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To study the risk factors associated with necrotizing fasciitis in Himalayan region

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Abstract

Background: Necrotizing fasciitis (NF) is a severe skin and soft tissue infection that spreads rapidly through the deep fascia. If treatment is delayed, it can progress to a deadly soft tissue infection with a high mortality rate. Early diagnosis, immediate surgical debridement, and broad-spectrum antibiotic therapy were shown to be the most effective therapies for NF in terms of lowering death rates.

Methods: The approval from the institutional scientific review protocol committee and the ethical committee was taken. Written informed consent from the patient was also taken. The study was conducted in all the patients admitted with the diagnosis of necrotizing fasciitis in the department of general surgery at Dr. Rajendra Prasad Govt. Medical College & Hospital, Tanda for a period of one year from June 2018 to May 2019.

Results: Of a total of 60 patients with a diagnosis of NF, 23.3% were females and 76.6% were males. The incidence of NF was higher in males than in females. Out of 60 patients, 47 patients had risk factors whereas no risk factor was observed in 13 patients. Diabetes mellitus was the most common risk factor observed which was seen in 27 (45%) patients followed by age > 60 years seen in 18 (30%) patients. Alcohol abuse was seen in 11 (18.3%) patients. 5 (8.3%) patients had hypertension, 5 (8.3%) obesity, 4 (6.7%) CAD, 4(6.7%) COPD, 3(5%) patients PVD, 3 (5%) HIV, 2(3.3%) CRF, 2 (3.3%) patients hypothyroidism,

1(1.7%) patient paraplegia, 1(1.7%) Hansen's disease and 1 (1.7%) patient had CVA. 1 (1.7%) patient each of squamous cell carcinoma, tuberculosis, herpes zoster and leucocyte adhesion syndrome respectively. NSAIDs use present in 1 (1.7%) patient. 13 (21.7%) patients had no risk factor present.

Conclusion: From our study, we conclude that diabetes mellitus remains the single most important risk factor for the disease followed by advanced age.

Keywords: necrotizing fasciitis, risk factor

Introduction

Necrotizing fasciitis is not frequent but is a highly aggressive and lethal infection. Necrotizing fasciitis can be defined as an infection of any of the layers of skin and soft tissue i.e. subcutaneous tissue, superficial fascia and deep fascia which are associated with necrotizing changes. Jones in 1871 first described these infections and termed them as “hospital gangrene” [1]. Wilson coined the term “necrotizing fasciitis” in 1951 to encompass some of these infections [2].

Essential features of NF are widespread necrosis of fascia, subcutaneous fat, nerves, arteries, and veins. Skin and muscle layers are usually spared, though deep fascia may also be involved. Initially, when the disease process starts there is obliterative vasculitis with microangiopathic thrombosis at the leading edge of the lesion along with edema and inflammation, hyaline necrosis is also seen at the level of the skin and subcutaneous fat. As the disease progresses, liquefaction necrosis occurs at the tissue level. Fascia becomes swollen and exhibits dull grey discoloration. Necrotic bullae are seen in subepidermal space and subcutaneous fat necrosis is also seen. There is a dense neutrophilic rich inflammatory infiltrate. In the later stages, non-inflammatory coagulation and hemorrhage are present and ultimately myonecrosis may also develop. Strikingly in adjacent tissues, only a little inflammation is seen. The extensive tissue damage and gangrene caused by vascular thrombosis, as well as the systemic release of toxins and the deleterious consequences of excessive cytokine release, all lead to multiorgan failure and a high mortality rate [1].

Various risk factors have been implicated in the development of necrotizing fasciitis. The prevalence of diabetes mellitus in patients with any type of NF ranges between 40 to 60% [3]. Other common co-morbidities include age > 60 years, liver cirrhosis, chronic heart failure, obesity, alcohol abuse, immunodeficiency, systemic lupus erythematosus, pre-existing hypertension, chronic renal failure, coronary artery disease and peripheral vascular disease [4]. The use of nonsteroidal anti-inflammatory drugs (NSAIDs) or steroid treatments might suppress a fever, making the diagnosis of NF more difficult. [5]. As NF is a highly aggressive and lethal disease, the early prediction may lead to a better outcome and less morbidity. Hence, we studied the risk factors present in necrotizing fasciitis.

Material and method

The approval from the institutional scientific review protocol committee and the ethical committee was taken. Written informed consent from the patient was also taken. The study was conducted in all the patients admitted with the diagnosis of necrotizing fasciitis in the department of general surgery at Dr. Rajendra Prasad Govt. Medical College & Hospital, Tanda for a period of one year from June 2018 to May 2019.

The diagnosis of necrotizing fasciitis was made by intense pain, swelling, erythema, bluish or purplish discoloration, blisters, bullae, necrosis of skin and multiple patches expanded to the large area of

gangrenous skin. These local findings were supported by various features of systemic illness depending on the area of involvement. Which includes tachycardia, fever, intense thirst, dehydration, weakness and confusion. Patient's Vitals including pulse, blood pressure and temperature on the day of admission were recorded. Later, a thorough physical examination was performed.

Various risk factors responsible for necrotizing fasciitis were studied. Which includes diabetes mellitus, age > 60 years, alcohol abuse, hypertension, obesity, coronary artery disease, chronic obstructive pulmonary disease, peripheral vascular disease, NSAIDs use, chronic diseases and an Immunocompromised state.

Results

Sex distribution: Sixty (60) patients with necrotizing fasciitis were included in this study. Out of a total of 60 patients, 14 (23.3%) were females and 46 (76.6%) were males. The male to female ratio was around 3:1.

Table 1: Sex Distribution

Sex	Number of patients	Percentage
Male	46	76.6
Female	14	23.3
Total	60	100

Age distribution

The age of the patients ranges from 5 months to 70 years with a mean age of52.3± 13.81 years. Majority of the patients i.e. 18 (30%) were above 60 years of age followed by 16 (26.7%) of age groups 51-60 years, 11 (18.3%) of age groups 41-50 years,8(13.3%) of age 31-40 years, 6 (10%) of age groups 21-30 years.1(1.7%) of age groups for less than 10 years.

Table 2: Age Distribution

Age Group	Number	Percentage
<10	1	1.7
11-20	0	0
21-30	6	10
31-40	8	13.3
41-50	11	18.3
51-60	16	26.7
>61	18	30
Total	60	100

Clinical manifestations

Pain, erythema, swelling and bluish discoloration of the affected area was present in all 60 (100%) patients. Necrosis was seen in 57(95%) patients. Brownish Discharge was seen in 52 (86.7%) patients. Vesicles and bullae were present in 36(60%) patients. Tachycardia, fever and intense urge to thirst was seen in 24 (40%), 23 (38.3%) and 17 (28.3%) of patients respectively. Tachypnoea, dehydration, altered mental state were present in 13 (21.7%), 12 (20%) and 11 (18.3%) patients respectively. Decreased urine output and crepitus were seen in 9 (15%) and 6 (10%) patients respectively. 3 (5%) patients were having diabetic ketoacidosis.

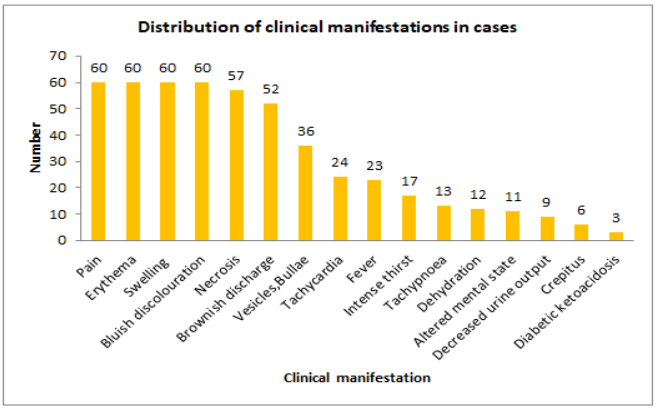

Figure 1: Clinical Manifestations

Risk factors

Out of 60 patients, 47 patients had risk factors whereas no risk factor was observed in 13 patients. Diabetes mellitus was the most common risk factor observed which was seen in 27 (45%) patients followed by age >

60 years seen in 18 (30%) patients. Alcohol abuse was seen in 11 (18.3%) patients. 5 (8.3%) patients had hypertension, 5 (8.3%) obesity, 4 (6.7%) CAD,4 (6.7%) COPD, 3(5%) patients PVD, 3 (5%) HIV, 2(3.3%) CRF, 2 (3.3%) patients hypothyroidism, 1(1.7%) patient paraplegia, 1(1.7%) Hansen's disease and 1 (1.7%) patient had CVA. 1 (1.7%) patient each of squamous cell carcinoma, tuberculosis, herpes zoster and leucocyte adhesion syndrome respectively. NSAIDs use present in 1 (1.7%) patient. 13 (21.7%) patients had no risk factor present.

Table 3: Risk Factors (n=60)

Risk Factors	Present	Percentage
Diabetes Mellitus	27	45
Age >60 yrs	18	30
Alcohol abuse	11	18.3
Hypertension	5	8.3
Obesity	5	8.3
Coronary artery disease	4	6.7
Chronic obstructive pulmonary disease	4	6.7
Peripheral vascular disease	3	5
HIV	3	5
Chronic renal failure	2	3.3
Hypothyroidism	2	3.3
Paraplegia	1	1.7
Hansen’s disease	1	1.7
Cerebrovascular accident	1	1.7
Squamous carcinoma foot	1	1.7
Tuberculosis	1	1.7
Herpes zoster	1	1.7
Leucocyte adhesion syndrome	1	1.7
NSAIDs Use	1	1.7
No-Risk Factors	13	21.7

Discussion

NF is important surgical urgency with a high mortality rate, even with sufficient treatment, with the reported rate of mortality varying from 6% to 36%. Various studies have reported a higher incidence of NF in males than in females ranging from 60% to 85% in males and 20% to 40% in females [6-9]. Similarly in our study, the incidence of NF was higher in males than in females. Males comprised 76% and females comprised of 24%. We also observed that the incidence of NF was 30% in the age group above 60 years and 26% in the age group between 50 to 60 years. The majority (56%)

of our patients were above 50 years of age. Incidence of NF is higher in the older age group as reported previously [10, 11]. The higher incidence of NF in older age groups could be due to the reason that elderly people suffer from various comorbid conditions like hypertension, coronary artery disease, chronic obstructive pulmonary disease, cerebrovascular accident and diabetes mellitus which are a risk factor for NF.

Various studies have reported that initial signs and symptoms of NF are intense pain, swelling, tenderness, erythema, bluish or purplish discoloration, tachycardia, bullae formation and fever [12-15]. If the condition is untreated, the clinical status deteriorates rapidly. All of the 60 patients of our study presented with pain, swelling, erythema, bluish discoloration of the affected area in 100% followed by necrosis in 95%, brownish discharge in 86.7%, vesicles, and bullae in 60% and crepitus in 10 %. The systemic features seen in our study were in the form of fever (38.3%), tachycardia (40%), intense thirst (28.3%), dehydration (20%), diabetic ketoacidosis (5%) and altered mental sensorium (18.3%).

NF is more prone to develop in immunocompromised patients with underlying medical conditions [16]. Necrotizing fasciitis patients have pre-existing comorbid conditions that act as risk factors and renders them susceptible to necrotizing fasciitis. The various comorbid condition acting as risk factors for NF are diabetes mellitus, age more than 60 years, alcohol abuse, hypertension, obesity, coronary artery disease, chronic obstructive pulmonary disease, peripheral vascular disease, HIV, chronic renal failure, cerebrovascular accident, malignancy, and immunocompromised state [11]. In our study, we have noted similar comorbid conditions in 78.3% of patients whereas in 21.7 % no risk factors were observed. Divakra et al have reported no risk factors in 24% of patients [11].

Diabetes mellitus (DM) has been blamed to be the commonly associated risk factor for NF due to impaired cellular immunity, higher blood sugar level acting as a good medium for bacterial growth and low tension of oxygen in the tissue in DM [17]. In our study, we also noted DM to be the commonest risk factor of NF in 45% of patients.

The studies have reported alcohol abuse disorder as one of the risk factor for NF and have proven that alcohol consumption, particularly chronic heavy drinking, affects all components of the immune system [7, 18, 19]. In our study, we observed the history of alcohol abuse in 18.3% of patients with NF.

Divakra SR et al in their study has also observed the relation of hypertension with NF [11]. 12% of patients in their study had hypertension as a comorbid condition. In our study, 5 (8.3%) patients of NF were suffering from hypertension.

Obesity increases the incidence of various skin infections viz: erysipelas, cellulitis, and necrotizing fasciitis [20]. Das et al in a study from New Zealand revealed obesity as a risk factor for NF and was seen in 18.9% in European, 34% in Maori and 23.3% in pacific people [10]. In our study, we observed obesity as a risk factor for NF in 5 (8.3%) patients.

Various studies showed coronary artery disease to be present as a risk factor for NF in 2-15% of the patients [6, 21, 22]. In our study, coronary artery disease was seen as a risk factor for NF in 6.7% of patients.

Several factors contribute to the pathogenesis of necrotizing fasciitis in herpes zoster. The vesicle

creates a full-thickness dermal lesion that provides a route for bacteria to spread from the skin surface into the subcutaneous tissues. In our study, herpes zoster as a risk factor for NF was present in 1.7% of the patients.

NSAIDs use causes inhibition in adherence to neutrophils and decrease in prostaglandin synthesis thus predisposing patients to increase in necrotizing fasciitis. Along with that, NSAIDs induced suppression of signs and symptoms of inflammation leads to delay in the diagnosis [23-25]. In our study, the use of NSAIDs was present as a risk factor for NF in 1.7% of patients.

AG. Angoules et al found chronic renal failure as a risk factor in 3% of the patients [19]. In our study chronic renal failure was present in 3.3% of patients having necrotizing fasciitis.

COPD was found to be associated with 8.3% of NF patients, and HIV associated with NF was found to be 6% [19, 26]. In our study, the incidence of COPD and immunosuppression (HIV) was 6.7% and 5% respectively.

In our study, the association of peripheral vascular disease was seen in 5% of the patients which was 3.1% as reported by Kalavaini et al in a retrospective cohort [27].

Conclusion

Necrotizing fasciitis is one of the highly aggressive and lethal infection. It can progress rapidly and cause significant destruction of soft tissues. From the above study, we conclude that diabetes mellitus remains the single most important risk factor for the disease followed by advanced age.

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