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A Clinical Study to Determine the Relation Between Hemoglobin A1c and Wound Healing in Diabetic Foot Wounds

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Abstract: ***Background: Diabetic foot ulcers (DFUs) are a significant complication of diabetes mellitus. Hemoglobin A1c (HbA1c) is a marker of long-term glycemic control and may influence wound healing. Objective: To assess the correlation between HbA1c levels and the rate of wound healing in diabetic foot ulcers. Methods: A prospective observational clinical study was conducted on 100 diabetic patients with foot ulcers. Patients were grouped based on HbA1c levels: Group A (≤7.5%) and Group B (>7.5%). Wound healing was assessed over 12 weeks using standardized wound area measurements and healing scores. Results: Group A demonstrated significantly faster wound healing compared to Group B (p < 0.05). Higher HbA1c levels were associated with delayed epithelialization, increased infection rate, and prolonged healing time. Conclusion: Poor glycemic control, reflected by elevated HbA1c, is significantly associated with impaired wound healing in diabetic foot ulcers. Optimizing glycemic control should be a primary objective in DFU management.***

Keywords: Diabetic Foot Ulcers, Hemoglobin A1c, Wound Healing, Glycemic Control, Diabetes Mellitus

1. Introduction

Diabetic foot ulcers (DFUs) are among the most debilitating complications of diabetes mellitus, affecting nearly 15–25% of diabetic patients during their lifetime. They are a major cause of non-traumatic lower limb amputations worldwide. The pathophysiology involves peripheral neuropathy, peripheral vascular disease, impaired immunity, and poor glycemic control. HbA1c, an established marker of glycemic control, provides an average blood glucose status over the preceding 2–3 months. Poor wound healing in DFUs is multifactorial, but chronic hyperglycemia and high HbA1c are key contributors to impaired angiogenesis, collagen synthesis, and immune defense. This study investigates the association between HbA1c levels and wound healing outcomes.

2. Review of Literature

Several studies have highlighted the role of HbA1c in predicting wound healing outcomes in diabetic patients. Armstrong et al. (2017) described the recurrence and poor healing of DFUs as closely linked with uncontrolled diabetes. Brem and Tomic-Canic (2007) elucidated cellular mechanisms, showing that high glucose impairs keratinocyte migration and angiogenesis. Lavery et al. (2006) demonstrated that patients with HbA1c > 8% had significantly higher infection rates. These findings strongly support the hypothesis that glycemic control is a modifiable risk factor for improving DFU prognosis.

3. Materials and Methods

3.1 Study Design

A prospective observational study was conducted over 12 months at Alluri Sitarama Raju Academy of Medical Sciences. Ethical approval was obtained from the institutional review board.

3.2 Study Population

Inclusion Criteria:
- Type 2 diabetes mellitus patients aged 35–75 years
- Presence of foot ulcer (Wagner Grade I to III)
- No history of immunosuppressive therapy or malignancy

Exclusion Criteria:
- Non-diabetic ulcers
- Peripheral arterial disease (ABI < 0.8)
- Chronic kidney disease stage IV or higher

3.3 Methodology

Patients were divided into:
Group A: HbA1c ≤7.5%
Group B: HbA1c >7.5%

Ulcer size was measured weekly using wound tracing and digital planimetry. Healing was evaluated by percentage reduction in ulcer area and healing time over 12 weeks.

3.4 Statistical Analysis

Data were analyzed using SPSS version 25. Student's t-test and chi-square test were applied for continuous and categorical variables respectively. $p < 0.05$ was considered significant.

4. Results

4.1 Demographics

Total Patients	100
Male	58%
Female	42%

4.2 HbA1c and Healing Time

Group	Mean Healing Time (weeks)	p-value
Group A (≤7.5%)	6.8 ± 1.2	<0.001
Group B (>7.5%)	10.3 ± 2.5	

4.3 Ulcer Size Reduction

Group A: 75.3% average size reduction
Group B: 42.6% average size reduction

4.4 Complications

Infection rates: 10% in Group A vs.35% in Group B
Minor amputations: 2 in Group A, 7 in Group B

5. Discussion

The present study demonstrates a significant negative correlation between elevated HbA1c and wound healing outcomes in DFU patients. Delayed angiogenesis, impaired leukocyte function, and reduced fibroblast activity in hyperglycemic environments explain the poor healing. Our results are consistent with Lavery et al. (2006), who reported a threefold increased infection rate among patients with HbA1c > 8%. While the study emphasizes glycemic control, limitations include single-center design, short follow-up, and lack of molecular analysis. Future multicenter trials and inclusion of newer glycemic markers (e. g., glycated albumin) may provide deeper insights.

6. Conclusion

HbA1c serves as a reliable prognostic marker in assessing wound healing potential in diabetic foot ulcers. Effective glycemic control should be prioritized along with wound care strategies to improve patient outcomes and reduce amputation rates.

References

[1] Armstrong DG, Boulton AJ, Bus SA. Diabetic Foot Ulcers and Their Recurrence. N Engl J Med.2017; 376 (24): 2367-75.
[2] Brem H, Tomic-Canic M. Cellular and molecular basis of wound healing in diabetes. J Clin Invest.2007; 117 (5): 1219–22.
[3] Lavery LA, et al. Risk factors for foot infections in individuals with diabetes. Diabetes Care.2006; 29 (6): 1288–93.