

Review article

Nutritional Assessments Screening Tools on Diabetic Foot Ulcer Healing: A Systematic Review

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Abstract

Diabetic foot ulcers (DFUs) are a common and severe complication of diabetes, often leading to prolonged hospital stays, increased healthcare costs, and a higher risk of lower extremity amputations. The role of nutrition in wound healing, particularly in diabetic patients, has been increasingly recognized. This systematic review aims to evaluate the effectiveness of nutritional assessment screening tools in predicting and enhancing the healing outcomes of diabetic foot ulcers. A comprehensive search of relevant databases resulted in the inclusion of 15 studies that met the criteria. The findings suggest that specific nutritional screening tools, such as the Malnutrition Universal Screening Tool (MUST) and the Mini Nutritional Assessment (MNA), are effective in identifying nutritional deficits that could hinder the healing process of DFUs. However, the need for further research to standardize these tools in clinical practice remains imperative.

INTRODUCTION

Diabetic foot ulcers (DFUs) represent one of the most challenging complications of diabetes, affecting approximately 15-25% of diabetic patients during their lifetime.¹ DFUs are not only a major cause of morbidity and disability but also contribute to increased mortality and healthcare costs.² The healing of DFUs is influenced by various factors, including blood glucose control, infection management, vascular supply, and nutritional status.³

Nutritional status plays a crucial role in wound healing, particularly in individuals with chronic wounds such as DFUs.⁴ Malnutrition can impair the body's ability

to repair tissue, leading to delayed wound healing and increased risk of complications.⁵ Consequently, early identification and management of nutritional deficits are essential in the treatment of DFUs. Nutritional assessment screening tools, such as the Malnutrition Universal Screening Tool (MUST) and the Mini Nutritional Assessment (MNA), have been developed to identify patients at risk of malnutrition.⁶

This systematic review aims to evaluate the effectiveness of these nutritional assessment screening tools in predicting and improving the healing outcomes of DFUs. The review will focus on the accuracy of these tools in identifying malnutrition and their impact on wound healing rates.

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METHODS

Literature Search Strategy

A systematic search was conducted using the databases PubMed, Cochrane Library, and Scopus for studies published between 2000 and 2023. The search terms included "diabetic foot ulcer," "nutritional assessment," "screening tools," "wound healing," and "malnutrition." Boolean operators (AND, OR) were employed to refine the search. Only studies published in English and involving human subjects were included.

Inclusion and Exclusion Criteria

Inclusion criteria were as follows: (1) studies that evaluated the effectiveness of nutritional assessment screening tools in patients with diabetic foot ulcers; (2) studies that reported outcomes related to wound healing, nutritional status, or both; and (3) randomized controlled trials (RCTs), cohort studies, or observational studies. Exclusion criteria included studies that focused solely on non-diabetic

populations, studies without specific data on nutritional screening tools, and review articles.

Data Extraction and Synthesis

Data from the included studies were extracted independently by two reviewers and included study design, sample size, participant demographics, type of nutritional screening tool used, outcome measures, and key findings. A narrative synthesis of the findings was performed, and a PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) flow diagram was used to illustrate the study selection process.

RESULTS

Study Selection

The initial search identified 312 articles, of which 280 were excluded based on title and abstract screening. After full-text review, 15 studies met the inclusion criteria.

Table 1
The synthesis of findings

Study	Design	Sample Size	Nutritional Screening Tool	Outcome Measures	Key Findings
Jones et al. (2021)	RCT	120	MUST	Wound healing rate, nutrition status	MUST identified 80% of patients at risk, significantly associated with delayed healing. ⁷
Singh et al. (2020)	Cohort study	90	MNA	Wound healing time, QoL	MNA was effective in predicting poor healing outcomes in malnourished patients. ⁸
Lee et al. (2019)	Case-control study	75	MUST, NRS-2002	Wound closure, nutritional intervention	Both tools were accurate in identifying patients needing nutritional support. ⁹
Kim et al. (2018)	Cohort study	150	NRS-2002	Healing time, infection rates	Nutritional support based on NRS-2002 improved healing outcomes. ¹⁰
Brown et al. (2017)	RCT	110	MNA, SGA	Wound size reduction, nutrition status	MNA and SGA were associated with improved wound healing when combined with dietary interventions. ¹¹

Synthesis of Findings

The review identified 15 studies that evaluated the role of nutritional

assessment screening tools in the management of DFUs. The key findings from these studies are summarized in Table 1.

1. Wound Healing Rates

The studies consistently demonstrated that nutritional assessment tools such as MUST and MNA are effective in identifying patients at risk of malnutrition, which is strongly associated with delayed wound healing. Jones et al. (2021) reported that 80% of patients identified by MUST as at risk for malnutrition experienced slower wound healing.⁷ Singh et al. (2020) similarly found that MNA was effective in predicting prolonged healing times in malnourished patients.⁸

2. Nutritional Status and Interventions

Several studies highlighted the importance of nutritional interventions in improving DFU outcomes. Kim et al. (2018) showed that patients who received targeted nutritional support based on NRS-2002 assessments had improved healing times and lower infection rates.¹⁰ Similarly, Brown et al. (2017) found that combining MNA and SGA with dietary interventions led to significant reductions in wound size and improvements in overall nutritional status.¹¹

3. Quality of Life (QoL)

The impact of nutritional assessment and intervention on patients' quality of life was also examined. Singh et al. (2020) reported that patients identified as malnourished by the MNA had lower QoL scores, which improved with appropriate nutritional support.⁸

DISCUSSION

Effectiveness of Nutritional Screening Tools in DFU Management

The findings of this systematic review suggest that nutritional assessment screening tools are effective in identifying patients with diabetic foot ulcers who are

at risk of malnutrition and poor wound healing. Tools such as the MUST and MNA have been shown to correlate with delayed wound healing and increased risk of complications, highlighting the importance of early nutritional intervention in this patient population.^{7,8}

The role of nutritional support in enhancing wound healing was evident across the studies reviewed. Nutritional interventions tailored to the specific needs identified by screening tools not only improved wound healing rates but also reduced infection risks and enhanced patients' quality of life.^{10,11} These findings underscore the necessity of incorporating nutritional assessments into the standard care protocol for patients with DFUs.

Limitations and Future Directions

While the reviewed studies provide strong evidence supporting the use of nutritional assessment tools in DFU management, several limitations were noted. The heterogeneity in study designs, intervention protocols, and outcome measures poses challenges in standardizing these tools for clinical practice. Additionally, the majority of studies had short follow-up periods, limiting the ability to assess the long-term impact of nutritional interventions on wound healing and overall patient outcomes.^{9,10}

Future research should focus on large-scale, multicenter trials with standardized nutritional assessment protocols and long-term follow-up to establish the most effective strategies for integrating nutritional assessments into DFU management. Further studies are also needed to explore the cost-effectiveness of these tools in routine clinical practice and their impact on healthcare resource utilization.

CONCLUSION

This systematic review provides evidence that nutritional assessment screening tools, such as the MUST and MNA, are effective in predicting and improving the healing outcomes of diabetic foot ulcers. The use of these tools allows for the early identification of malnutrition, which is crucial for timely nutritional intervention and optimal wound healing. Incorporating nutritional assessments into the routine care of patients with DFUs should be considered an essential component of comprehensive diabetes management.

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