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Comparative Study of Wound Healing in Cellulitis Patients With and without Diabetes in a Tertiary Care Hospital

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ABSTRACT

Cellulitis is a common bacterial skin infection with varying outcomes in different patient populations. Diabetic patients are particularly prone to complications and delayed wound healing. This study compares wound healing outcomes in cellulitis patients with and without diabetes in a tertiary care setting. A prospective observational study was conducted over 6 months at [Hospital Name], including 100 patients diagnosed with cellulitis: 50 diabetic and 50 non-diabetic. Wound healing was assessed over a 4-week period using standard wound healing criteria including time to epithelialization, reduction in wound size, and occurrence of complications. Non-diabetic patients showed a significantly faster healing time (mean: 14.6 ± 3.2 days) compared to diabetic patients (mean: 21.9 ± 5.1 days, $p < 0.01$). Diabetic patients had a higher rate of complications such as abscess formation (28%) and secondary infections (18%) compared to non-diabetics (12% and 6%, respectively).Diabetic cellulitis patients experience delayed wound healing and higher complication rates compared to non-diabetic counterparts. Strict glycaemic control and early intervention are essential for improving outcomes.

INTRODUCTION

Cellulitis is an acute, diffuse bacterial infection involving the dermis and subcutaneous tissues, most commonly caused by Streptococcus pyogenes and Staphylococcus aureus [1]. Studies have revealed that diabetic wounds showed significantly higher bacterial counts compared non diabetic wounds[2]. It is frequently encountered in clinical practice and, if not promptly managed, can lead to severe complications such as abscess formation, necrotizing fasciitis, and systemic sepsis [3].

Cellulitis can affect individuals across all demographics, the course and outcome of the disease are significantly influenced by underlying comorbidities, notably diabetes mellitus. Diabetes mellitus is a chronic metabolic disorder characterized by hyperglycemia resulting from insulin resistance or deficiency. It is a well-established risk factor for infections and delayed wound healing due to its multifaceted effects on the immune system, microvascular circulation, and tissue regeneration [4,5].

Diabetes mellitus is a global problem in both developed and developing country. It is predicted that by 2030 there will be 366 million diabetics and by 2040 it will raise to 642 million[6].Diabetic individuals are predisposed to cellulitis due to impaired leukocyte function, peripheral neuropathy, poor skin integrity, which increase susceptibility to skin breakdown and infection [7].

Furthermore, the wound healing process in diabetic patients is substantially impaired. Hyperglycemia adversely affects several key phases of wound repair namely inflammation, proliferation, and remodeling by reducing neutrophil chemotaxis, impairing fibroblast function, and inhibiting angiogenesis [8].

Early diagnosis of microbial infections is aimed to institute the appropriate antibacterial therapy and to avoid further complications[9]. For such complicated infections National guidelines recommended broad spectrum empiric antibiotic therapy[10]. This delay not only prolongs the duration of cellulitis but also increases the risk of chronic wounds, recurrent infections, and, in severe cases, limb amputation [11].

Despite existing knowledge on the impact of diabetes on wound healing, comparative studies analyzing wound healing outcomes in cellulitis patients with and without diabetes remain limited, particularly in tertiary care settings in low- and middle-income countries.

Understanding these differences is vital for improving clinical decision-making, optimizing resource utilization, and designing targeted interventions for high-risk populations.Therefore, this study aims to compare wound healing outcomes including time to epithelialization, complication rates, and duration of hospital stay between cellulitis patients with and without diabetes, admitted to Government cuddalore medical college and hospital [A tertiary care hospital].

The results may inform better treatment protocols and highlight the importance of early diabetes management in patients presenting with cellulitis.

Aim

To compare the wound healing outcomes in cellulitis patients with and without diabetes mellitus admitted to a tertiary care hospital, and to assess the impact of diabetes on the duration and quality of healing, complication rates, and associated laboratory parameters.

Objectives

1.To evaluate and compare the average wound healing time in cellulitis patients with diabetes versus those without diabetes.

2.To assess the incidence of complications (e.g., secondary infections, abscess formation) in both groups during the course of treatment.

3.To analyze relevant laboratory markers (e.g., CRP, ESR, total leukocyte count) associated with the inflammatory response and healing process in both patient groups.

4.To determine the relationship between glycemic control (as indicated by HbA1c and fasting blood sugar levels) and the rate of wound healing in diabetic patients.

5.To provide clinical recommendations for improving management strategies and outcomes in diabetic patients with cellulitis.

MATERIALS AND METHODS

A prospective observational study was designed at The Department of Surgery, CUDDALORE GOVERNMENT MEDICAL COLLEGE AND HOSPITAL [Tertiary Care Hospital] from January 2025 – March 2025. A total of 100 patients with cellulitis were enrolled. They are grouped into Group A and Group B. Cellulitis patients with diabetes are enrolled in Group A(50 patients) and cellulitis patients with out diabetes are enrolled in Group B(50 patients). The end point of the treatment include wound healing following debridement or minor amputation or major amputation. Wound healing assessed using weekly wound measurements, epithelisation rates and presence of complications. Datas are collected on patient demographics, comorbidities, wound characteristics and are analysed using statistical software. Healing time between Group A and Group B were differentiated using independent Sample T-Test. Comparison between Group A and Group B was done by using Chi-square test.

Inclusion Criteria:

- Age 18–70 years
- Diagnosed cellulitis (clinically and/or via imaging)
- For diabetics: HbA1c >6.5%

Exclusion Criteria:

- Immunocompromised individuals (HIV, chemotherapy)
- Chronic ulcers or peripheral arterial disease unrelated to DM
- Recent surgery or trauma

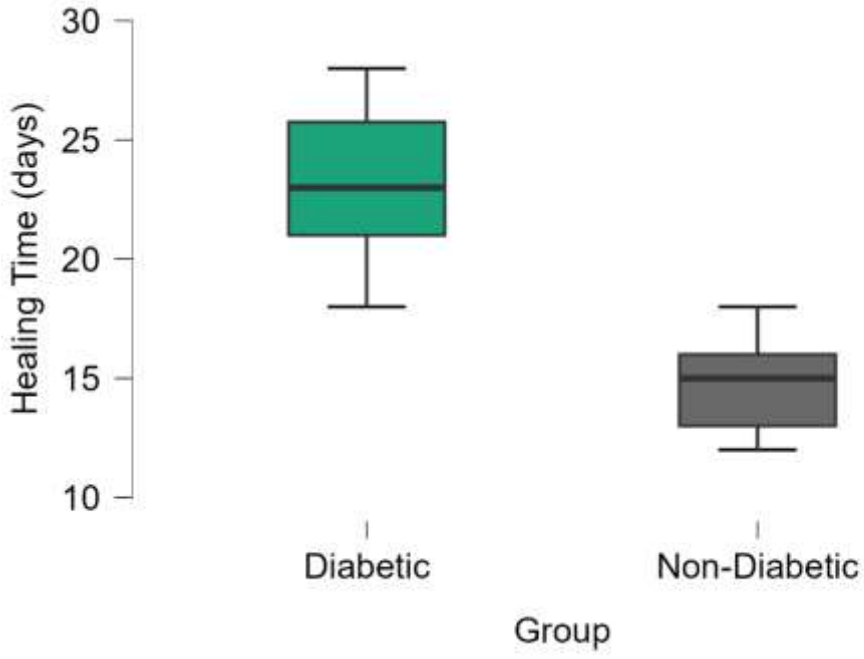
STATISTICAL ANALYSIS

Descriptive Statistics

MEASURES	HEALING TIME	
	DIABETIC	NON-DIABETIC
Valid	50	50
Missing	0	o
Mean	23.280	14.880
Std. Deviation	3.110	1.955
Minimum	18.000	12.000
Maximum	28.000	18.000

Boxplots

Healing Time (days)



Independent Sample T-Test

	T	df	p
Healing time(Days)	16.168	98	<0.001[a]

Assumption Checks

Test of Normality (Shapiro-Wilk)

Residuals	W	P
Healing time(days)	0.974	0.047

Note. Significant results suggest a deviation from normality.

Test of Equality of Variances (Brown-Forsythe)

Healing time(days)	F	df1	df2
	13.385	1	98

Note. Student's t-test.

[a] Brown-Forsythe test is significant ($p < .05$), suggesting a violation of the equal variance assumption

CORRELATION

Pearson's Partial Correlations

Variable	**Creatinine(mg/dl)**	**HbA1c(%)**	**TLC(10^9/L)**	**ESR(mm/h)**	**FBS(mg/dl)**	**CRP(mg/L)**
Creatinine(mg/dl)	-					
p value	-					
HbA1c(%)	0.085					
p value	0.561					

Variable	Creatinine(mg/dl)	HbA1c(%)	TLC(10^9/L)	ESR(mm/h)	FBS(mg/dl)	CRP(mg/L)
TLC(*10^9/L)	-0.132	0.025				
p value	0.194	0.865				
ESR(mm/h)	-0.100	-0.007	-0.230			
p value	0.327	0.961	0.022			
FBS(mg/dl)	-0.005	-0.231	0.063	-0.061		
p value	0.963	0.110	0.534	0.549		
CRP(mg/L)	0.018	0.386	-0.066	-0.055	-0.005	
P value	0.861	0.006	0.514	0.587	0.962	

Note: Conditioned on variables: Healing time(days)

RESULT

Healing Time (days)

Diabetic: Mean = 23.28, SD = 3.11

Non-Diabetic: Mean = 14.88, SD = 1.96

$T(98) = 16.168$, $p < 0.001$

Complications

Diabetics: 15 out of 50 had complications

Non-Diabetics: 3 out of 50 had complications

$X^2(1) = 9.756$, $p = 0.002$

Correlation with Healing Time

HbA1c: $r = 0.386$, $p = 0.006$

CRP, FBS, Creatinine: Not significant

INTERPRETATION

a. Healing Time

The independent samples t-test revealed a statistically significant difference in healing time between diabetic and non-diabetic cellulitis patients ($p < 0.001$). Diabetics had a much longer mean healing time (23.28 days) compared to non-diabetics (14.88 days). However, assumption checks indicated non-normality and unequal variances, suggesting that the test results should be interpreted with caution or supported by a non-parametric test.

b. Complications

Chi-square analysis showed a significant association between diabetic status and the presence of complications ($p = 0.002$). Diabetic patients were more likely to experience complications than non-diabetics.

c. Correlation

A moderate positive correlation was found between HbA1c and healing time ($r = 0.386$, $p = 0.006$), suggesting poor glycemic control is linked to slower healing. ESR showed a weak negative correlation with TLC ($r = -0.230$, $p = 0.022$). Other markers like FBS, CRP, and Creatinine did not significantly correlate with healing time.

DISCUSSION

Diabetes mellitus is known to impair multiple aspects of wound healing, including angiogenesis, leukocyte function, and fibroblast activity. This study confirms that diabetic patients with cellulitis require a longer healing period and are at higher risk for secondary complications. Previous literature supports these findings, emphasizing the need for glycemic control and multidisciplinary wound care in diabetic patients [1][3].

CONCLUSION

This study provides strong evidence that diabetic status significantly prolongs wound healing time in cellulitis patients and is associated with a higher risk of complications. The significant correlation between HbA1c levels and delayed healing underscores the importance of tight glycemic control. While the regression analysis was inconclusive due to a technical error, the overall findings emphasize the need for proactive diabetic management in cellulitis care.

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