



EVALUATION OF SEVERITY STRATIFICATION OF SKIN AND SOFT TISSUE INFECTIONS (SSTIs) IN PLANNING TREATMENT STRATEGIES AND PREDICTING POOR PROGNOSTIC FACTORS - A CASE SERIES STUDY

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ABSTRACT

Introduction: Skin and soft tissue infections are the infections which involve the skin and underlying subcutaneous tissue, underlying fascia or the underlying muscles. Skin and soft tissue infections (SSTIs) can span from superficial epidermal infection to fatal necrotising fasciitis. These infections have a variable presentation and have overlapping in presentation etiology and severity, hence the diagnosis and the management of the infection from mild cases to severe cases is often difficult. Therefore, it is of utmost importance to identify the severity to reduce the morbidity and mortality and to have an effective and early management of SSTIs. **Aims And Objectives:** To study the clinical profile of patients with community acquired skin and soft tissue infections (SSTIs) coming to a tertiary level hospital and identify factors responsible for extending the hospital stay and poor outcome in patients with SSTIs. **Methodology:** A case series study was conducted at Rajarajeswari Medical College and Hospital over a period of 18 months comprising of 125 patients diagnosed with skin and soft tissue infections (SSTIs) and results were drawn. All demographic data was tabulated and graphed and the inferential statistics were obtained using Chi-square test. **Results:** Most common age group involved in skin and soft tissue infections were between the ages of 41-60 years and adult males were more affected with abscess formation being the most common clinical presentation (60%). Type 2 diabetes mellitus was the most common associated comorbidity. Staphylococcus aureus was the most common cultured organism (44.8%), followed by E. coli (37.6%). 94.4% of the SSTIs were managed surgically via incision and drainage or debridement followed by intravenous antibiotics administration. **Conclusion:** SSTIs are categorised into mild, moderate and severe form based on clinical and demographic profile of the patient. The most common predisposing factor for SSTIs was found to adult males of lower socioeconomic status being more prone to trauma due to working and living conditions, with other risk factors such as smoking and Type 2 Diabetes Mellitus. An algorithm for severity stratification is formulated which can help in proper management of the patients by medical or surgical intervention thereby reducing the associated morbidity and mortality.

KEYWORDS : skin and soft tissue infections, risk factors, diagnosis, management**INTRODUCTION**

Skin and soft tissue infections are the infections which involve the skin and underlying subcutaneous tissue, underlying fascia or the underlying muscles. Skin and soft tissue infections (SSTIs) can vary from superficial epidermal infection to life threatening necrotising fasciitis.^[1,2]

Since these infections have a variable presentation and they have overlapping in presentation etiology and severity, the diagnosis and the management of the infection from mild cases to severe cases will be difficult. It is very important to identify the severity to reduce the morbidity and mortality and to have an effective and early management of SSTIs.

For establishing an accurate diagnosis, understanding about anatomical relations of skin and soft tissue and recognition of physical examination findings are critical steps and it may necessitate aspiration of tissues, biopsy and radiographic procedures to ascertain the extensiveness of infection and for assessing deep seated collections.

The treatment of SSTIs can be oral or parenteral antibiotics, with varying duration in treatment. Empirical therapy is recommended on the basis of etiological factors and the severity of infection. The modification to culture-specific therapy is recommended for upholding efficacy and preventing resistance.

Ultimately, thorough and aggressive surgical exploration and debridement is paramount for diagnosis as well as a therapeutic procedure particularly in immunocompromised hosts or in patients with necrotizing infections or myonecrosis. For early medical or surgical evaluation, the use of ultrasonography, CT scans or MRI may also be of help in estimating the depth of the infection.^[3,4] Fasciotomy, regular surgical debridement and abscess drainage are different surgical options found to decrease the morbidity, mortality, duration of administration of antibiotics and the duration of hospital stay of the admitted patients.

OBJECTIVES

1. To study the clinical profile of patients with community acquired skin and soft tissue infections (SSTIs) coming to a tertiary level hospital.
2. To evaluate the existing method of severity stratification of SSTIs specific to the groups of patients.

3. To identify factors responsible for prolonged stay and poor outcome in patients with SSTIs.

METHODOLOGY:

- a. **Study design:** Case series study
- b. **Study period:** 18 months, January 2023 - June 2024
- c. **Sample size:** 125 patients
- d. **Study centre:** Department of General Surgery, Rajarajeswari Medical College and Hospital
- e. **Sampling technique and study population:** Convenient sampling. All consecutive cases coming to the General Surgery OPD and Emergency.

Inclusion Criteria:

1. Presence of at least 2 of the following clinical signs and symptoms of local infection:
 - Swelling
 - Pain out of proportion to the clinical findings
 - Erythema
 - Induration
 - Abscess formation
 - Tenderness on palpation
2. Presence of even one of the following systemic conditions:
 - Body temperature >40 degree Celsius or <35 degree Celsius
 - WBC counts > 15000
 - Wound culture or Gram stain positive.
3. Diagnosis of Severe infections like necrotising fasciitis, Fournier's gangrene.

Exclusion Criteria:

1. Patients with trivial injury
2. Patients with hospital acquired infection
3. Patients should not have been admitted within 4 weeks of presentation
4. All patients less than 12 years of age
5. Sites of infection other than skin i.e. osteomyelitis, meningitis, bacteria, etc.

Statistical Methods Applied:

Data collected was analysed using Descriptive and Inferential Statistics. Analysis was done both manually and by using a computer.

Calculated data was arranged in a systemic manner, presented in various bar graphs, pie charts and figures, and statistical analysis was made to evaluate the objectives of this study with the aid of Statistical Package for Social Science (SPSSv23) and MS Excel.

Data Analysis:

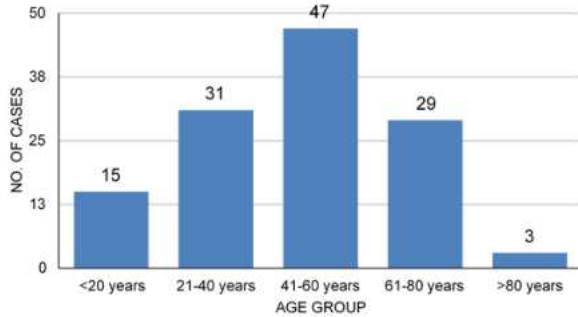


Figure 1. Age distribution of cases

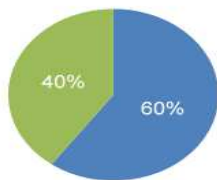


Figure 2. Sex distribution of cases

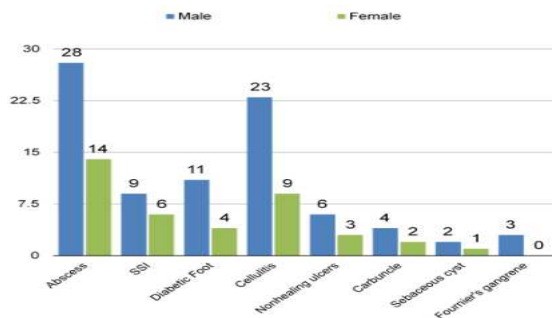


Figure 3. Clinical presentations of soft tissue infections

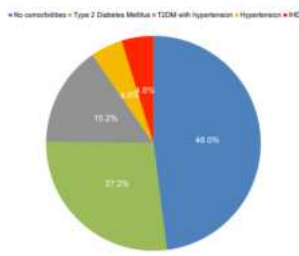


Figure 4. Comorbid conditions in cases of soft tissue infections

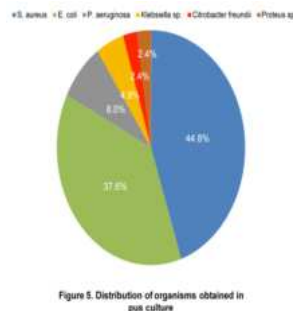


Figure 5. Distribution of organisms obtained in pus culture

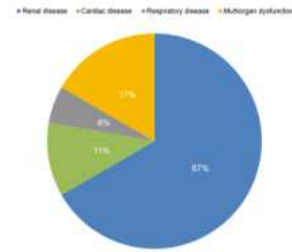


Figure 6. Complications associated with soft tissue infections

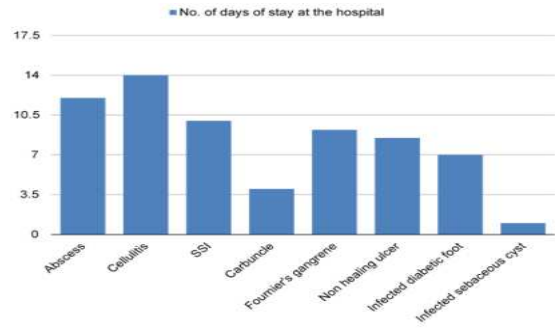


Figure 7. Duration of stay at the hospital

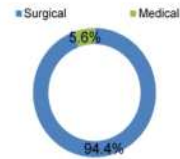


Figure 8. Management of cases with soft tissue infections

RESULTS

The present study was conducted in the Department of Surgery at Rajarajeswari Medical College and Hospital, Bengaluru. A total of 125 patients with diagnosis of soft-tissue infection were admitted in the hospital during our study and were studied prospectively. All the patients enrolled have completed the study.

Age And Sex Distribution:

In the present study, the most common age group involved in cases of soft-tissue infections was in the range of 41–60 years (37.6%) followed by age group of 21–40 years (24.8%), followed by age group of 61–80 years (23.2%), and followed by age group of <20 years (12%) and the least commonly involved age group was >80 years (2.4%). The minimum age encountered was 17 years and the maximum age was 87 years [Figure 1]. In our study, soft-tissue infections were seen more frequently in males with male to female ratio of 1.5:1 [Figure 2].

Clinical Presentation:

In this study, abscess formation (33.6%) was the most common clinical presentation of soft-tissue infections followed by cellulitis (25.6%), followed by infected diabetic foot ulcers (12%) and surgical site infections (12%), followed by non-healing ulcers (7.2%), and followed by carbuncle (4.8%), infected sebaceous cyst and Fournier's gangrene (2.4%) each [Figure 3].

Comorbid Conditions

In this study, 52% cases presented with comorbid conditions associated with soft-tissue infections. Type 2 diabetes mellitus (27.2%) was the most common associated comorbid condition. Other comorbid conditions encountered in our study were hypertension, type 2 diabetes mellitus with hypertension and ischaemic heart disease. [Figure 4].

Microbiological culture

S. aureus was the most common organism to be cultured (44.8%) followed by *Escherichia coli* (37.6%), *Pseudomonas aeruginosa* (8%), *Klebsiella sp.* (4.8%), *Citrobacter freundii* and *Proteus sp.* (2.4% each). [Figure 5].

Complications

In our study, 67% of complications was renal failure due to acute or chronic kidney injury seen followed by multi-organ failure seen in 17% of the complications. Cardiac and respiratory complications were at 11% and 6% respectively. [Figure 6].

Duration Of Stay

In this study, the total average duration of stay in the hospital was found to be 8.2 days. The average duration of stay of the patients with abscess was 12 days, cellulitis was 14 days, surgical site infections was 10 days, followed by Fournier's gangrene (9.2 days), followed by nonhealing ulcer (8.5 days), followed by infected diabetic foot (7 days) and carbuncle (4 days). The shortest duration of stay in the hospital was observed in cases of infected sebaceous cyst (1 day) [Figure 7].

Management

In this study, 94.4% of the cases of soft-tissue infections were managed surgically, and in the remaining 5.6% cases, no surgical intervention was done. Most cases of soft-tissue infections in our study necessitated surgical intervention with incision and drainage or debridement/excision. [Figure 8].

DISCUSSION:

The present study was conducted in the Department of Surgery at Rajarajeswari Medical College and Hospital, Bengaluru. A total of 125 patients with diagnosis of soft-tissue infection were admitted in the hospital during our study and were studied prospectively. The most common age group involved in soft-tissue infections was in the range of 41–60 years (37.6%) and least involved was the age group >80 years (2.4%).

In our study, adult males were more frequently observed to have soft-tissue infections (M:F = 1.5:1). These findings are corresponding to previous similar studies by Lipsky *et al.*^[5] and Ki and Rotstein^[6] that the soft-tissue infections are common in adult males.

Abscess formation (33.6%) was most common clinical presentation of all soft-tissue infections. In a similar study, Ellis Simonsen *et al.*^[7] concluded that abscess formation was the most common occurrence in cases of skin and soft-tissue infections (SSTIs) attributable to delayed presentation of such cases to the clinician.

In the present study, 52% cases were associated with comorbid conditions, Type 2 diabetes mellitus (27.2%) being the most commonly associated comorbid condition. Our study agrees with the study of Shen and Lu^[8] in which the authors concluded that diabetes mellitus was the most common co-morbid condition associated with soft-tissue infections.

S. aureus was the most common cultured organism (44.8%), followed by *E. coli* (37.6%) in cases of soft-tissue infections. This finding is in consensus with the study by Mohanty *et al.*^[9] in which the authors concluded that *S. aureus* was the most common isolate followed by *E. coli* and *Pseudomonas* species in abscesses obtained from the soft-tissue infections.

About 94.4% of the total cases of soft-tissue infections were managed surgically. Majority of soft-tissue infection cases in our study needed surgical intervention, in the form of incision and drainage or debridement/ excision. In their study, Lee *et al.*^[10] came to the conclusion that incision and drainage without supplemental antibiotic therapy was effective in the management of skin and soft-tissue abscesses. Macfie and Harvey^[11] in their study described that free drainage following incision and drainage was the safest treatment for the majority of abscesses. Additionally, they stated that the antibiotics did not have any noteworthy impact on the time of recovery or recurrence and their routine use was not suggested. Therefore, our study is consistent with the accessible literature on this subject.

In the present study, we conclude that the favourable mode of treatment of soft-tissue infections is prompt surgical intervention.

The most common complication in cases of soft-tissue infections was renal failure (12%). Thaichinda and Kositpantawong^[12] in their study concluded that the most common complication in cases of soft-tissue infections was acute renal failure followed by multi-organ system dysfunction. Accordingly, the findings of our study are in line with comparable previous studies cited in literature. In actual

circumstances, even a single unrelated factor such as renal impairment or septicemia may stimulate a reaction of events which ultimately results in multi-organ failure.

The average stay of patients with soft-tissue infections was 8.2 days. This finding is closely related to the study of Namiduru *et al.*^[13] in which the authors concluded that the soft-tissue infections extended the length of patient's hospital stay by 12.8 days. The average duration of stay in the hospital was also prolonged by comorbidities such as diabetes and renal disease.

In our study, diabetes mellitus in conjunction with renal dysfunction or peripheral vascular disease accentuated mortality. In a retrospective study, Elliott *et al.*^[14] recounted the factors influencing mortality in cases of NSTIs which were nearly similar as seen in our study excluding diabetes mellitus.

In their study, Elliott *et al.* iterated that diabetes mellitus was not a susceptible factor leading to death in cases of NSTIs. This distinction can be attributed to the differences in the demographic patterns accompanying the paucity of tertiary care facilities in underdeveloped countries in contrast to developed countries.

The existing method helps in stratification and also in proper management of SSTIs. It has aided in managing cases depending upon the severity as highlighted by the various demographic and clinical factors. But the existing system necessitates some modifications. Certain symptoms and signs and other risk factors that were found to be statistically significant ($P < 0.05$) affecting the outcome has been ascertained by our study. These factors when added to the existing schema can better delineate mild cases from moderate-severe cases requiring outpatient and inpatient management respectively.

The study revealed numerous risk factors in addition to the one already stated in the literature. These factors affected the outcome and resulted in increased morbidity and mortality. The factors which need to be added to the present stratification system to modify the existing system are:

- i) Male patients of lower socioeconomic status
- ii) Even if the involved body surface area (BSA) is less than 9%.
- iii) Loss of sensations
- iv) Loss of movement and function
- v) Restriction of joint movement
- vi) Presence of gangrene
- vii) TLC > 15000/cumm
- viii) Hyponatremia

CONCLUSION:

SSTIs can be categorized into mild, moderate and severe based on the clinical and demographic profile of the patient; The predisposing factor for SSTIs included male patients of lower socioeconomic status who are more prone to trauma due to their working and living conditions.

Other risk factors include:

Smoking and Diabetes mellitus.

Temperature above 38 C,

Hypotension,

TLC > 15000,

Hyponatremia,

Presence of gangrene, bullae, crepitus increases the severity of infection;

Severe infection when BSA > 9% except the one involving hand, head, scrotum. where the infection is associated with co-morbidities and gangrene. Loss of sensation, loss of movement/function of affected part and restriction of joint movement also indicated the severity of infection; Based on the above findings an algorithm is formulated for severity stratification which can help in prompt and proper management of the patients either by medical or surgical intervention who presents to the surgical OPD/emergency with SSTIs thereby reducing the morbidity and mortality associated with it.

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