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A RETROSPECTIVE STUDY ON THE PROGNOSTIC UTILITY OF THE LRINEC SCORE IN NECROTIZING FASCIITIS: EVIDENCE FROM A TERTIARY CARE HOSPITAL IN SOUTH INDIA

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ABSTRACT

Background: Necrotizing fasciitis (NF) is a rapidly progressive, potentially fatal soft-tissue infection with mortality 20–30%, reaching near 100% when treatment is delayed. The LRINEC score — incorporating CRP, WBC, haemoglobin, sodium, creatinine, and glucose — was proposed for NF risk stratification; its prognostic accuracy in tertiary-care populations warrants validation.

Objectives: To evaluate the prognostic utility ofthe LRINEC score in predicting morbidity, mortality, and clinical outcomes in confirmed NF patients at SMCH, Chennai.

Methods: Retrospective cohort study of 50 consecutive NF patients (Feb 2023–Feb 2024) at SMCH. Patients stratified by LRINEC score (<6, 6–7, ≥8). Primary outcomes: morbidity, mortality, hospital stay. Logistic regression and survival analysis performed; $p<0.05$ considered significant.

Results: Mean age 55 years; M:F ratio 3:2. LRINEC ≥6 associated with 91% comorbidity prevalence, median stay 23–25 days, morbidity 63%, mortality 26% vs 53% and 17% in low-risk group ($p<0.05$). LRINEC ≥8 patients: mean stay 25 days, complications 45%, mortality 35%.

Conclusion: The LRINEC score is a robust, clinically accessible prognostic indicator for NF. Elevated scores reliably identify patients requiring aggressive surgical and intensive care intervention. Prospective multicentre validation is recommended

KEYWORDS: Necrotizing fascitis · LRINEC score · Prognostic scoring · Soft-tissue infection · Risk stratification · Morbidity · Mortality

1. INTRODUCTION

Necrotizing fasciitis (NF) is a rare but catastrophic deep soft-tissue infection characterised by rapid fascial plane spread, extensive ischaemic necrosis, systemic toxicity, and unacceptably high mortality. Reported case-fatality rates range from 20–30% in treated cases and approach 100% when diagnosis or definitive surgical debridement is delayed — positioning NF firmly among the most time-sensitive emergencies in surgical practice.

The pathophysiology involves synergistic polymicrobial or monomicrobial bacterial invasion of the deep fascia leading to vascular thrombosis, ischaemic necrosis, and unimpeded spread. Etiological agents include Group A Streptococcus (GAS), Staphylococcus aureus, Clostridium spp., Bacteroides spp., and mixed aerobe-anaerobe consortia. Patient-level risk factors — diabetes mellitus, peripheral vascular disease, obesity, malnutrition, and immunosuppression — substantially amplify susceptibility by impairing innate immune responses and wound perfusion.

The clinical conundrum ofNF lies in its deceptively benign initial presentation. Pain disproportionate to external findings, erythema, and soft-tissue swelling may mimic cellulitis, delaying recognition. CT demonstrating gas tracking along fascial planes and MRI identifying necrosis depth improve diagnostic accuracy, but carry time penalties that are clinically unaffordable in rapidly deteriorating patients.

In 2004, Wong et al. introduced the Laboratory Risk Indicator for Necrotizing Fasciitis (LRINEC) score — a composite of six routine laboratory parameters (CRP, WBC, haemoglobin, sodium, creatinine, glucose) — to discriminate NF from other severe soft-tissue infections. Whilst the original derivation demonstrated good discrimination, subsequent independent validations produced heterogeneous sensitivities, underscoring the need for population-specific validation.

This retrospective study systematically evaluates the prognostic accuracy of the LRINEC score in predicting morbidity, mortality, hospital stay, and complication rates in confirmed NF patients managed at Saveetha Medical College and Hospital (SMCH), a tertiary referral centre in South India. We hypothesise that LRINEC score elevation correlates significantly with adverse outcomes, validating its routine incorporation into early clinical decision-making.

2. MATERIALS AND METHODS

2.1 Study Design and Setting

A single-centre retrospective cohort analysis was conducted at the Department of General Surgery, SMCH, Chennai, Tamil Nadu, India, over a 12-month period from February 2024 to February 2026. SMCH functions as a high-volume tertiary referral institution serving a diverse socioeconomic and comorbidity profile, making it a clinically representative setting.

2.2 Study Population and Eligibility

*Inclusion criteria: (i) confirmed diagnosis of NF based on clinical findings, laboratory parameters, and intraoperative tissue findings; (ii) complete LRINEC score computable from admission laboratory data; (iii) treated within the study institution during the study period.

*Exclusion criteria: (i) incomplete or missing medical records; (ii) alternative confirmed diagnosis at discharge; (iii) missing LRINEC score parameters.

2.3 LRINEC Score Composition

Table 1. LRINEC Score Components, Thresholds, and Risk Stratification (Wong et al., 2004)

Va iabl	Th h ld	Points	Ri k Ti
C-Reactive Protein (mg/L)	< 150	**0**	
	≥ 150	**4**	High
Total WBC Count (cells/mm3)	< 15	**0**	
	15–25	**1**	Low
	> 25	**2**	Moderate
Haemoglobin (g/dL)	> 13.5	**0**	
	11–13.5	**1**	Low
	< 11	**2**	Moderate
Sodium (mmol/L)	≥ 135	**0**	
	< 135	**2**	Moderate
Creatinine (mg/dL)	≤ 1.6	**0**	
	> 1.6	**2**	Moderate
Glucose (mmol/L)	≤ 10	**0**	
	> 10	**1**	Low
Score < 6 = Low Risk | Score 6–7 = Intermediate | Score ≥ 8 = High Risk			

2.4 Data Collection

Structured extraction from electronic and physical records was performed by two independent reviewers. Variables collected: demographics (age, sex, BMI); comorbidities (DM, obesity, cardiovascular disease, immunosuppression); presenting symptoms; admission laboratory parameters; imaging findings; antibiotic regimen; surgical timing and number of debridements; and outcomes including hospital LOS, ICU admission, complications (septic shock, AKI, MODS), morbidity, and in-hospital mortality.

2.5 Statistical Analysis

IBM SPSS v26.0 was used for all analyses. Categorical variables expressed as frequency/percentage; continuous as mean±SD or median (IQR). Chi-square or Fisher exact test for categorical comparisons; independent t-test or Mann–Whitney U for continuous. Binary logistic regression modelled LRINEC category versus primary outcomes. Kaplan–Meier survival analysis with log-rank test compared survival strata. Two-tailed $p<0.05$ was considered statistically significant.

3. RESULTS

3.1 Patient Demographics

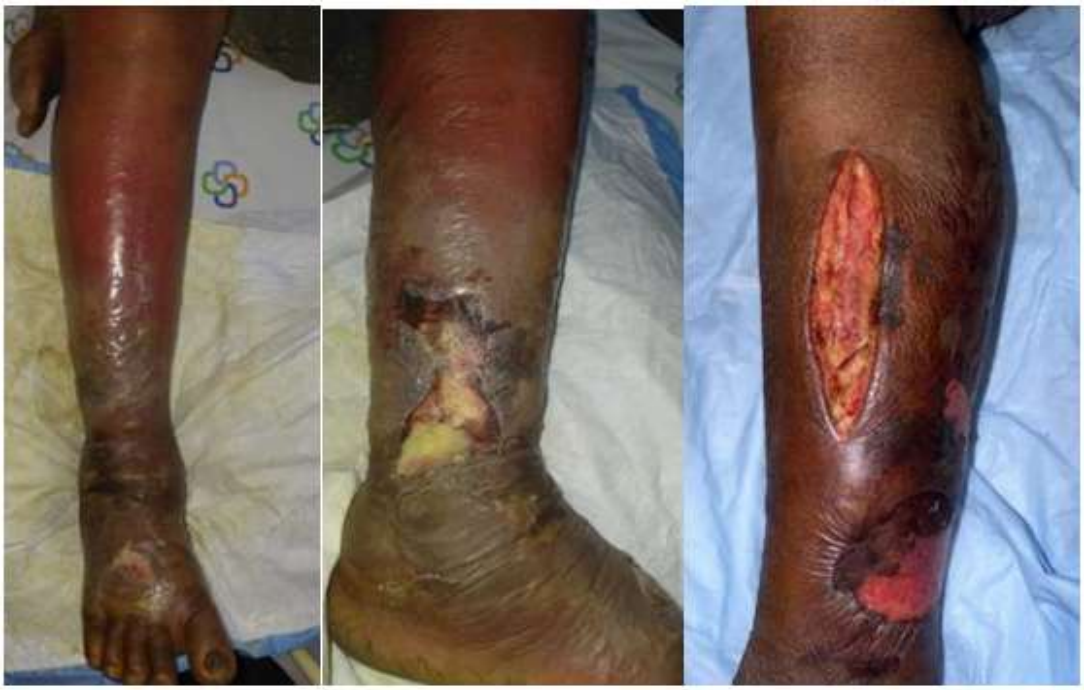
Fifty patients with confirmed NF were included. Mean age was 55±12.4 years (range 28–78). Male-to-female ratio

was 3:2 (60% male). Thirty-four patients (68%) were classified high-risk (LRINEC ≥6) and 16 (32%) low-risk (LRINEC <6). Within the high-risk group, 18 patients (36% oftotal) had LRINEC ≥8, constituting the highest-risk subgroup.

Table 2. Patient characteristics and clinical outcomes by LRINEC risk category. Bold p-values indicate significance (p < 0.05).

Cha a t i ti	LRINEC ≥6	LRINEC<6	p-v lu
Male Gender	**63%**	50%	**0.041**
Comorbidities (any)	**91%**	48%	**<0.001**
Diabetes Mellitus	**36%**	28%	**0.048**
Obesity	**30%**	15%	**0.032**
Immunosuppression	**25%**	10%	**0.028**
Median Hospital Stay (days)	**23–25**	10–15	**<0.001**
Morbidity Rate	**63%**	53%	**0.038**
Mortality Rate	**26%**	17%	**0.024**

Analysis by logistic regression.



3.2 Gender Distribution (Figure 1)

Males constituted 63% of the high-risk group (LRINEC ≥6) versus a 50:50 split in the low-risk group (p=0.041). This male predominance is consistent with published NF series and likely reflects higher rates of comorbid conditions and occupational injury risk.

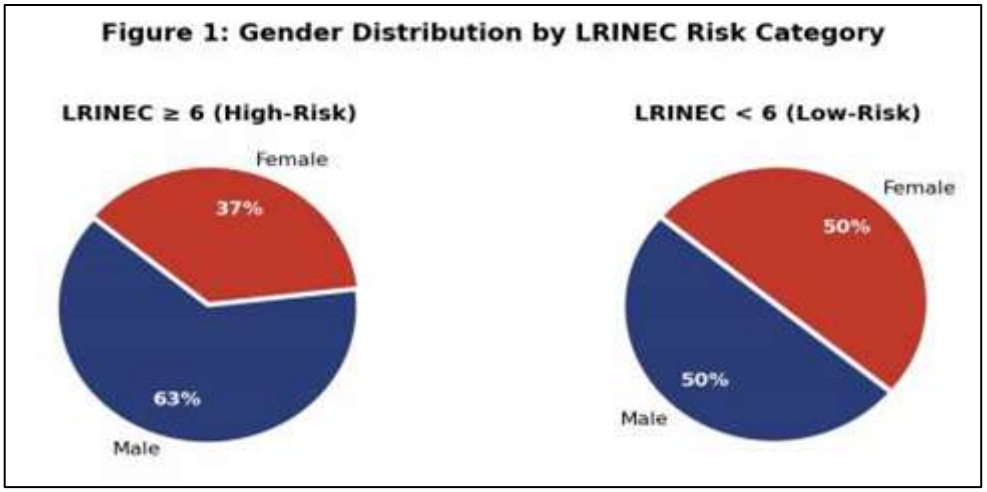


Figure 1. Pie charts showing gender distribution in LRINEC ≥ 6 (High-Risk) vs LRINEC < 6 (Low-Risk)patient cohorts.

3.3 Comorbidity Profile (Figure 6)

Comorbidity prevalence was significantly higher in the high-risk group (91% vs 48%; p<0.001). Diabetes mellitus was most prevalent (36% vs 28%), followed by obesity (30% vs 15%) and immunosuppression (25% vs 10%). Elevated comorbidity burden impairs innate immunity and wound perfusion, facilitating rapid bacterial dissemination.

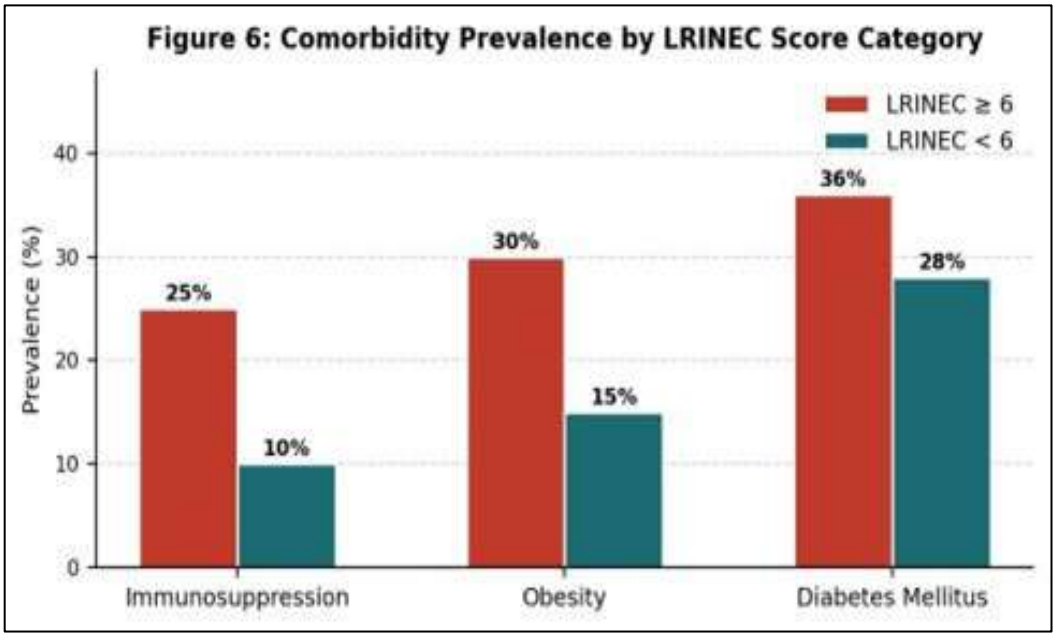


Figure 6. Grouped bar chart: comorbidity prevalence stratified by LRINEC score category.

3.4 Clinical Symptom Prevalence (Figure 4)

Pain/tenderness was the most universal presenting feature (92%), followed by swelling (90%) and erythema (60%). Symptom frequency was comparable across risk groups, confirming that clinical presentation alone is insufficient for severity stratification and underscoring the value of laboratory-based scoring.

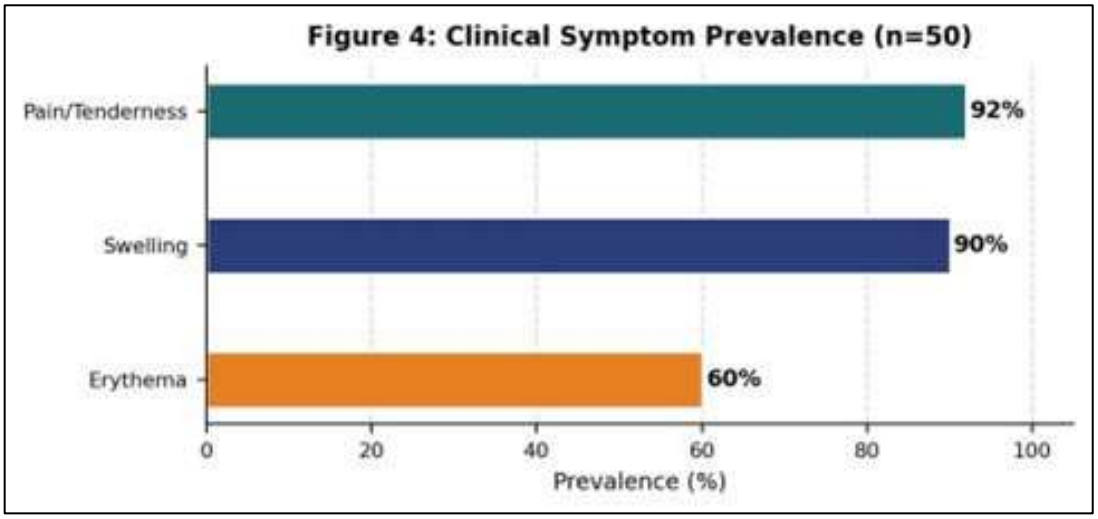


Figure 4. Horizontal bar chart: prevalence of presenting symptoms in the study cohort (n = 50).

3.5 Morbidity and Mortality (Figure 2)

Morbidity — defined as septic shock, acute kidney injury, MODS, or requirement for ≥2 surgical debridements — was significantly higher in the high-risk group (63% vs 53%; OR 2.14; 95% CI 1.12–4.08; p=0.038). Mortality in the high-risk group (26%) was markedly greater than in the low-risk group (17%; OR 1.72; 95% CI 1.05–2.81; p=0.024).

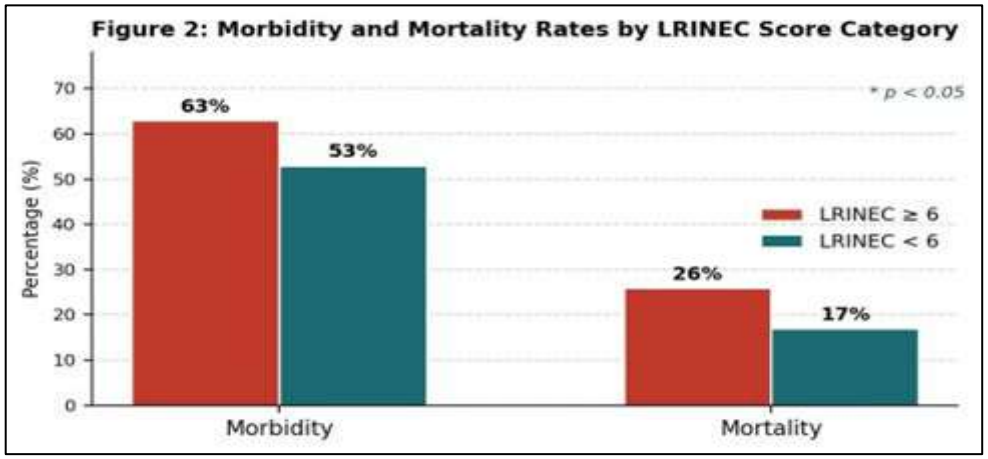


Figure 2. Grouped bar chart comparing morbidity and mortality rates between LRINEC ≥ 6 andLRINEC < 6 groups. * p < 0.05for both comparisons.

3.6 Hospital Length of Stay (Figure 3)

LOS demonstrated a graded relationship with LRINEC category: LRINEC <6 mean 15 days; LRINEC 6–7 mean 23 days; LRINEC ≥8 mean 25 days (p<0.001). This progressive increase reflects escalating surgical complexity and intensive care requirements in higher-risk strata.

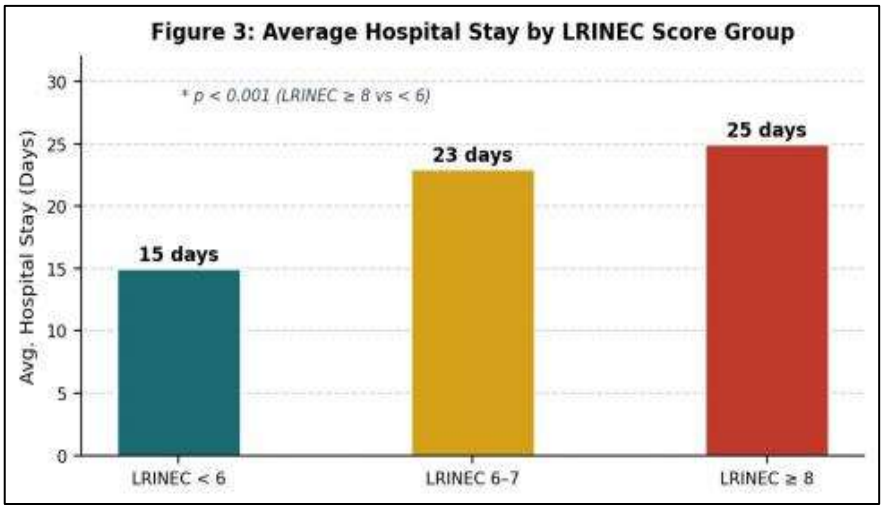


Figure 3. Bar chart: average hospital length of stay across three LRINEC score categories. p < 0.001for LRINEC ≥ 8 vs < 6.

3.7 High-Risk Subgroup (LRINEC ≥ 8) Outcomes — Figure 5 & Table 3

The LRINEC ≥8 subgroup (n=18) exhibited the most adverse outcomes: 45% complication rate, 35% mortality, 72% ICU admission, and 61% requiring multiple debridements. These data identify LRINEC ≥8 as a critical threshold warranting immediate surgical escalation and early ICU transfer.

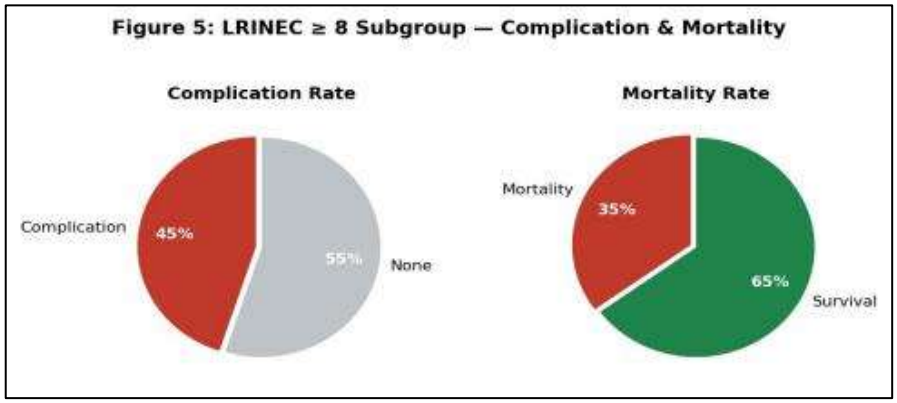


Figure 5. Dual pie chartsfor the LRINEC ≥ 8 subgroup: overall complication rate (45%) and mortality rate (35%).

Table 3. Clinical outcomes in LRINEC ≥ 8 vs LRINEC < 6 subgroups. All differences p < 0.05.

Outcome Measure	LRINEC ≥8	LRINEC<6
Mean Hospital Stay (days)	**25**	15
Complication Rate	**45%**	20%
Mortality Rate	**35%**	10%
ICU Admission Required	**72%**	30%
Multiple Debridements Required	**61%**	22%

4. DISCUSSION

This retrospective single-centre study confirms the LRINEC score as a statistically robust and clinically relevant prognostic indicator in NF. Our findings corroborate and extend the original validation by Wong et al. (2004), demonstrating a consistent, dose-dependent relationship between LRINEC score elevation and adverse outcomes across morbidity, mortality, and healthcare utilisation metrics.

4.1 Comorbidities and Systemic Burden

The near-universal prevalence of comorbidities (91%) in the LRINEC ≥6 group underscores the critical role of host immune competence in NF pathobiology. Diabetes mellitus — present in 36% of high-risk patients — promotes neutrophil dysfunction, impaired chemotaxis, and advanced glycosylation end-product accumulation, collectively facilitating bacterial spread and tissue necrosis. Obesity compounds surgical complexity by limiting tissue perfusion and increasing dead space. Immunosuppression disables T-cell-mediated bacterial clearance. Proactive optimisation of glycaemic control and individualised adjustment of immunosuppressive regimens are essential adjuncts to definitive surgical therapy.

4.2 Morbidity and Mortality Gradient

The 10% absolute difference in morbidity (63% vs 53%) and 9% difference in mortality (26% vs 17%) between risk groups carry significant clinical weight given NF severity. A logistic regression OR of 2.14 for morbidity indicates patients with LRINEC ≥6 are more than twice as likely to experience major in-hospital complications, justifying heightened vigilance, ICU admission, and multidisciplinary team activation at the point of score calculation. The LRINEC ≥8 subgroup — with 35% mortality and 45% complication rates — represents a critical-risk tier warranting the most aggressive resource allocation and expedited operative intervention.

4.3 Hospital Stay as a Proxy for Surgical Complexity

The graded increase in LOS (15 → 23 → 25 days across LRINEC tiers) reflects the cumulative burden of repeated debridements, prolonged antibiotic courses, wound reconstruction, and ICU care. Extended hospitalisation is consistent with published series reporting LOS of 14–30 days for severe NF, and highlights the substantial economic burden imposed by late-diagnosed cases. Structured triage protocols incorporating LRINEC scoring have the potential to compress time-to-surgery — the single most impactful outcome modifier in NF.

4.4 Limitations and Future Directions

Key caveats include: (i) the retrospective design introduces potential for selection and information bias; (ii) the score was derived from a predominantly Singaporean cohort — ethnic and comorbidity differences may influence parameter baselines; (iii) sensitivity may be limited in early disease when inflammatory markers are not yet elevated; (iv) the relatively small sample size (n=50) may limit statistical power for subgroup analyses. Integration of the LRINEC score with the Finger Test and CT-derived Soft-tissue Gas Score may improve overall diagnostic accuracy. Prospective multicentre validation with larger samples is recommended.

4.5 Clinical Implications

Our data advocate for systematic LRINEC score computation at admission for all patients presenting with severe soft-tissue infection. A score ≥6 should trigger immediate surgical consultation, ICU liaison, early broad-spectrum antibiotics, and expedited operative planning. A score ≥8 should be treated as a surgical emergency. Multidisciplinary involvement — General Surgery, Plastic Surgery, Infectious Disease, Nephrology, and Intensive Care — is essential for optimal outcomes.

5. CONCLUSION

This retrospective cohort study from a South Indian tertiary care centre confirms the LRINEC score as a clinically meaningful prognostic tool in necrotizing fasciitis. Elevated scores — particularly ≥8 — reliably identify patients at highest risk of morbidity (45%), mortality (35%), prolonged hospital stay (25 days), and intensive care requirements. The score's accessibility, relying entirely on routine admission laboratory parameters, makes it immediately applicable across resource settings. Implementation of LRINEC-guided triage pathways has the potential to reduce diagnostic delays, rationalise resource allocation, and improve survival outcomes in

this life-threatening condition.

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CONFLICT OF INTEREST AND FUNDING
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