Original Article

Association of Glycated Hemoglobin Levels with Severity of Diabetic Foot Ulcer and Bacterial Profile

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Abstract

Background: Glycated haemoglobin A1c (HbA1c) can serve as a diagnostic tool for predicting the development of diabetic foot ulcers (DFUs), a common chronic complication. There are inconsistent results about the association between baseline HbA1c and severity of DFUs. Objective: This study was to evaluate the relationship between levels of HbA1c and the severity of wound grades and bacteria isolates from infected ulcers. **Materials and Methods:** This study included 114 patients with lower extremity diabetic foot infection. The data included age, sex, and baseline glycated HbA1c. The severity of DFUs was evaluated using the Wagner classification. Bacterial infections were identified by VITEK 2 systems. SPSS software was used for statistical analysis. **Results:** The majority of DFUs were elderly (≥ 65 years) men. The HbA1c with mean value 9% ± 1.7 increases significantly with age. Most (43.8%) had a grade 4 (localized gangrene) wound classification. Grade 3 had levels of HbA1c (> 7), and decreased significantly (OR = 0.02*, 95% CI 0.001-0.62) in HbA1c ≤ 7 compared to grade 5 (gangrene involving the whole foot). Gram-negative bacteria; *Esherichia coli* was abundant, and increased in grade 4 compared to grade 5 (OR = 3.3*, 95% CI 1.04–10.6). **Conclusion:** HbA1c can be used as a predictive biomarker because the level of HbA1c (≥ 7) increased with age, severity of wound grades, and types of isolated bacteria, primarily with gram-negative. A lower HbA1c level (≤ 7) was observed in cases with extensive gangrene of wounds and may be attributed to systemic inflammation and anaemia.

Keywords: Bacteria, foot ulcers, HbA1c, wound grade

Introduction

Diabetes mellitus (DM) is a public health problem as a consequence of its high prevalence and related complications.[1] Diabetic foot ulcers (DFUs) are prevalent in approximately 15%–20% of cases and are responsible for 85% of non-traumatic lower limb amputations.[2]

Long-term uncontrolled diabetes causes both macrovascular and microvascular problems.[3] Diabetic peripheral neuropathy (DPN) is commonly linked to neuropathic pain, foot ulcers, and lower extremity amputation, significantly impacting patients' quality of life.[1]

Infected DFU is the primary cause of lower limb amputations among half of the cases.[4] Infected DFUs present in 40%–60% of all DFUs and affect its outcomes, and diabetic foot infection (DFI) causes higher hospital admissions, poorer outcomes, and higher amputation rates.[5]

A foot with healthy blood flow is less susceptible to ulcers and infection than one with peripheral vascular dysfunction.[6] Older patients, long history of DM, poor glycemic control, using multiple anti diabetic medications, and physical activity with less frequent inspection of the feet were some of the major risk factors for development of DF among Iraqi diabetic patients.[7]

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