



## Clinico-Microbiological Study of Necrotizing Fasciitis

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### Abstract

**Introduction:** Necrotizing fasciitis (NF) is a rapidly progressive inflammatory infection of the fascia and necrosis of subcutaneous tissues. It is a surgical emergency which requires high degree of suspicion for early diagnosis, and treatment in order to reduce morbidity and mortality.

**Aim:** This study is done to analyse NF- its clinical presentation, and microbiological characteristics. Study also emphasizes on surgical management and prognosis of this condition.

**Methodology:** This is a prospective study which included all the 40 patients admitted and treated for NF in Govt. T D Medical College, vandanam between January 2016 and January 2017.

**Results:** There were 40 patients admitted and treated with NF during the study period. The mean age of occurrence was 55.9 years and who were predominantly male. Most common site affected was lower limb. The patients presented with necrotic patch, blebs, ulcer, cellulitis, skin erythema, Ulcer with cellulitis, Microbiologically most of the culture yielded growth, with polymicrobial being the most common type isolating *Pseudomonas*, *Staphylococcus*, *Klebsiella* and *Escherichia coli* are the organisms causing it. The majority of them responded well to antibiotics and surgical debridement with few patients needing amputation.

The mortality rate in our study was 10%.

**Keywords:** Culture, Diabetes mellitus, Necrotizing fasciitis, surgical debridement.

### Introduction

Skin the protective organ is vulnerable to a wide variety of disease and condition. Among the wide variety of conditions, skin and subcutaneous tissue infections form a major class. Necrotising fasciitis is such a condition which obviously requires a surgical intervention immediately either in the form of emergency fasciotomy or early surgical debridement lest otherwise it may endanger the life of the patient. The condition is followed by

extensive loss of skin and subcutaneous fat and fasciae leave a chronic wound, after the acute phase is over.

NF lesions are entities not frequently seen in daily surgical practice. These infections are marked by absence of clear local boundaries are palpable limits, which is responsible both for their severity and frequent delay in recognizing their surgical nature. NF continues to challenge the practising surgeon. NF is characterized by rapidly progressing

inflammation and necrosis, ranging from necrosis of the skin to life threatening infection involving the fascia and muscle. When it's so called as necrotising myositis.

### **Aims and Objectives**

Study was designed to document the natural history of patients with necrotizing fasciitis in Govt T D medical college. Elucidate the clinical and microbiological aspect of necrotizing fasciitis in our set up over 1 year.

To make a protocol for diagnosing, appropriate antibiotics in patients with necrotizing fasciitis.

### **Review of Literature**

The Nischal et al conducted a retrospective study that included the 30 patients admitted and treated at Victoria hospital, Bengaluru between July 1 2014 and June 30, 2015 for NF. Microbiologically half of the culture yielded growth, with polymicrobial being the most common type isolating *Pseudomonas*, *Staphylococcus*, *Klebsiella* as organisms causing it. Mono microbial culture mainly yielded *Escherichia coli* and *streptococcus*. The majority of them responded well to antibiotics and surgical debridement with few patients needing amputation, all being diabetics. The mortality rate in our study was 10%.

A study by Ming jong blair et al conducted a study on "necrotizing fasciitis in south east Taiwan", and published in international journal of infectious disease in 2008, they found monobacterial infections are more common and accurate early diagnosis and extensive surgical debridement are essential for favourable outcome.

A study by Ramin espander et al conducted a study on "necrotizing fasciitis of the extremities" and published in strategies in trauma and limb reconstruction. In 2011, they found maximum number of cases are associated with lower extremities and maximum no. of amputations are associated with polymicrobial infection.

A study by Shin hsun shen et al conducted a study on "monomicrobial necrotizing fasciitis caused by coagulase negative staphylococci and methicillin

resistant staphylococcus aureus" and published in European journal of orthopaedic surgery and traumatology in 2012, they found mortality, patient characteristics, clinical presentation and laboratory data did not differ significantly.

Necrotising fasciitis is a rapidly progressive and potentially fatal disease condition. It is characterized by progressive inflammation and extensive necrosis of the subcutaneous tissue and fascia<sup>1</sup>. Necrotising fasciitis was first described in 1848. In 1920, Meleney identified 20 patients in China in whom haemolytic streptococcus was the sole organism. Wilson coined the term necrotizing fasciitis in 1952 and found no specific pathologic bacteria related to the disease. Soft tissue infections that cause necrosis are more serious because of their propensity for extensive tissue destruction and high mortality rates.<sup>2,3</sup>

The nomenclature for necrotizing soft tissue infections is confusing. Attempts to differentiate these infections on the basis of predisposing conditions, presence of pain, toxic condition, fever, presence of crepitus, appearance of the skin and subcutaneous tissues, and presence of bullae are of little help in diagnosis or initial treatment. Bacteria seldom respect anatomic barriers, and hence necrotizing fasciitis is rarely limited to fascia and myonecrosis is frequently not limited to muscle. Necrotizing fasciitis is caused by polybacterial infection and associated with profound systemic toxicity. Characterized by a wide spread tissue necrosis underlying a viable skin, and the only visible signs for the same may be skin areas of necrosis, fluid filled vesicles, and severe sepsis<sup>4</sup>.

Hence it is important to know the various presentation and the organisms associated in our set up to recognize this clinical entity to give appropriate treatment for the patients since the mortality associated with it is about 70% in most of the literature. The outcome of necrotizing fasciitis is influenced by the early recognition and extensive surgical treatment and starting of broad spectrum antibiotics<sup>5</sup>.

Necrotising fasciitis results from a polymicrobial, synergistic infection— most commonly a

streptococcal species (group Aβ haemolytic) in combination with *Staphylococcus*, *Escherichia coli*, *Pseudomonas*, *Proteus*, *Bacteroides* or *Clostridium*; 80% have a history of previous trauma/infection and over 60% commence in the lower extremities. Predisposing conditions include:

**Relavence of the Study**

Necrotizing fasciitis is a diagnostic challenge due to its variable presentation. Therefore it is important to have a strong clinical suspicion while evaluating patients with cellulitis. Necrotizing fasciitis is rapidly progressing clinical condition with associated systemic toxicity. Early detection and timely intervention (medical and surgical) is mandatory for favourable outcome more over there is paucity of Indian studies regarding microbiological sensitivity in Necrotizing fasciitis, study thus attains importance in our setting.

**Materials and Methods**

Our study is a prospective descriptive study. The study population consists of total of 40 patients with necrotizing fasciitis involving the extremities. Inclusion criteria was all a patients attending General surgery outpatient department and casualty from January 2016 to January 2017 who were diagnosed to have necrotizing fasciitis.

Patients were informed consent taken as per the institution rules and no additional test or procedure done apart from the standard treatment procedure. The procedures followed were in accordance with the Helsinki Declaration of 1975, as revised in 2000.

The Institutional Review Board approved the study. Patient’s admitted with necrotizing fasciitis were evaluated in detail with respect to patient’s history, examination and chart reviews. All patients were ruled out for peripheral vascular disease and deep vein thrombosis.

Tissue for culture and histopathology was sent and work up for sepsis done. All details were entered in the Performa designed for entering the data, recording of treatment, antibiotics used, surgical procedures and outcome of every patient was

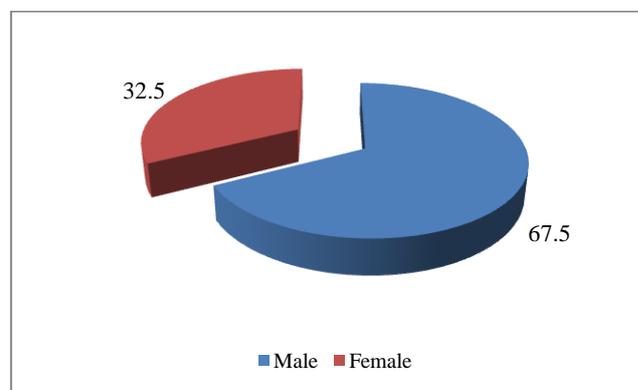
recorded and analyzed.

Data analysis done using Pearson’s chi square statistic to identify univariate differences with respect to diabetic status and variables with respect to morbidity and mortality. The Statistical software namely SPSS 11.0 and Systat 8.0 were used for the analysis of the data and Microsoft word and Excel have been used to generate graphs, tables etc.

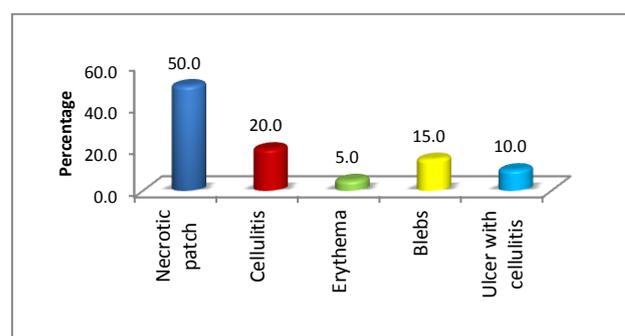
**Observations and Analysis**

**Table 1:** Percentage distribution of the sample according to age

Age	Count	Percent
40 - 49	13	32.5
50 - 59	14	35.0
>=60	13	32.5
Mean ± SD	55.9 ± 11.2	



**Figure 1:** Percentage distribution of the sample according to sex. Out of 40 patients studied 27 (67.5%) were males and 13(32.5%) were females.



**Figure 2:** Percentage distribution of the sample according to complaints. Clinical presentation is variable. The commonest presentation being necrotic patch of skin and cellulitis making up for 28(70%) of the study population.

**Table 2:** Percentage distribution of the sample according to antibiotic sensitivity

Antibiotic sensitivity	Count	Percent
Piperacillin	18	45.0
Ciprofloxacin	9	22.5
Amikacin	5	12.5
Linezolid	4	10.0
Cephalosporin	3	7.5
Others	1	2.5

**Table 3:** Percentage distribution of the sample according to organism

Organism	Count	Percent
Pseudomonas	13	32.5
Staphylococcus	10	25.0
Klebsiella	11	27.5
Escherichia coli	6	15.0

**Table 4:** Association of Antibiotic sensitivity and Organism

Antibiotic sensitivity	Pseudomonas		Staphylococcus		Klebsiella		Escherichia coli	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Piperacillin	8	61.5	5	50.0	1	9.1	4	66.7
Ciprofloxacin	2	15.4	3	30.0	3	27.3	1	16.7
Amikacin	1	7.7	0	0.0	4	36.4	0	0.0
Linezolid	0	0.0	1	10.0	2	18.2	1	16.7
Cephalosporin	1	7.7	1	10.0	1	9.1	0	0.0
Others	1	7.7	0	0.0	0	0.0	0	0.0

In the study I found that piperacillin found to be the most sensitive antibiotic against pseudomonas, staphylococcus and Escherichia coli except klebsiella which is more sensitive to amikacin.

## Discussion

Necrotizing fasciitis is a common infection encountered in our clinical set up. This study was designed for patients with necrotizing fasciitis. Our primary intention was to early diagnosis based on the natural history of the condition so that prompt and effective antibiotic management of necrotizing fasciitis in a tertiary care hospital.

In our experience most common mode of onset of symptoms is spontaneous (75%) in nature. but clinical presentation is variable and hence mode of onset has no much value in predicting the course of the disease. Clinical findings may just be cellulitis but when a bleb or a patch on an acutely swollen limb is seen during the course of admission don't wait for the antibiotic to act surgical intervention<sup>5</sup> is

all required and a extensive surgical management is mandatory to eradicate the extension of NF's fatal effects to achieve a good outcome. Hence one should have a good clinical knowledge to watch for the warning signs of patch, blebs on an acutely swollen limb. And act accordingly and not wait for it to demarcate with antibiotics.<sup>6</sup>

Our study made a note on the common organisms possible with necrotizing fasciitis in our setup which will give a guide on the most empirical treatment early in the course of the hospital stay rather than wait for the culture sensitivity reports.<sup>7</sup> Where the time is limited to wait for cultures. Sensitive pattern<sup>9</sup> also served the same purpose to be ahead and act promptly in reducing the overall mortality rate. This helped our surgical management better results.

This study thus enables our patients with NF to recover much faster and have less morbidity and mortality. And when compared to other studies reduced mortality rates.

## Conclusions

Necrotizing fasciitis is a common condition encountered in our setup and high degree of suspicion is required acutely swollen limb in a patient. A detailed wound care is essential in these patients as they are prone for more severe infection. An early extensive debridement is mandatory and key for a favourable outcome. And to start on broad spectrum antibiotics as soon as suspected necrotizing fasciitis<sup>10</sup> is advisable.

And to sum up in a patient with lower limb swelling, no foot care, hemodynamic instability and spreading lesion, start on piperacillin and an extensive debridement.<sup>11</sup>

Reassess after 48 hours and plan for a second surgery if wound not clean. Clean wounds continue dressing and discharge and follow up for dressing on OPD basis. Admit the patient if wound has satisfactory granulation tissue and repeat culture and plan for skin graft or secondary suturing.<sup>12</sup>

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