IDENTIFICATION OF FOOT CARE USED FOR PREVENTION OF DIABETIC FOOT ULCER (DFU): A SCOPING REVIEW

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Abstract

Backgrounds; Diabetes mellitus cases continue to increase every year. Diabetes can cause various complications, with diabetic ulcers being one of the most serious problems. Diabetic ulcer treatment will take a long time and pose a significant financial burden. Diabetic ulcers can lead to numerous issues, necessitating early prevention. Aside from medication, one effort to prevent complications of diabetic ulcers in people with diabetes is to perform primary prevention on the feet. This preventive measure can save costs. **Objectives :** The aim of this review is to identify foot treatments used to prevent diabetic foot ulcers. **Method :** We carried out the review using the Arksey & Malley scoping review framework guidelines. We also utilized PRISMA-SCR to enhance reporting and boost validity. We utilize six databases to search the research literature, filtering articles based on inclusion criteria. These include qualitative and quantitative primary data studies that concentrate on foot care for individuals with diabetes. We have registered the research protocol on the Open Science Framework.(osf.io/ecqtv) **Results;** Ten of the 317 screened articles met the criteria for inclusion in this review. Most of the articles screened showed that 40% of the most widely used foot care was monitoring foot temperature periodically, followed by the use of pressure-reducing Isolen. **Conclusions**; Temperature monitoring technology, including infrared imaging, combined with special therapeutic footwear to reduce pressure is an effective measure for preventing diabetic ulcers. Telemedicine systems enable remote monitoring, while patient education strengthens self-care capabilities.

Keywords:*Diabetes melitus; Diabetic foot ulcer; foot care; Foot maintenance; wound prevention*

BACKGROUND

The number of cases of diabetes in the military continues to rise. Over the past few decades, there has been a significant increase in the number of cases and prevalence of diabetes, which has become a global health challenge. (Bus, 2016). Worldwide, about 422 million people suffer from diabetes, with most of them living in low- and middle-income countries. Diabetes is the direct cause of 1.5 million deaths every year. (WHO, 2023). Treatment for diabetic ulcers will take a long time because the wounds are difficult to heal and susceptible to infection. (Saprianto et al., 2022). Diabetic foot ulcers and amputations of the lower limbs are common complications of militancy diabetes; these complications pose a significant financial burden. Approximately 25% of militia diabetics have complications from DFU. (Abbott et al., 2019). The high risk of developing ulcers in military diabetes patients is a complex problem that can affect all aspects of the patient's life. The occurrence of trauma to the legs of military diabetic patients sometimes occurs unconsciously due to a loss of sensation in the leg. Ischemia can also cause premature leg lesions due to neurosensory or motor disappearances. (Pedras et al., 2016). There is an increased risk of peripheral sensory neuropathy, periperal vascular disease, and foot deformity. The combination of these conditions can cause ulcers to form in the legs. (Stoekenbroek et al., 2017). Polyneuropathy results in the formation of wounds, leading to a reduction in skin sensory pressure and vibration and a loss of knee reflex in diabetics. (Florenza Laowo & Batubara, 2021).

DFU events can lead to a variety of problems, necessitating prompt prevention to avoid complications in diabetes cases. One attempt to prevent the development of complications in diabetic patients through the use of diabetes medications is by performing primary prevention in the legs. Primary DFU prevention is still rare in most health services, and there are frequent delays in secondary treatment. (Barshes et al., 2017). In DFU's preventive efforts, proper training can reduce the incidence of complications of militancy diabetes by up to 80%. (Moradi et al., 2017). Using apreventive-based approach to remission remediation for dietetic foot ulcers can protect diabetic legs from continuous and cost-effective complications. (Abbott et al., 2019). We strongly recommend early treatment of DFU complications, as proper prevention can significantly impact all aspects of the patient's life. This review aims to identify the foot care practices used to prevent diabetic foot ulcers. This review will discuss the type of intervention needed to prevent foot injuries in diabetic patients. Therefore, we anticipate that this review will offer a thorough overview of the treatments available to prevent foot injuries in patients with diabetes mellitus.

METHODS

We performed data extraction using the Preferred Reporting Items for Systematic Reviews and Meta-analyses extension for Scoping Reviews (PRISMA-SCR) to optimize reporting and improve the validity of this scope review. The scoping review framework guidelines (Arksey & Malley, 2005) guide the review. Additionally, we use PRISMA-SCR to optimize reporting and improve validity. (Tricco et al., 2018). We have registered this research protocol in the Open Science Framework (https://osf.io/). We use five-stage scoping review frameworks, as shown below.

Stage 1: Research Questions
This scoping review raises the following research questions: What are the current strategies for preventing foot injuries, and how do diabetic patients receive foot care? **Stage 2: Relevant Studies and Search Terms**
This review explores foot treatments used for the prevention of diabetic foot ulcers. In this scoping review we use six database based searches. The initial search is done to take the title, abstract, and content to identify terms and keywords. The inclusion and exclusion criteria in this coverage survey are based on the Population Concept Context (PCC) model listed in Table 2. Searches are limited to full text articles published in English and Indonesian from 2019 to 2024. In this review the selection of articles last 5 years because at the vulnerable time 5 trahun is broken begins many articles discussing methods of prevention of diabetic foot wounds.

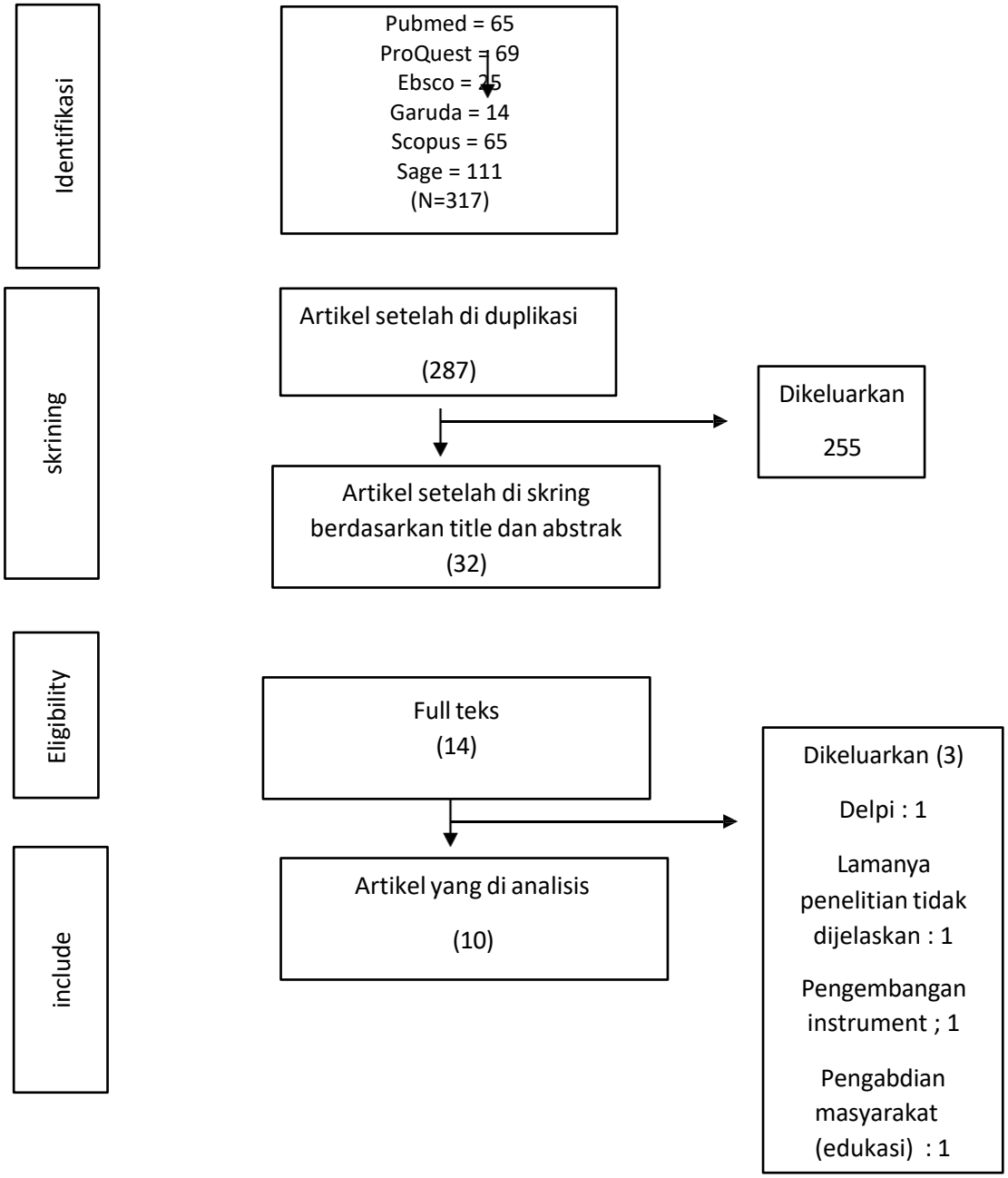
Table 1 Search Database

Database	**Keyword**	**artikel**	**Access Date**
Scopus	diabetic AND foot AND ulcer AND preventive OR prevention AND incidence	**65 artikel**	**6 july 2024**
Pubmed	((diabetic AND foot AND ulcer OR diabetic AND foot AND ulcer OR diabetic AND foot AND lesion OR diabetic AND foot AND injury) AND (prevention OR precaution OR intervention OR control)) AND (incident OR event OR situation OR accident)	**41 artikel**	**6 july 2024**
ProQuest	Identification Of Foot Care Used TO Prevent Diabetic Foot Ulcers	**69 artikel**	**6 july 2024**
Garuda	pencegahan luka kaki diabetes	**14 artikel**	**6 july 2024**
Ebsco	prevention of diabetic foot wounds	**25 artikel**	**6 july 2024**
Sage	Diabetic foot ulcer OR Diabetic foot AND foot care OR Foot maintenance AND wound prevention	**111 artikel**	**6 july 2024**
Total		**317 artikel**	

Stage 3: Study selection

The study has been extracted from the database.
After completing the initial search and applying the inclusion and exclusion criteria in this

survey, Figure 1 illustrates the process of filtering results and extracting manuscripts. The process yielded 317 articles from six databases. Subsequently, we eliminate duplicates from Mendeley and Rayyan, leaving 287 articles. We then utilize the Rayyan platform to filter these articles based on their titles and abstracts, which yields 19 articles for additional filtering. We then read the entire article to extract 11 articles for analysis.



Extraction Reliability Studies
The Mendeley software reference manager downloads all identified abstracts from the article search, and after de-duplication, exports them into the Rayyan software program. This program then performs an article reduplicate filter to eliminate duplication of articles that evade the Mendeley filter. Three authors (SMS, SY, and DK) filter this article, considering the criteria for its exclusion and inclusion in the review.

Stage 4: Data
We extract the data to include important information such as the author's name, the year of the article, the research location, the research design, and the measured samples listed in Table 3.

Table 3. ekstraksi artikel

Author, year	Country	Sample Number	Research Methods	Research Duration	Type of foot care used	Results
Kelechi,Teresa J; Madisetti, Mohan ; Prentice, Margaret; Mueller, Martina. 2021	Australia	40	Randomized Controlled Trial	8 week	Insole cool	The cooling insole significantly lowers the skin temperature, which can help prevent diabetic foot ulcers. There was a 35% decrease in skin temperature in the intervention group.
Dhruv Bose, Gurpreet Singh, Shubham Gupta, Arnab Chanda. 2024	India	50	Mixed methods	3 mounth	Insole	Participants tolerate custom insoles well and they effectively reduce plantar pressure, demonstrating potential for ulcer prevention.

Erel, Veysel ; Nasirian, Aida ;Gu, Yixin;Lavery, Larry ; Wijesundara, Muthu B. J. 2024	Belanda	60	Pilot Study	6 mounth	Cyclical pressure detector	The cyclical pressure reducer showed a significant reduction in plantar pressure, as well as early signs of ulcers. The device resulted in a 30% decrease in plantar pressure in high-risk areas.
Bus, Sicco A; Baal, Jeff G van; Stegge Wouter Bernard Aan de; Busch-Westbroek Tessa E 2021	USA	173	Randomized Controlled Trial	15 mounth	Skin temperature monitoring at home	In high-risk diabetic patients, monitoring the skin temperature at home significantly reduces the incidence of foot ulcers.
Lazo,Maria; Taype-Rondán, Alvaro; Ortiz, Antonio Bernabe; Malaga,German . 2020	USA	22	Feasibility study	6 mounth	Feet thermometers with mHealth supplementation	Foot thermometers combined with mHealth show validity and potential for ulcer prevention, highlighting the need for larger trials. The study group observed a 45% decrease in foot ulcers.

Collings, Richard; Freeman, Jennifer; Latour, Jos M; Hosking Joanne ; Paton, Joanne. 2023	Belgia	30	Randomized Controlled Trial	12 minggu	Insole for plantar pressure remover	The insole effectively reduces plantar pressure and is preferred by participants for convenience and usability. On average, this insole reduces plantar pressure by 28%.
Christopher Beach, Glen Cooper, Andrew Weightman, Emma F. Hodson-Tole, Neil D. Reevesand Alexander J. Casson, 2021	Inggris	15	Pilot Study	4 mounth	We are monitoring the dynamic plantar temperature using infrared thermography.	Infrared thermography is capable of monitoring dynamic plantar temperatures and shows the potential for early detection of ulcer risk.
Ming A, Alhajjar A, Walte I, Piehler C, Hoetzsch J, Leuckert M, Clemens V, Petrow A, Siddiquee IM, Scurt FG, Isermann B, Mertens PR. 2024	Germany	283	Randomized Controlled Trial	24 mounth	Telemedical monitoring	Telemedical monitoring using telehealth systems shows potential for early detection of plantar temperature changes in diabetic patients. Although the system enables closer monitoring and prompt response to early signs of foot ulcers, further research is necessary to ensure its effectiveness and sustainability.
Lavery LA, Petersen BJ, Linders DR, et al. 2019	USA	129	Longitudinal Study	34 week	Remote temperature monitoring	Unilateral remote temperature monitoring can predict the future incidence of ulcers on diabetic legs that are in remission. The study suggests that this approach can assist in identifying high-risk patients and implementing

						timely preventive interventions, but further research is necessary to validate these findings.

Stage 5: Thematic summary and key findings

We use inductive thematic analysis, based on Braun and Clarke's work in various research studies, to identify key emerging themes. Each research finding necessitates an introduction, leading to the generation of initial codes that subsequently refine into the final themes in the paper.

Ethical Aspects

The researchers conducted this study in compliance with current regulations, ensuring that all authors of the analyzed articles received accurate citations in compliance with the Copyright Act.

Study Characteristics

Of the 10 articles included, 4 articles 40% research was carried out in the USA, 1 article in Germany, 1 Article in the Netherlands, Italy,1 article in the UK, 1 Artikel in India, 1 artikel in Indonesia, 1 Ertikel in Australia, 1 ertikel in Belgium. There are 2 Mixed methods, 4 RCT tests, 1 Pilot Study, 1 Feasibility study, 1 Longitudinal Study. The duration of the study ranges from 12 weeks to 24 months. In this study, the most commonly used foot injury prevention is a foot temperature monitoring of 4 articles of 40% (Beach et al., 2021; Bus et al. 2021; Lavery et al, 2019; Lazo-Porras and al., 2020), 3 uses of insolents to reduce plate pressure (Bose et al.; 2024; Collings et al; 2023; Erel et al.: 2024), 1 telemedical monitoring (Ming et al.. (Kelechi et al., 2021).

RESULTS AND DISCUSSION

The purpose of writing this review is to identify foot treatments used to prevent diabetic foot ulcers. The findings suggest that periodic foot temperature monitoring is the most widely used foot care mBy adjusting the temperature to reduce metabolic needs in the legs and preventing cell autolysis by eliminating imbalances between oxygen needs and supply, infrared thermal imaging can serve as an additional tool for the evaluation of high-risk diabetic legs (Bagavathiappan et al., 2010; Mart-Vaquero et al., 2019; Yavuz et al., 2020). 2020). Special therapeutic foot nails with anti-weight properties are effective in reducing the incidence of DFU (L-Moral et al., 2019; Luo et al., 2022).

Remote monitoring can assist patients in managing their leg condition and enabling them to independently conduct examinations of their legs. This technology can serve as a viable alternative for patients suffering from superficial ulcers. (Keegan et al., 2023; Smith-Strem and High blood sugar levels can cause neural damage to the legs, resulting in decreased sensation. This can lead to diabetics not noticing changes in foot temperature, increased pressure, or even the occurrence of injuries, necessitating foot care to prevent these issues. hings. Foot temperature monitoring needs to be a priority in the prevention of foot injuries. Innovation in the use of foot temperature surveillance technology, such as infrared thermal imaging, is required in diabetes treatment protocols to get optimal results.

CONCLUSION

Our review delves into the widespread use of foot care for the prevention of foot injuries. Diabetic foot ulcer risk management (DFU) integrates several key strategies. Temperature monitoring technology, including infrared imaging, is combined with special therapeutic footwear to reduce pressure. Telemedicine systems allow remote surveillance, while patient education strengthens self-care capabilities. This multifaceted approach effectively reduces the incidence of DFU, mitigates complications, and improves the well-being of diabetics. The holistic implementation of these methods optimizes DFU prevention and management for diabetic foot health.

ACKNOWLEDGMENTS

The author expresses his appreciation to the facilitator at the EBP course, who gave many inputs and advice related to this writing. The author also appreciates PSMIK Army 2023, which has helped a lot in the optimal use of Rayyan, Mandeley, Elicit, and other AI software so that it can facilitate the writing of this article.

DISCLOSURE

This work, in writing, has no conflict of interest.

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