) from September 2019 to June 2020. A total of 70 patients participated in the study and were randomly assigned to peer training (n=35) and control groups (n=35). Diabetes Quality of Life, and diabetes self-care behaviors, were completed by both groups before, immediately, 1 month, and 3 months after the intervention. Data were analyzed using Chi-square test, paired t-test, independent t-test, ANOVA, and descriptive statistical methods. $P < 0.05$ was considered statistically significant.	The results showed that the mean scores of QOL, HBM constructs (awareness, perceived vulnerability, perceived severity, perceived benefits, self-care behaviors, and foot care) before the intervention showed no significant difference between the two groups, but immediately after one month of educational intervention, the mean scores for the intervention group were significantly higher than the control group ($p < 0.05$).
Effectiveness of a Transtheoretical Model-Based Foot Care Program in Improving Foot Care Behaviors and Self-Efficacy in Adults With Type 2 Diabetes	(Kes et al., 2022)	This study aims to evaluate the effects of a transtheoretical model (TTM)-based foot care program on foot self-care behavior and self-efficacy among adults with type 2 diabetes (T2DM).	A prospective, randomized, controlled trial with blinded evaluators was conducted between January 2020 and October 2020 in the outpatient endocrinology unit of a hospital in northwestern Turkey. The sample consisted of 51 adults with T2DM who were randomly assigned to an intervention group (n = 25) and a control group (n = 26). The intervention group	The results showed that the self-efficacy scale scores for diabetic foot care in the intervention group increased significantly at 3 and 6 months, compared to the control group. Similarly, the self-care behavior scale scores for foot care in the intervention group also increased significantly at 3 and 6 months.

			received a TTM-based foot care program over a 6-month period. Data were analyzed using two-way repeated measures analysis of variance (ANOVA).	
The effectiveness of a thermography-driven preventive foot care protocol on the recurrence of diabetic foot ulcers in low-medical resource settings: An open-labeled randomized controlled trial	(Qin et al., 2023)	This study investigates the efficacy of nurse-guided foot care and thermographic evaluation in preventing the recurrence of diabetic foot ulcers in countries with low medical resources.	A 1:1 allocation, single-blind, randomized controlled trial. Two wound care facilities with specialist wound care nurses in Indonesia. 120 patients with a history of diabetic foot ulcers. In the intervention group, baseline risk assessment included smartphone thermography evaluation. Personalized foot care and education were provided monthly for participants whose thermography showed increased foot lesion temperature at baseline risk assessment. The control group received standard care and education using a booklet at baseline. The follow-up period was six months.	Secondary outcomes included quality of life (European Quality of Life 5 Dimensions 3 Level Version) and foot care behavior, analyzed using a Mixed Model for Repeated Measures at baseline, three months, and six months (3 and 6 months from baseline). 120 participants (intervention 60, control 60) were randomized. The intervention group had a significantly lower recurrence rate than the control group (15% vs. 35%, $p = 0.011$) and a significant difference in time to ulceration (log-rank test, $p = 0.009$) after the 6-month follow-up period. The intervention reduced the risk of diabetic foot ulcer recurrence by 59% (hazard ratio 0.41, 95% confidence interval 0.18, 0.96, $p = 0.039$) in multivariate Cox regression analysis. At the third follow-up, the total diabetic foot care behavior score ($p < 0.001$) significantly improved through the intervention. At the sixth follow-up, mobility ($p = 0.020$), self-care ($p = 0.023$), pain/discomfort ($p < 0.001$), anxiety/depression ($p = 0.016$), EuroQol Visual Analog Scale score ($p = 0.002$), and total diabetic foot care behavior score ($p < 0.001$) showed significant

				improvements in the intervention group.
Caring-Based Supportive Educative Enhance Prevention Ability Of Diabetic Ulcers In Patients With Type II Diabetes	(Mumpuningtias et al., 2022)	This study aimed to determine the effect of self-care management education on preventing foot ulcers in patients with type II diabetes mellitus	The design of this study is quasi-experiment. The number of samples was 86 with a simple randomized sample divided into two groups, 43 in the treatment group caring base supportive educative activities, and 43 in the control group distributing leaflets on diabetes. Results from studies were analyzed using the paired t-test and the independent t- test	These study results are based on independent t-test scores of self-care management in the treatment and control groups after the intervention, namely p = 0.002. The difference in the delta score of self-care management scores in the treatment and control groups after the intervention was p=0.000.
Effectiveness of Foot Care in Preventing Skin Damage and Risk of Diabetic Foot Wounds in Diabetes Mellitus Patients	(Jumain & Rasiman, 2024)	The aim of the research is to analyze the effectiveness of foot care in preventing skin damage and the risk of diabetic foot wounds in diabetes mellitus patients	This research method uses a quasi-experimental design with a pretest posttest one group design. This research was conducted at the Undata Hospital in the Bougenvile room with a population of 31 participants. The selection of respondents was based on inclusion criteria, namely: age ? 30 years and suffering from DM	The results of the analysis used the paired sample t-Test. The average skin damage prevention score for DM patients before giving foot care was 2.97 and the skin damage prevention score after being given foot care was 2.52, respectively, experiencing a decrease in skin improvement of 0.45. These results show that the average value of diabetic ulcer risk for DM patients before being given foot care was 2.81 and the average value after being given foot care was 2.16 with a difference in improvement in the risk of diabetic ulcers of 0.65 which shows that the p-value is 0.000 < ? (0.005) then H0 is rejected and H1 is accepted.
Prevention and Treatment of Diabetic Foot Ulcer by Health Education of Specialized Nurses	(Ng et al., 2023)	The purpose of this study was to analyze the preventive effect of specialist nurse health education on diabetic foot ulcers.	Desin penelitian menggunakan quasi-experimental design dengan kelompok kontrol dan intervensi	The results showed that the foot care knowledge score in the intervention group was higher than that in the control group at one month and three months after the intervention, and the difference was statistically significant

				(P < 0.05).
Foot care education as an effort to prevent wounds in patients with diabetes mellitus	(Marliyana et al., 2024)	Provide education on foot care as an effort to prevent diabetic wounds.	Using a quasi-experimental one-group pre-post-test design with foot care education intervention. Foot care behavior measurement instrument using the NAFF (Nottingham Assessment of Functional Footcare) questionnaire.	The results showed that after being given foot care education, all 20 respondents behaved positively with the majority of respondents aged 50-60 years as many as 10 people (50.0%) and Wilcoxon bivariate test to see differences in respondents' foot care behavior before and after the intervention was given pValue = 0.000.
Foot self-care behaviour in primary care patients with diabetic foot ulcers: Structural equation modelling of psychological predictors	(Zhu et al., 2024)	This study aims to explore the psychological determinants of this important behavior among primary care patients.	This study uses a quantitative approach with a design that involves structural equation modeling to explain the relationship between behavioral variables and foot care behavior in patients with diabetic foot.	The results of this study revealed that the developed model successfully explained 51.1% of the variation in foot care behavior in patients with diabetic foot disease. Perceived disease threat (consequences, timeline, identity, anxiety, and emotions) directly increased foot care behavior, but indirectly decreased it by increasing diabetic pressure. In contrast, perceived control (personal control, medication control, and coherence) had no direct relationship, but indirectly increased foot care behavior by reducing diabetic distress and increasing confidence in foot care. These findings suggest that illness perception, diabetic distress, and self-confidence in self-care are modifiable predictors, so they can be targets for self-management interventions to improve foot care in diabetic foot disease patients.
Promoting foot self-care in type 2 diabetes mellitus patients receiving hemodialysis based on the information-motiva	(Jung & Kim, 2023)	The main objective of this study was to develop and validate a foot self-care behavior model for patients with type 2 diabetes	Cross-sectional observational design, where data were collected between June and August 2021 from 156 outpatients with type 2 diabetes	This study shows that age, diabetes foot care knowledge, social support, and foot care self-efficacy directly affect foot self-care behavior. Foot care

tion-behavioral skills model		mellitus (T2DM) undergoing hemodialysis (HD). The model is based on the information-motivation-behavior (IMB) skills model.	receiving routine HD. Structured questionnaires and electronic medical records were used to collect demographic and disease-related data along with the Foot Care Knowledge Questionnaire, the third version of the Diabetes Attitude Scale, the Perceived Social Support Multidimensional Scale, the Foot Care Confidence Scale, and the Foot Self-Care Behavior Scale.	self-efficacy also acted as a mediator, linking foot care knowledge, diabetes-related attitudes, and social support with foot self-care behaviors. The information-motivation-behavioral skills model was found to be suitable for explaining these behaviors in type 2 diabetes patients undergoing hemodialysis. The implication is that improving knowledge, attitudes, and social support can strengthen foot care self-efficacy, which in turn will improve foot self-care behaviors.
BASNEF Model Based Educational Guidelines regarding Foot Care among Type II Diabetic Patients	(Saad et al., 2022)	This study aimed to appraise the effect of BASNEF model based educational guidelines regarding foot care among type II diabetic patients	A quasi-experimental research design was utilized.	The present study revealed that there was a significant enhancement in mean scores of study group total knowledge, reported foot care practices and BASNEF model scores, post and after three months of educational guidelines implementation compared with control group. Additionally; there was a statistically significant correlation between the total BASNEF scores and total knowledge and total reported practices of study group post and follow up the educational guidelines

DISCUSSION

Although foot care education has long been recommended as an important part of diabetes mellitus management, gaps in previous studies are still evident in terms of holistic psychosocial approaches, sustainability of long-term effects of interventions, as well as the variety of behavioral theory models used. Most previous studies have not thoroughly evaluated the psychological and social factors that influence foot care behavior, especially in high-risk populations such as hemodialysis patients or those living in areas with limited healthcare resources.The main results of the reviewed studies showed that educational interventions based on behavioral models (such as the Health Belief Model, Transtheoretical Model, BASNEF, and Information-Motivation-Behavioral Skills Model) significantly improved foot care behaviors, knowledge, self-efficacy, and quality of life of people with diabetes. Studies by Tazangi et al. (2022) and Kes et al. (2022) showed that the application of the theoretical model in peer group training and ongoing programs had a positive impact on increasing awareness, risk perception, and foot care habits. Similarly, Qin et al. (2023) proved that technology-based interventions such as mobile phone thermography can reduce diabetic foot ulcer recurrence by 59%. In general, data from all studies support the effectiveness of educative and participatory approaches in promoting behavior change.

When compared to previous studies, these findings strengthen the evidence that behavioral theory-based interventions have a more significant impact than conventional educational approaches, such as simply distributing leaflets or guidebooks. Studies by Zhu et al. (2024) and Jung & Kim (2023) even identified specific psychological variables such as diabetic distress, disease perception, and social support as important mediators in the effectiveness of foot care behaviors. These findings are in line with the biopsychosocial approach to chronic disease management that is increasingly emphasized in modern clinical practice.However, there are some methodological limitations that may affect the interpretation of the results. Most of the studies used quasi-experimental designs with limited sample sizes and not all of them applied full blinding or randomization techniques, which could lead to bias. In addition, the follow-up period generally lasted only 3 to 6 months, so the long-term effects of the interventions remain unknown. Differences in measurement tools, rating scales, and statistical analysis methods also pose challenges in directly comparing results between studies.

The implications of this literature suggest the importance of further exploration of behavioral theory-based long-term interventions that incorporate educational, psychological, and technological aspects. Future research could focus on developing integrated interventions that consider local sociocultural variables, as well as using more rigorous randomized trial designs with large sample sizes and multi-time evaluations. In addition, the measurement of long-term effectiveness on amputation rates, health costs, and patient compliance should also be expanded.

CONCLUSION

In conclusion, this literature review confirms that behavior model-based foot care education is effective in improving self-care behaviors, self-efficacy, and quality of life of patients with diabetes mellitus. Theoretical approaches such as HBM, TTM, and IMB can provide a strong basis for designing behavior change-oriented interventions. Despite limitations in the design and duration of the study, these findings provide a clear direction for the development of more personalized, sustainable, and contextualized interventions in the future.

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