

Diabetic Foot Awareness Among Healthcare Professionals In KSA: A Systematic Review

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Abstract

Background: Diabetic foot complications pose a significant burden on healthcare systems, with prevention and management heavily reliant on the awareness and practices of healthcare professionals. This systematic review aimed at assessing the level of awareness regarding diabetic foot among healthcare professionals in the Kingdom of Saudi Arabia (KSA).

Methods: A comprehensive search strategy was employed to identify relevant studies from electronic databases including PubMed, MEDLINE, Embase, CINAHL, and Scopus, supplemented by grey literature and reference list searches. Studies published from inception to [insert date] were included, with no language restrictions. Quantitative, qualitative, and mixed-methods studies assessing awareness of diabetic foot among healthcare professionals in KSA were eligible for inclusion. Two reviewers independently screened titles, abstracts, and full texts, with data extracted using a standardized form. Methodological quality assessment was performed, and data were synthesized narratively.

Results: The initial search yielded 61 studies, with three studies meeting the inclusion criteria. These studies, conducted by Alsaigh et al., Qutob et al., and Alsheikh et al., utilized cross-sectional study designs to assess various aspects of diabetic foot care in Saudi Arabia. While Alsaigh et al. highlighted good knowledge but poor practices among participants, Qutob et al. found that healthcare providers generally prioritize foot care, with certain factors influencing their emphasis. Conversely, Alsheikh et al. identified knowledge gaps among primary care providers, particularly in diagnosing and managing diabetic foot infections. Collectively, these findings underscore the importance of enhancing awareness, attitudes, and practices surrounding diabetic foot care among healthcare professionals in KSA.

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Conclusion: *This systematic review protocol outlines a comprehensive approach to assessing the awareness of diabetic foot among healthcare professionals in KSA. By synthesizing existing evidence, it aims to inform strategies for improving diabetic foot care practices and ultimately reducing the burden of diabetic foot complications in the region.*

Introduction

Globally, people are dealing with Diabetes Mellitus (DM). High blood glucose levels caused by insulin hormone resistance or insufficiency define this metabolic condition, which may have systemic, chronic effects on the body [1]. By 2030, the worldwide prevalence of diabetes mellitus (DM) among people aged 20–79 is projected to reach 578 million cases, and by 2045, it might reach 700 million cases [2].

According to some estimates, Saudi Arabia has the seventh-highest number of diabetes patients worldwide and the second-highest number in the Middle East [3]. In 2016, the World Health Organization reported a diabetes prevalence of 14.4% in Saudi Arabia, with 13.8% of females and 14.7% of men affected. Five percent of all fatalities in Saudi Arabia were thought to be caused by [4]. Researchers in the Alkharj district found that 3.8% of women and 9.2% of men had diabetes in a cross-sectional research [5,6]. Diabetes problems may be broadly categorized into two main groups. Microvascular problems include damage to tiny arteries that leads to neuropathy, retinopathy, and kidney-related disorders [7], whereas macrovascular issues include long-term damage to big vessels that causes cardiovascular diseases. On top of all these problems, 30% of people with DM have diabetic neuropathy, which damages the longer peripheral nerves that innervate the lower extremities. Half of these people are over 50, and the risk of foot ulcers and lower-extremity amputation is incredibly high because of this [8].

Among the most dangerous consequences of diabetes is diabetic foot. For diabetics, it's the main reason for hospital stays, limb loss, and mortality. Diabetic foot ulcers are 2.5 times more likely to cause mortality than diabetic foot ulcers without ulcers [9]. The clinical and economical cost of diabetic foot problems is substantial. Inadequate management of blood sugar, smoking, foot abnormalities, peripheral neuropathy, vision loss, and chronic renal illness all raise the likelihood of problems [10].

Pathological alterations characterized by ischemia and neuropathy underlie the development of diabetic foot ulcers. Inappropriate foot care may lead to ulcers becoming infected and ultimately requiring amputation. Amputations occur in about 20% of cases with moderate to severe diabetic foot infections [11]. Diabetics may keep their feet safe by taking special care of them. Skin checks, evaluations of the nervous system and blood vessels, selection of suitable shoes, and clipping of toenails are all part of this [10,12]. Worldwide, the cost of caring for and managing diabetic foot has grown significantly. The average cost of treating diabetic foot ulcers in China has risen from 15,535.58 yuan in 2014 to 42,040.60 yuan in 2020, according to [13]. Aside from the monetary toll, DM is a leading cause of amputations of the lower extremities on a worldwide scale. Another Canadian research found that 93.8% of individuals with peripheral vascular disorders and 81.8% with diabetes had lower limbs amputated [14].

Diabetic foot ulcers and their consequences may be lessened via patient education [15]. Preventing foot ulcers in diabetic people requires proper foot care education. To do this, you should avoid going barefoot and instead wash and dry your feet every day, paying special attention to the spaces in between your toes [16]. The likelihood of complications and bad outcomes is reduced when a multidisciplinary team from multiple specialties is included in the therapy of diabetic foot [17]. Effective wound care, glucose management, infection eradication,

and blood flow optimization are all parts of diabetic foot ulcer treatment [18]. Many varieties of wound dressings are available, each with its own unique purpose in the treatment of diabetic foot ulcers. Although surgical intervention is not generally necessary for the care of diabetic foot ulcers, in more complex instances, lower limb amputation may be necessary. Patients with diabetic foot ulcers are more likely to have lower limbs amputated, according to a Nigerian research. Infected wounds, leukocytosis, proteinuria, osteomyelitis, and ulcers that last more than a month are all considered risk factors [19].

Diabetic foot care knowledge was the subject of many investigations. Patients in these studies lacked instruction regarding diabetic foot, while others found that patients had strong understanding but poor practice [20-22]. Patients had sufficient knowledge and attitude about diabetic foot, according to other investigations [23,24]. In addition, research has shown that healthcare practitioners' understanding of diabetic foot varies between nations, with the lowest levels of awareness finding in Sri Lanka (77.9%) [26] and the highest in Pakistan (40%) [25]. The majority of Pakistani nurses had a favorable outlook on diabetic ulcer patients, according to a recent research [25]. Nevertheless, more practice is required, and primary care doctors might benefit from training in this area. The early diagnosis and treatment of diabetic foot complications in Saudi Arabia are also the focus of awareness efforts.

Methods

Review Question

What was the level of awareness regarding diabetic foot among healthcare professionals in the Kingdom of Saudi Arabia (KSA)?

Search Strategy

A systematic search was conducted in electronic databases including PubMed, MEDLINE, Embase, CINAHL, and Scopus. Additionally, grey literature and reference lists of relevant articles were searched. The search included articles published from inception to [insert date], with no language restrictions. Keywords and MeSH terms related to "diabetic foot", "awareness", and "healthcare professionals" were used.

Types of Studies Included

This systematic review included quantitative, qualitative, and mixed-methods studies that assessed the awareness of diabetic foot among healthcare professionals in KSA. Studies reporting on interventions to improve awareness were also considered.

Participants

Healthcare professionals including physicians, nurses, podiatrists, and allied health professionals working in any healthcare setting in KSA were included.

Search Keywords

The following search keywords and MeSH terms were used: "diabetic foot", "foot ulcer", "diabetes mellitus", "awareness", "knowledge", "attitudes", "practice", "healthcare professionals", "physicians", "nurses", "podiatrists", "Saudi Arabia".

Study Selection Process

Two reviewers independently screened titles and abstracts of identified articles for relevance. Full texts of potentially relevant articles were then assessed for eligibility based on inclusion and exclusion criteria. Any discrepancies were resolved through discussion or by consulting a third reviewer.

Outcomes

The primary outcome was the level of awareness regarding diabetic foot among healthcare professionals in KSA. Secondary outcomes may have included attitudes towards diabetic foot care, knowledge of risk factors and management, and practices related to diabetic foot assessment and prevention.

Data Extraction and Coding

Data were extracted using a standardized form including study characteristics (author, year, study design), participant characteristics, intervention details (if applicable), outcomes, and key findings. Qualitative data such as themes and quotes were also extracted. Data were coded and categorized based on relevant themes.

Data Management

Data were managed using reference management software (e.g., EndNote) for citation organization and removal of duplicates. Extracted data were stored securely on password-protected computers and were only accessible to members of the research team involved in data analysis.

Results

The initial search identified a total of 61 studies from PubMed, Embase, Cochrane Library, and CINAHL. There were no duplicates and 41 studies were screened based on their titles and abstracts. Of these, 12 full-text articles were reviewed, and three studies were eligible for inclusion in this systematic review (Figure 1).

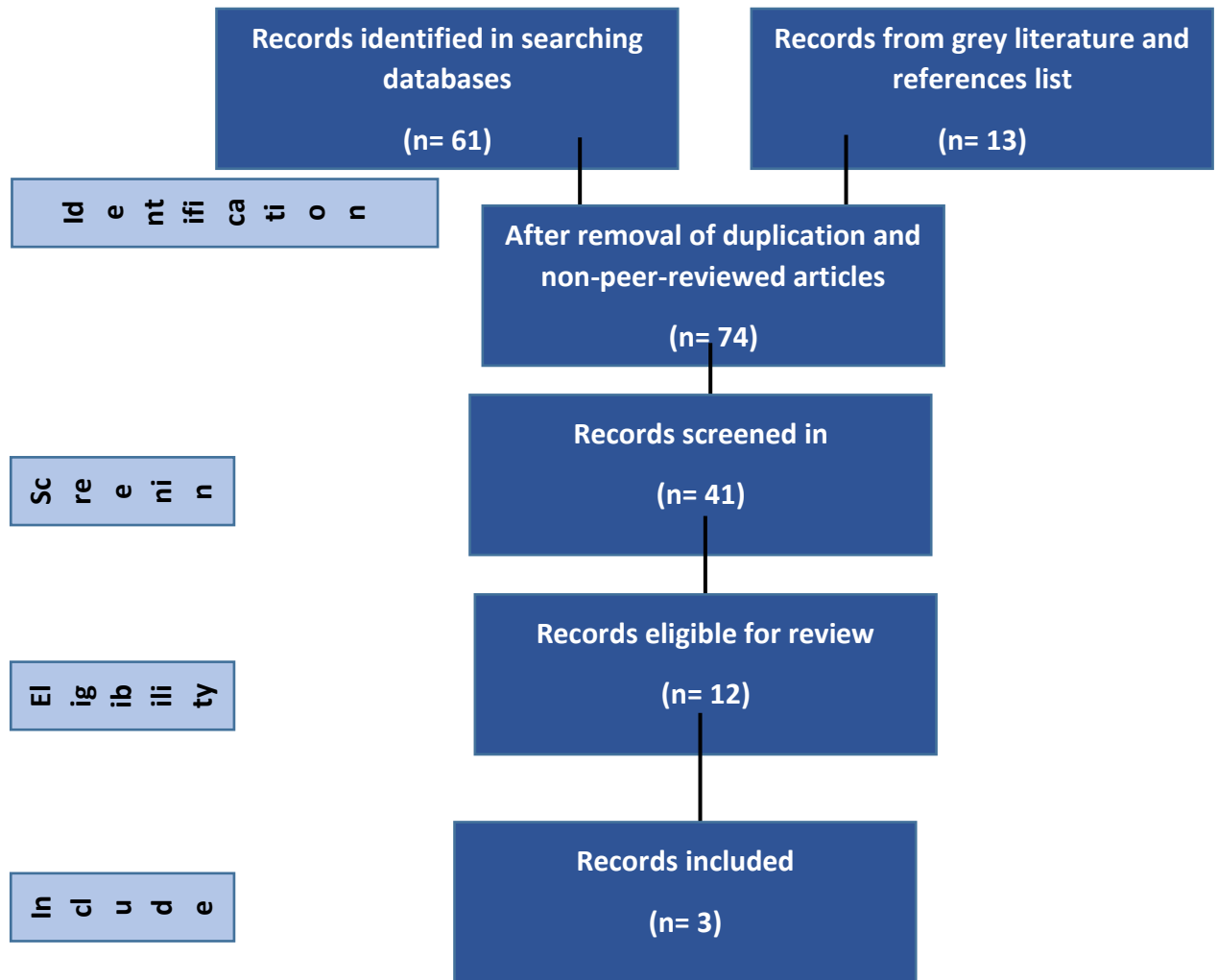


Figure 1: Flow chart of selection process

Alsaigh et al. [26] focuses on assessing the knowledge, awareness, and practices related to diabetic foot ulcers among healthcare workers, diabetic patients, and their relatives in Saudi Arabia. The study reveals good knowledge and attitudes but poor practices among participants, indicating a need for more education on diabetes and its complications. Qutob et al. [27] evaluates the importance given to foot care by healthcare professionals treating diabetic patients in Riyadh, Saudi Arabia. It finds that healthcare providers generally prioritize foot care, with certain demographic and professional factors influencing their emphasis on it. The study suggests integrating technology and educational programs to enhance foot care. Alsheikh et al. [28] examines the knowledge and attitudes of primary care providers (PCPs) in Riyadh, Saudi Arabia, regarding diabetic foot (DF) disease diagnosis and prevention. It identifies knowledge gaps among PCPs, particularly in diagnosing and managing DF infections, despite acceptable awareness of preventive measures. The study recommends addressing these gaps through educational interventions within medical conferences and residency programs.

In terms of methodology, all three articles adopt a cross-sectional study design to assess various aspects of diabetic foot care in Saudi Arabia. They utilize structured questionnaires to collect data from healthcare workers, diabetic patients, and their relatives or from primary care providers (PCPs). Alsaigh et al. [26] focuses on assessing knowledge and attitudes among healthcare workers, diabetic patients, and relatives, while Qutob et al. [27] specifically targets healthcare providers treating diabetic patients. Similarly, Alsheikh et al. [28] examines PCPs' knowledge and attitudes toward diabetic foot disease. While [26-27] employ pretested questionnaires, [28] uses a self-administered questionnaire. However, all studies aim to gauge awareness, practices, and attitudes related to diabetic foot care, albeit with slightly different participant demographics and survey methodologies. In terms of results, all three articles reveal varying degrees of knowledge, attitudes, and practices related to diabetic foot care among their respective study populations in Saudi Arabia. Alsaigh et al. [26] highlights good knowledge and attitudes but poor practices among participants, emphasizing the need for further education on diabetes and its complications. Qutob et al. [27] find that healthcare providers generally prioritize foot care, with certain demographic and professional factors influencing their emphasis on it, suggesting the importance of tailored interventions to enhance foot care practices. Conversely, Alsheikh et al. [28] identifies knowledge gaps among PCPs, particularly in diagnosing and managing DF infections, despite acceptable awareness of preventive measures. This underscores the necessity of targeted educational interventions within medical conferences and residency programs to address these deficiencies among primary care providers. Overall, the studies collectively emphasize the importance of improving knowledge, attitudes, and practices surrounding diabetic foot care in Saudi Arabia to mitigate the burden of this complication. Table 1 summarizes the studies included in this review.

Table 1: Characteristics of studies included in this review

Authors	Year	Design	Setting	Sample	Main Findings	Conclusion
Sultan H Alsaigh et al.	2022	Cross-sectional study	Saudi Arabia	Healthcare workers, diabetic patients, relatives	- Good knowledge but poor practices among healthcare workers, diabetic patients, and relatives regarding diabetic foot care.	The study underscores the need for increased efforts to educate the Saudi population about diabetes and its complications.
Rayan A. Qutob et al.	2023	Cross-sectional study	Riyadh, Saudi Arabia	Healthcare providers	- Healthcare professionals generally prioritize foot care, influenced by demographic and professional factors. - Integration of technology and educational	Policymakers should consider integrating continuous glucose monitoring technologies and implementing targeted

					programs is recommended.	educational programs for healthcare professionals to enhance foot care.
Sultan Alsheikh et al.	2022	Cross-sectional study	Riyadh, Saudi Arabia	Primary care providers	- Knowledge gaps among primary care providers (PCPs) in diagnosing and managing diabetic foot (DF) infections. - Acceptable awareness of preventive measures but suboptimal knowledge in diagnosis and management of DF infections.	Targeted educational interventions within medical conferences and residency programs are recommended to address knowledge gaps among PCPs in diagnosing and managing diabetic foot infections.

Discussion

One of the many consequences of diabetes is diabetic foot ulcer (DFU). A lifelong risk of DFU is 25% for those with diabetes [29]. Impetigo is present in about 60% of diabetic wounds at presentation [30]. As many as 28% of patients with infected ulcers end up needing amputation of the lower extremities [31]. There is a 2% chance of acquiring DFUs and a 1% likelihood of amputation, according to a big research that included Saudi diabetic patients [32]. A constant 17% of DFU patients admitted to Saudi Arabia's tertiary hospitals have required amputations in the recent past [33,34]. Even though there are a lot of tools that may assist with this disease management, nobody knows whether primary care physicians and patients are even aware of them or if they have problems using them. A multidisciplinary approach is the key to providing the best treatment for DF patients. The area lacks well defined coordinated interdisciplinary treatment. Primarily, this model's first line of defense is primary care physicians (PCPs), who are responsible for putting this treatment into action. So, our goal was to find out what PCPs think and what they're doing wrong when it comes to treating DFU patients well.

There is a considerable probability of missing early DFUs since 35.5% of participants in the Alsheikh research [28] that they do not look and examine high-risk patients' feet at every visit. The diagnosis of DFU was discovered by chance in 20% of patients during regular examinations in a research spanning four European countries [35]. With 96.1% of the participants, patients are educated on the need of self-inspection. But research with Riyadh patients found that only 33.3% of those people got foot care instruction from their primary care

physicians [35]. Although 76.6% of patients reported having adequate understanding, this disparity is likely due to the fact that most primary care clinics in Saudi Arabia use diabetes education specialists rather than primary care physicians to provide patient education. Some patients still won't self-inspect, no matter how much instruction they get. Only 28–47% of patients really check their own feet, even when they have all the necessary information [36]. Overall, there is a dearth of high-quality research evaluating the efficacy of patient-level educational interventions, and the studies that do exist reveal only small improvements in outcome [37,38].

The significance of primary care physicians' "every visit" examination is highlighted by this study. Patient education programs reduced amputation rates by 8% ($p = 0.3$), according to a Saudi research. Despite concerns about the study's statistical significance due to its limited sample size, the clinical result is noteworthy. It is both practical and economical to teach patients and their loved ones how to properly care for their feet. It is recommended that this training be conducted annually. Online learning also exists in other contexts. Any member of the family may access this kind of instruction at any time, which ensures uniformity and the dissemination of information about foot care [39].

Regardless of the danger of DFU, around 73% of the participants prescribed therapeutic footwear. Toe deformities and callus formation may both be mitigated by properly fitting shoes, which in turn reduces the likelihood of DFU [40]. In low-risk patients, however, preventative footcare should take precedence over the recommendation of therapeutic bespoke diabetic shoes [41]. A study comparing patients in a control group and those with therapeutic footwear found no change in the rate of re-ulceration [42]. The high prescription rate, on the other hand, can lead patients to believe falsely that these shoes help prevent ulcers, which in turn might make them neglect other foot care procedures.

When patients reach the age of 50, only 28.3% of primary care physicians appropriately send them for ABI/TBI testing. Both the likelihood of wound healing and ulceration may be predicted with TBI, according to the available evidence. An intricate web of relationships exists between DFU and PAD. Two years after having an amputation, the mortality rate for individuals with PAD and DFU is 50% [41]. Amputation, ulceration, and delayed healing are all possible outcomes of inadequate blood flow to the limbs. Therefore, it is important to try to detect PAD early on, and if it causes healing to be delayed or not happen at all, it has to be treated [43]. Not only can early referrals, imaging, and routine vascular testing help avoid amputation, but timing is also crucial [44]. In addition, the interdisciplinary circle may be more effectively established with early detection.

Among primary care physicians (PCPs) surveyed, around half used probes to detect bone exposure. In order to exclude out osteomyelitis, 68.4% also order MRIs. These numbers show that people aren't taking enough precautions to rule out illnesses. In high-risk individuals, probe-to-bone may reliably identify DFU osteomyelitis [45]. When looking to diagnose osteomyelitis, magnetic resonance imaging (MRI) is often seen to be the gold standard [46]. Medical students had strong overall knowledge about foot examination in DF patients, according to a research [47]. The number of pupils who had their foot edema and shoe appropriateness evaluated was reduced. No questions about ulcer assessment or infection investigation were included in the research. Consequently, whether or whether gaps in knowledge began during medical school remains debatable.

Our findings were disheartening, and the response rate in the Alsheikh research [28] was lower than anticipated at 44.2%, which might have weakened the conclusions drawn from it.

Regrettably, our study's findings are consistent with earlier worldwide articles about diabetes treatment [48-50]. Keeping blood glucose levels appropriate was something that the participants were aware of. On the other hand, there was a noticeable lack of knowledge about other areas of care that might enhance DFU results, such proper wound care and management, early infection detection, and early blood flow restoration [51]. The projected annual cost of DFU treatment in one Saudi hospital is 661,804.3 SAR (176,481.2 USD) [52,53], on top of the poor quality of life it causes. It is recommended to use a multi-level strategy to improve DFU results. Knowledge, rather than a lack of resources, is the most common obstacle cited by participants in our survey. As far as we are aware, not all educational institutions have the same required formal course. In addition, primary care physicians are not as likely to attend wound care conferences. More than 50% of participants in our survey had less than 10 CME hours.

There are a plethora of possible explanations for this discovery. primary care physicians could have an excessive workload. Because of the breadth of their work, the continuing medical education (CME) conferences and activities that they attend often cover a variety of diseases. Dealing with DFUs may not be a priority either. The inclusion of DFD-related lectures and workshops in residency and family medicine conference curricula is one potential next step. Educational interventions have been shown to be beneficial in randomized controlled trials [48–50]. E-learning, when paired with a post-session assessment, may provide the desired results [54]. Even though this research only included a small subset of patients, a larger study found that nurses were crucial in making a diagnosis in over 20% of DFU instances when the primary care physician (PCP) was not involved. Since nurses have more direct patient contact in healthcare facilities, it is imperative that they get ongoing education and training on DFUs [55].

Conclusion

This systematic review synthesizes the findings of three studies focused on diabetic foot care in Saudi Arabia. The included studies highlight the importance of addressing knowledge gaps and improving practices related to diabetic foot care among healthcare workers and primary care providers in the country. Studies revealed good knowledge but poor practices among healthcare workers, diabetic patients, and relatives, indicating a pressing need for increased education on diabetes and its complications. In addition, studies find that healthcare providers generally prioritize foot care, with certain factors influencing their emphasis, suggesting the integration of technology and educational programs to enhance practices. Conversely, it was identified that knowledge deficiencies among primary care providers in diagnosing and managing diabetic foot infections, emphasizing the necessity of targeted educational interventions within medical conferences and residency programs. Overall, these studies underscore the importance of enhancing awareness, attitudes, and practices surrounding diabetic foot care to alleviate the burden of this complication in Saudi Arabia.

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