

Effectiveness of Foot Care Education on Knowledge and Self Care Practices for Prevention of Diabetic Foot Ulcer Among Patients with Diabetes Mellitus: A Narrative Review of Literature

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ABSTRACT

Diabetic foot ulcer (DFU) is a serious complication of poorly controlled diabetes, commonly affecting the plantar surface of the foot. Nearly 15% of diabetic individuals develop DFU, and 14–24% may require amputation. It results from neuropathy, vascular insufficiency, and infection. Prevention through foot care education is essential to reduce complications. Diabetic foot ulcers are a major cause of morbidity and amputation among diabetic patients, especially in rural areas, due to poor awareness, delayed treatment, and inadequate self-care practices. This review is needed to evaluate existing evidence on foot care education, identify knowledge gaps, and guide effective interventions to improve self-care practices and prevent diabetic foot ulcers. To review and synthesize existing evidence on the effectiveness of foot care education in improving knowledge and self-care practices for the prevention of diabetic foot ulcers among diabetic patients, with special emphasis on rural populations. A comprehensive literature review was conducted using PubMed and Google Scholar. MeSH terms like 'diabetic foot' and 'self-care' and keywords such as 'practice' and 'behaviour' were used to identify relevant English-language studies. Findings showed varied assessment tools including Modified Diabetic Foot Care Knowledge (MDFCK), Modified Diabetic Foot Care Behaviours (MDFCB), Nottingham Assessment of Functional Foot Care (NAFFC), Diabetes Knowledge Test (DKT), and Diabetes Foot Care Questionnaire (DFQ). Most studies used questionnaires focusing on hygiene, foot inspection, footwear, and self-care practices. However, inconsistency in tool usage and validation was noted. Overall, patients demonstrated inadequate knowledge and poor self-care practices. The review highlights the need for effective educational interventions to improve foot care knowledge and practices, especially among high-risk groups such as rural populations and individuals with low literacy levels.

Keywords: Diabetic foot ulcer, foot care education, self-care practices, knowledge, prevention, diabetes mellitus.

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INTRODUCTION

Diabetic foot ulcer (DFU) is a full-thickness wound below the ankle in individuals with diabetes, primarily caused by neuropathy, ischemia, and infection. It is a preventable yet serious complication with high morbidity, mortality, and economic burden, emphasizing the need for effective prevention through education and self-care practices.

Diabetic foot ulcer (DFU) is a significant global health problem among individuals with diabetes, with an estimated prevalence of approximately 6.3%. It is more common among males and patients with type 2 diabetes. The lifetime risk ranges from 19% to 34%, highlighting its widespread occurrence. In India, the prevalence is around 4.5% among newly diagnosed diabetic patients, reflecting

growing concern in low- and middle-income countries due to poor awareness and delayed healthcare access. Overall, DFU is a common yet largely preventable complication associated with high morbidity, amputation, and mortality, emphasizing the need for early detection, patient education, and effective preventive strategies.

Diabetic foot ulcers (DFUs) primarily develop due to repeated minor trauma, particularly in plantar weight-bearing areas subjected to increased pressure. Contributing factors include friction and shear forces from ill-fitting footwear, abnormal gait, and unnoticed injuries such as puncture wounds, burns, or ingrown toenails. Structural deformities, including Charcot neuroarthropathy, further increase the risk of ulcer formation.

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Peripheral neuropathy plays a central role in the etiology of DFU. Chronic nerve damage results in loss of protective sensation, reducing patients’ awareness of pain or injury. Consequently, minor wounds often go unnoticed and untreated, eventually progressing into ulcers. Although some patients may experience tingling or pain, the predominant sensory loss significantly contributes to ulcer development.

Risk factors include peripheral neuropathy, poor footwear, inadequate hygiene, improper nail care, smoking, alcohol use, obesity, and diabetes-related complications, increasing risk of injury, infection, delayed healing, and ulcer formation.

Diabetic foot ulcers (DFUs) develop due to the interaction of peripheral neuropathy, peripheral vascular disease, and impaired immune response. Neuropathy causes loss of protective sensation, foot deformities, and dry skin, increasing susceptibility to injury. Vascular insufficiency reduces blood flow, leading to ischemia and delayed wound healing. Chronic hyperglycemia further impairs immune function and tissue repair, increasing the risk of infection, gangrene, and amputation. The combined effect of neuropathy, ischemia, infection, and delayed healing contributes to the progression of DFU.

DFUs commonly present as open ulcers on pressure-bearing areas such as the heel, toes, and metatarsal heads. Early signs include calluses, blisters, redness, warmth, and swelling. As the condition progresses, ulcers may deepen, showing necrosis, slough, or foul-smelling discharge. Pain may be absent due to neuropathy but can occur in ischemic conditions. Additional features include loss of sensation, tingling, delayed healing, and signs of infection such as pus, fever, and spreading redness. Advanced complications include cellulitis, osteomyelitis, gangrene, and sepsis.

Wagner Classification of Diabetic Foot Ulcer

- **Grade 0:** Intact skin with high-risk foot
- **Grade 1:** Superficial ulcer
- **Grade 2:** Deep ulcer reaching tendon or bone
- **Grade 3:** Deep ulcer with infection or osteomyelitis
- **Grade 4:** Localized gangrene
- **Grade 5:** Extensive gangrene of entire foot

Evaluation of diabetic foot ulcers (DFUs) requires a comprehensive approach, including clinical, neurological, vascular, and laboratory assessments. Clinical examination focuses on ulcer size, depth, location, and infection, along with patient history. Neuropathy is assessed using the 10-g monofilament and vibration tests, while vascular status is evaluated through pulse examination and Ankle-Brachial Index (ABI). Laboratory tests such as blood glucose, HbA1c, complete blood count, and wound culture help

assess glycemic control and infection. Imaging techniques like X-ray and MRI are useful in detecting complications such as osteomyelitis. Early and accurate diagnosis is essential for effective management.

Management aims at wound healing and prevention of complications. Key components include debridement, infection control, pressure offloading, and proper wound care. Debridement removes necrotic tissue and promotes healing, with surgical debridement being most effective. Other methods include enzymatic, autolytic, mechanical, and biological techniques. Offloading reduces pressure on ulcers using methods such as total contact casting and specialized footwear. Infection is managed through appropriate antibiotics based on clinical assessment.

Prevention focuses on early identification of at-risk patients, regular foot examination, and management of risk factors. Patient education plays a central role, emphasizing daily foot inspection, hygiene, proper nail care, and appropriate footwear. High-risk individuals require regular monitoring and culturally appropriate education. Avoidance of barefoot walking, tight footwear, and self-treatment of foot lesions is essential. Multidisciplinary care and structured educational programs significantly reduce the incidence and complications of DFUs.

Nursing management plays a crucial role in the prevention, early detection, and management of diabetic foot ulcers (DFUs). It focuses on patient education, regular assessment, wound care, and promotion of self-care practices. Nurses should perform regular foot assessments, including inspection of skin integrity, color, temperature, sensation, and presence of deformities. Early identification of risk factors such as neuropathy and poor circulation is essential.

Proper wound care includes cleaning the ulcer with aseptic techniques, applying appropriate dressings, and assisting in debridement procedures. Monitoring for signs of infection such as redness, swelling, and discharge is critical. Although pain may be minimal due to neuropathy, nurses should assess discomfort and administer prescribed medications. Timely administration of antibiotics and monitoring infection progression are vital.

Education is a key nursing responsibility. Patients should be taught daily foot inspection, hygiene, proper nail care, and the importance of wearing appropriate footwear. Emphasis should be placed on avoiding barefoot walking and early reporting of abnormalities. Nurses should encourage adherence to self-care behaviours, including glycaemic control, regular follow-up, and lifestyle modifications such as smoking cessation and weight management. Nurses coordinate with healthcare teams, including physicians, podiatrists, and dietitians, to ensure

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comprehensive care. In rural settings, nurses play a vital role in community-based education programs, using simple and culturally appropriate methods to improve awareness and prevent complications.

METHODOLOGY

This narrative review is based on recent peer-reviewed studies (2020–2026) retrieved from databases such as PubMed, Springer, and ScienceDirect. Keywords used included diabetic foot ulcer, foot care education, self-care practices, and diabetes knowledge. Both experimental and observational studies were included to provide a comprehensive overview.

REVIEW OF LITERATURE

Knowledge Regarding Diabetic Foot Care

Recent literature indicates significant knowledge deficits among diabetic patients, particularly in developing countries. A large review in India reported that only 32% of patients had good knowledge, while a majority lacked awareness regarding preventive foot care measures.

Common deficiencies include:

- Lack of awareness of daily foot inspection
- Poor understanding of appropriate footwear
- Ignorance of early warning signs

These findings emphasize the need for structured educational interventions.

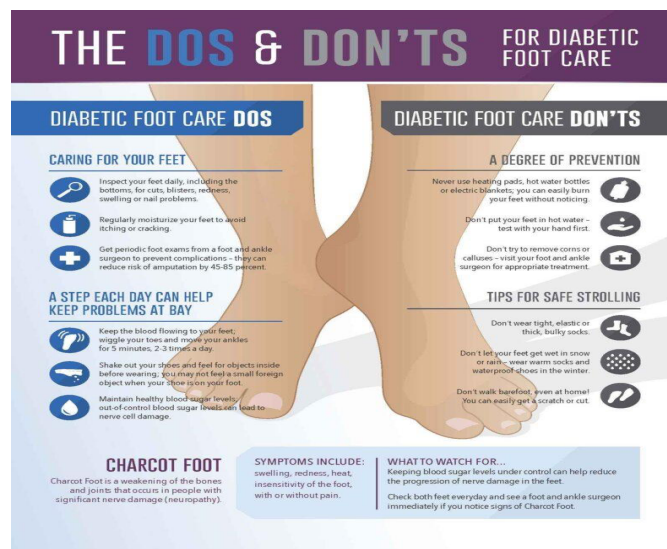
Self-Care Practices

Self-care practices such as foot hygiene, inspection, and proper footwear are essential in preventing ulcers. However, studies consistently report poor adherence to these practices, especially among rural and low-literacy populations.

Research highlights that:

- Many patients do not perform daily foot inspection
- Barefoot walking remains common
- Minor injuries are often neglected

This gap between knowledge and practice significantly increases the risk of DFUs.



Strong evidence supports the effectiveness of foot care education:

- A 2025 interventional study showed that awareness scores improved significantly after education (from 9.49 to 13.70, $p < 0.001$), along with a marked increase in self-care practices.
- A quasi-experimental study found that interactive education improved foot care practices up to 2.5 times compared to routine care.
- Systematic reviews confirm that educational interventions enhance knowledge, self-efficacy, and preventive behaviours.

Additionally:

- There is a positive correlation between knowledge and practice ($r = 0.59$), indicating that improved awareness leads to better self-care.
- Structured Teaching Programs (STPs) significantly improve outcomes in community settings.

Long-Term Effectiveness and Innovations

Emerging evidence suggests that:

- Multimedia education and mobile-based reminders improve long-term retention of knowledge and behaviour.
- Continuous reinforcement is essential for sustained behavioural change

However, long-term adherence remains a challenge, requiring ongoing follow-up.

Barriers to Effective Self-Care

Key barriers identified include:

- Low literacy levels
- Cultural practices (e.g., barefoot walking)
- Financial constraints
- Lack of access to healthcare services

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These factors highlight the need for culturally sensitive and accessible education programs.

Role of Nurses in Prevention

Nurses play a crucial role in:

- Risk assessment and early identification
- Patient education and counseling
- Demonstration of foot care techniques
- Follow-up and reinforcement

A multidisciplinary approach involving nurses, physicians, and podiatrists is essential for optimal outcomes.

RECENT ADVANCES IN DIABETIC FOOT ULCER MANAGEMENT

Recent advances in diabetic foot ulcer management include advanced wound dressings, growth factors, and bioengineered skin substitutes that promote faster healing. Negative pressure wound therapy and hyperbaric oxygen therapy enhance tissue repair and reduce infection. Stem cell therapy shows promise in improving angiogenesis and regeneration. Additionally, telemedicine and smart technologies support early detection, monitoring, and improved patient compliance, especially in rural populations.

DISCUSSION

This review highlights that diabetic foot ulcer (DFU) remains a major yet preventable complication of diabetes, contributing significantly to morbidity and amputation rates worldwide. Evidence from the selected studies indicates that patients, particularly in rural and low-resource settings, have inadequate knowledge and poor self-care practices related to foot care. Key etiological factors such as peripheral neuropathy, vascular insufficiency, and infection further increase the risk of ulcer development.

The findings consistently show that structured foot care education improves patients' knowledge, enhances self-care behaviours, and supports early identification of complications. However, variations in assessment tools across studies limit comparability and standardization of results. Additionally, socioeconomic factors, low literacy levels, and limited access to healthcare services act as major barriers to effective prevention.

Therefore, there is a need for culturally appropriate, accessible, and evidence-based educational interventions, along with standardized assessment methods, to improve patient outcomes and reduce the burden of diabetic foot ulcers.

COMPARISON OF FINDINGS

The reviewed studies consistently indicate that diabetic foot ulcer (DFU) is a significant complication of diabetes, with inadequate knowledge and poor self-care practices observed among patients, especially in rural and low-resource settings (Untari et al., Omotosho et al., Kebede et al.). Patients commonly lacked awareness regarding foot

hygiene, daily inspection, and proper footwear. In contrast, studies from better-resourced settings reported relatively higher awareness but persistent gaps in practice.

All studies uniformly identify peripheral neuropathy, vascular insufficiency, and infection as key etiological factors (Raja et al., McDermott et al., Armstrong et al.), showing strong agreement in clinical understanding. Educational interventions were found effective in improving knowledge and self-care behaviors, although outcomes varied based on intervention type and duration. Differences were noted in the use of assessment tools, limiting comparability. Additionally, socioeconomic factors such as low literacy and limited healthcare access were consistently associated with poorer outcomes across studies.

CONCLUSION

Foot care education is a cost-effective and evidence-based strategy for preventing diabetic foot ulcers. It significantly improves patient knowledge, enhances self-care practices, and reduces complications. However, sustained behavioral change requires continuous education, follow-up, and patient-centered approaches.

IMPLICATIONS FOR NURSING PRACTICE

- Incorporate routine foot care education in diabetes management
- Use demonstration and return-demonstration methods
- Develop culturally appropriate educational materials
- Strengthen community-based education programs
- Ensure regular follow-up and monitoring

RESEARCH GAPS IDENTIFIED

- **Lack of interventional studies:** Most studies are descriptive or cross-sectional, with limited evidence on the long-term effectiveness of foot care education programs.
- **Inconsistent assessment tools:** Wide variation in tools (MDFCK, NAFFC, DKT, DFQ) limits comparability and standardization of findings.
- **Scarcity of nurse-led interventions:** Few studies highlight the role of nurses in delivering structured education programs.
- **Limited use of technology:** Minimal research on telemedicine or digital tools in DFU prevention.

SUMMARY

The review reveals that diabetic foot ulcers are a common yet preventable complication of diabetes. Most studies report inadequate knowledge and poor self-care practices among patients, particularly in rural settings. Key risk factors include neuropathy, vascular insufficiency, and infection. Foot care education significantly improves knowledge, promotes preventive behaviors, and supports

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early detection, though variability in tools and methods exists.

DFU leads to high morbidity, risk of amputation, and increased healthcare costs. Improving patient education and self-care practices can reduce complications, enhance quality of life, and decrease hospital admissions. Nurses play a vital role in early assessment, education, and community-based prevention, especially in rural populations.

FUTURE RESEARCH NEEDS

Future studies should focus on interventional designs, long-term outcomes, and standardized assessment tools. More research is needed on rural populations, nurse-led education programs, and the use of digital health technologies in DFU prevention.

RECOMMENDATIONS

- Implement structured, culturally appropriate foot care education programs
- Promote regular screening and early detection
- Develop standardized assessment tools
- Strengthen nurse-led and community-based interventions
- Encourage use of telemedicine for follow-up and monitoring

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