

Clinical Characteristics, Management Strategies, and Outcomes of Cellulitis: A Retrospective Study of 167 Patients

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Abstract: This retrospective study investigated the clinical characteristics, management strategies, and outcomes of cellulitis in 167 patients admitted to Nimra Institute of Medical Sciences (NIMS), Vijayawada, India, from August 2024 to January 2025. The mean patient age was 52.3 years (± 15.4), with male predominance (60%). Non-purulent cellulitis was the most prevalent subtype (54%), followed by erysipelas (24%) and purulent cellulitis (22%). Key comorbidities included Type 2 Diabetes Mellitus (60%) and edema or pedal edema (40%). The left lower limb was the most commonly affected anatomical site (43%). Empiric antibiotic therapy with ceftriaxone and metronidazole was the primary treatment, supplemented by vancomycin or linezolid for MRSA-related infections. Complete clinical resolution was achieved in 70% of cases, with a recurrence rate of 15%. Comorbid conditions, particularly poorly controlled diabetes and hypertension, significantly influenced treatment outcomes. These findings underscore the need for multidisciplinary management incorporating infectious disease specialists, endocrinologists, and wound care professionals.

Keywords — Cellulitis, Erysipelas, Diabetic Foot Ulcer, Antibiotic Therapy, Comorbidities, Retrospective Study

I. INTRODUCTION

Cellulitis is a common and potentially serious acute bacterial infection of the dermis and subcutaneous tissues, characterized by spreading erythema, edema, warmth, and tenderness. It represents a significant burden on healthcare systems worldwide, accounting for a substantial proportion of hospital admissions related to skin and soft tissue infections. The condition is caused predominantly by *Streptococcus pyogenes* and *Staphylococcus aureus*, with an increasing proportion of methicillin-resistant strains (MRSA) [1].

Lower extremity involvement is the most frequent presentation, with predisposing factors including peripheral vascular disease, lymphedema, obesity, and diabetes mellitus. Systemic symptoms such as fever, malaise, and leukocytosis may accompany local signs, reflecting the severity of the infection [2, 3]. Appropriate and timely antibiotic therapy remains the cornerstone of management, though treatment failures and recurrence continue to pose clinical challenges.

Comorbid conditions, particularly Type 2 Diabetes Mellitus (T2DM) and chronic edema, are well-recognized risk factors for complicated cellulitis, prolonged hospitalization, and treatment failure. Poor glycemic control impairs immune function and tissue perfusion, while edema reduces antibiotic penetration and creates a favorable environment for bacterial

proliferation [4, 5]. Despite these recognized associations, data from tertiary care settings in India remain limited.

This retrospective study was conducted to analyze the clinical characteristics, management strategies, and outcomes of cellulitis in patients admitted to a tertiary care institution, with a focus on identifying predictors of complications, recurrence, and treatment effectiveness.

II. MATERIALS AND METHODS

A. Study Design and Setting

This retrospective observational study was conducted at Nimra Institute of Medical Sciences (NIMS), Vijayawada, Andhra Pradesh, India, from August 2024 to January 2025. The study aimed to evaluate the clinical characteristics, management strategies, and outcomes of cellulitis cases in a tertiary care setting.

B. Study Population

The study included 167 patients diagnosed with cellulitis. Inclusion criteria comprised patients aged ≥ 18 years diagnosed with cellulitis on clinical assessment and admitted to NIMS during the study period. Patients with insufficient documentation or alternative diagnoses were excluded from the analysis.

C. Data Collection

Data were extracted from electronic medical records (EMR) and patient charts. Variables collected included: (1) Demographics — age, sex, and comorbidities such as diabetes mellitus, hypertension, and obesity; (2) Clinical Features — onset of symptoms, anatomical location, severity, and systemic symptoms; (3) Investigations — laboratory findings and imaging results; (4) Treatment — antibiotic regimens and adjunctive therapies; and (5) Outcomes — length of hospital stay, recurrence, complications, and mortality.

D. Statistical Analysis

Data were analyzed using Microsoft Excel. Descriptive statistics were employed to summarize baseline characteristics. Continuous variables were expressed as mean ± standard deviation (SD), and categorical variables as frequencies and percentages. The chi-square test was used to compare categorical variables, and t-tests for continuous variables. A p-value <0.05 was considered statistically significant.

III. RESULTS

A total of 167 patients were admitted with various forms of cellulitis during the study period.

A. Demographic Characteristics

The mean age of the patients was 52.3 years (±15.4), with male predominance comprising 60% of the total sample. Most patients had comorbid conditions, including diabetes mellitus (40%) and obesity (35%). Patients were categorized into three age groups: young adults (18–39 years) — 25 patients (15%); middle-aged adults (40–59 years) — 75 patients (45%); and older adults (≥60 years) — 67 patients (40%).

B. Types of Cellulitis

Three distinct subtypes were identified. Erysipelas was classified in 40 cases (24%), commonly involving the face and legs. Non-purulent cellulitis was the most prevalent subtype affecting 90 cases (54%), primarily involving the lower extremities. Purulent cellulitis was identified in 37 cases (22%), frequently with abscess formation requiring surgical drainage.

C. Clinical Presentation and Anatomical Sites

Left lower limb cellulitis was the most prevalent site, accounting for 43% of cases (72 patients), frequently associated with diabetic foot ulcers. Facial cellulitis was reported in 15% of patients, typically associated with trauma or sinus infections. Necrotizing cellulitis with ulceration was found in 7%, linked to severe polymicrobial infections. Orbital cellulitis was identified in 12 patients (7%), with a mean age of 45 years (±2.3). Leg cellulitis was identified in 85 patients (51%), of whom 55 (65%) had Type 2 Diabetes Mellitus and 40 (47%) presented with edema, often associated with chronic venous insufficiency or lymphedema.

TABLE I SYMPTOMS AND PREVALENCE IN CELLULITIS PATIENTS

Symptom	Percentage (%)
Fever, Nausea, Vomiting	70%
Cold Hands & Feet	40%

Symptom	Percentage (%)
Erythema (Redness)	85%
Edema	60%
Purulent Discharge	30%
Inflammation	75%
Abdominal Pain	25%
Weakness	50%

The most prevalent symptom was erythema (redness), observed in 85% of patients, followed by inflammation (75%), fever/nausea/vomiting (70%), edema (60%), weakness (50%), cold extremities (40%), purulent discharge (30%), and abdominal pain (25%).

D. Comorbid Conditions

Type 2 Diabetes Mellitus was the most common comorbidity, present in 60% of patients, contributing to impaired immune responses and delayed wound healing — particularly in cases with poor glycemic control (HbA1c >8% in 70% of cases). Edema and pedal edema were found in 40%, significantly complicating antibiotic penetration and prolonging recovery. Acne vulgaris and eczema were present in 10% and 5%, respectively. Seizures were noted in 8%, necessitating careful antibiotic selection. Diabetic foot ulcers (DFU) were observed in 30 patients (18%), all with T2DM. Wagner grading revealed: Grade 1 superficial ulceration in 10 cases (33%), Grade 2 deeper ulcers with tendon exposure in 15 cases (50%), and Grade 3 ulcers with abscesses or osteomyelitis in 5 cases (17%).

TABLE II COMORBID CONDITIONS IN CELLULITIS PATIENTS

Comorbid Condition	Percentage (%)
Type 2 Diabetes Mellitus	60%
Edema & Pedal Edema	40%
Acne Vulgaris	10%
Eczema	5%
Seizures	8%

TABLE III SMOKING STATUS AMONG PATIENTS

Smoking Category	Number of Patients
Current Smoker	15
Heavy Smoker (≥15 cigarettes/day)	11

Fifteen patients were identified as smokers, of whom 11 (42.3%) were heavy smokers consuming ≥15 cigarettes per day, constituting an additional risk factor for impaired tissue perfusion and delayed healing.

E. Therapeutic Management

Empiric antibiotic coverage included ceftriaxone and metronidazole, with adjustments based on culture results. MRSA-related infections were treated with vancomycin or linezolid, while severe cases with gram-negative involvement required piperacillin-tazobactam. The 14-day antibiotic

regimen was effective for most patients. Regular debridement was performed for ulcer management, and advanced dressings including hydrocolloid or silver-impregnated dressings were used to promote healing. Strict glycemic control was achieved using insulin therapy for patients with HbA1c >8%. Blood pressure was managed with ACE inhibitors to improve vascular perfusion. Compression therapy was implemented post-infection resolution, and diuretics were prescribed for patients with significant fluid retention.

F. Clinical Outcomes

Complete resolution of cellulitis was achieved in 70% of cases. Recurrence occurred in 15%, primarily due to poor glycemic control or unresolved edema. Severe complications including osteomyelitis or amputation were observed in 10% of diabetic foot ulcer cases. Among ulcer patients, complete healing occurred in 18 patients (60%) after 4–8 weeks of treatment, partial healing with residual scarring in 8 patients (27%), and 4 patients (13%) required surgical intervention including debridement or minor amputation due to non-resolving infection or osteomyelitis.

IV. DISCUSSION

The present study reveals significant age- and lifestyle-related variations in the incidence, etiology, and outcomes of cellulitis. Trauma-related cellulitis was predominant in younger adults, often secondary to active lifestyles or injection drug use, reflected in rapid recovery and shorter hospital stays consistent with fewer underlying health conditions [6, 7].

In middle-aged adults, the high prevalence of sedentary lifestyles, obesity, and diabetes highlights the central role of modifiable risk factors. Preventive strategies targeting weight management and glycemic control may significantly reduce morbidity in this population [8, 9]. Older adults demonstrated more severe presentations associated with age-related factors such as reduced mobility, poor skin integrity, and vascular insufficiency, necessitating tailored interventions including physical therapy, skin care education, and vascular health monitoring [10].

The interplay of cellulitis, diabetes, and comorbidities presents a significant clinical challenge. Diabetes contributes to immune dysfunction and microvascular damage, delaying cellulitis resolution, while edema reduces antibiotic efficacy and facilitates bacterial proliferation. Necrotizing cellulitis, present in 7% of cases, demanded aggressive management, including surgical debridement and broad-spectrum antibiotics [11, 12].

Elevated blood pressure was found to impair tissue perfusion and delay resolution of inflammation, a finding consistent with previous literature on vascular insufficiency in cellulitis [13]. Effective blood pressure management alongside glycemic control was essential in achieving favorable outcomes. In patients with acne vulgaris, secondary infections and disrupted skin barriers increased the risk of orbital cellulitis, and addressing acne concurrently improved recovery and prevented recurrence [14].

The 12% complication rate in this cohort highlights the need for improved treatment protocols, particularly for high-risk groups including patients with diabetic foot ulcers, advanced ulceration, and polymicrobial infections. Enhanced early detection through advanced imaging and biomarkers, tailored antibiotic regimens, and preventive strategies such as skin care education and glycemic control are critical to mitigating recurrence and complications [15, 16].

The findings underscore the importance of a personalized approach to managing cellulitis, considering age-specific and lifestyle-related risk factors. A multidisciplinary care team incorporating wound care specialists, endocrinologists, dermatologists, and infectious disease experts is critical in improving patient outcomes. Preventive strategies, such as regular foot care, compression therapy, and early management of skin conditions, are essential in reducing incidence and recurrence [17, 18, 19].

V. CONCLUSIONS

This retrospective study underscores the challenges in managing cellulitis, particularly in patients with multiple comorbidities including Type 2 Diabetes Mellitus, edema, and lower extremity ulcers. These conditions significantly delayed healing and increased the risk of recurrent and complicated infections. Our findings emphasize the importance of aggressive management strategies comprising broad-spectrum antibiotics, culture-guided therapy, surgical interventions when indicated, and optimal glycemic and blood pressure control. The critical role of a multidisciplinary care team incorporating wound care specialists, endocrinologists, and infectious disease experts cannot be overstated. Future therapeutic strategies should focus on personalized approaches, incorporating emerging technologies such as dermoepidermal substitutes, stem cell therapies, and novel wound care modalities, alongside comprehensive patient education to prevent complications and improve recovery rates across all age groups.

ACKNOWLEDGMENT

The authors express their gratitude to Nimra Institute of Medical Sciences (NIMS), Vijayawada, and the Department of Pharmacy Practice, Nimra College of Pharmacy, for providing access to patient data and institutional support for this study.

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