Clinical Features and Microbiological Profile of Necrotizing Fasciitis at a Tertiary Care Centre

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Cutaneous gangrene is not only the clinical diagnostic sign, but also fascial necrosis is a constant feature. It is usually accompanied by the systemic inflammatory response syndrome and needs prolonged intensive care treatment.

The overall incidence of NF has been estimated as 0.24-0.4/100,000 adults. In South East Asian countries, it is associated with 30-70% mortality despite advancement in therapy.

According to the microbiological characteristics, NF is classified as follows: Type 1 (polymicrobial) and Type 2 (monomicrobial), the former being more common. Type I NF also known as synergistic NF is a mixed infection caused by anaerobic, aerobic, and facultatively anaerobic Gram-positive and Gram-negative bacteria. Most of the pathogens originate from the bowel flora e.g., Escherichia coli, Pseudomonas spp., Bacteroides spp., and Vibri spp. Risk factors include immune compromise, recent surgery, and underlying abdominal pathology including malignancy.

Type II NF is usually monomicrobial and due to Gram-positive organisms. The most common pathogen causing Type II NF is Staphylococcus aureus. Antimicrobial resistance is common, necessitating the need for prompt and accurate diagnosis and treatment.

Conclusion: NF has varied presentations as shown by this study with predominant symptoms of tenderness and edema. Good results can be obtained by adopting a multidisciplinary approach along with prompt diagnosis and surgical care in hospital settings, health education, and awareness about dreaded complication of this disease.

Key words: Culture, Diabetes mellitus, Necrotizing fasciitis, Pseudomonas, Wound
NF is Group A β-hemolytic Streptococcus either alone or in combination with other species, usually Staphylococcus aureus. Cases of NF without a recognized precipitating factor are more likely to be due to streptococcal infection or, more recently, due to community-acquired methicillin-resistant staphylococcal infection. The earliest clinical feature common to all types of NF is exquisite pain, often out of proportion to any visible skin changes. This is due to the occlusion of perforating nutrient vessels with resultant nerve infarction. Pain progresses until the nerves supplying the skin are destroyed resulting in anesthesia of the affected areas. Early clinical suspicion and surgery are the keys to improving survival, and patients with necrotizing infections need an integrated multidisciplinary approach to management. It is adjusting with the infecting organism, the site of infection, and the effects from any toxins produced, and incorporating various clinical and laboratory parameters.

MATERIALS AND METHODS

Source of Data
This study was conducted comprising 50 patients of NF in Department of General Surgery and Microbiology at Katihar Medical College, Katihar (Bihar) for a period of 9 months between 2015 and 2016.

Inclusion Criteria
1. Patient has organisms cultured from tissue or discharge from affected site
2. Patient has purulent drainage at affected site
3. Patient has an abscess or other evidence of infection seen during surgical debridement
4. Patient has at least 2 of these signs or symptoms at the affected site with no other recognized cause: Localized pain or tenderness, redness, swelling, or heat.

Collection and Processing
Wound swab from all patients diagnosed to have NF was collected after surgical debridement. Blood culture (2 sets preferably) were done if there was any signs of bacteremia. The tissue was homogenized under sterile conditions and was cultured on blood and McConkey agar. The culture plates were incubated overnight at 37°C for aerobic growth. Bacterial growth was identified by the biochemical test and the resistance pattern by disc diffusion method according to Clinical and Laboratory Standards Institute guidelines. The tissue sample or the wound swab was inoculated immediately after collection in Robertson's cooked meat media for further anaerobic culture and identification. Variables that were examined included age, sex, mode of presentation, site/location of infection, co-morbid illness, etiological factors, admitting diagnosis, investigations, microbiological characteristics, antibiotic sensitivity, and the treatment outcome.

Methods of Collection of Data
- Detailed history taking
- Clinical examination
- Investigations (routine laboratory investigation)
- Relevant special investigations
- Conservative management with meticulous dressing and if needed major surgical interventions with its outcome.

RESULTS

Age
Out of 50 cases studied, the youngest patient was 30 years of age and oldest was 79 years. The highest number of cases was found in the age group 51-60 years (36%), followed by 41-50 years (28%) (Table 1).

Sex
Out of the 50 cases studied under this series, the majority of the patients were male 46 (92%) and the contribution of female patients was 4 (8%) (Table 2).

Sites of Involvement and Number of Patients Affected
Lower limb was the most common site of involvement which was predominantly seen in calf region followed by involvement of both calf and foot (Table 3).

Risk Factors
Diabetes mellitus was the most common risk factor present in majority of the cases of NF (44%), followed by increasing age more than 60 years (24%). Hypertension was present in 10% of the cases. No identifiable risk factor was present in 12% of the cases (Table 4 and Figure 1).

Clinical Features
Tenderness was present in majority of the patients (94%) followed by edema (74%). Other features present were erythema of skin, woody hard texture of skin, skin vesicles and bullae, hypotension, fever, tachycardia, and altered mental status.

Culture
Culture in 38 patients (76%) showed positive growth, while no growth was present in 12 patients (24% of cases). Among culture positive patients, monomicrobial growth was present in 46% cases which were slightly more than patients with polymicrobial growth (30%) (Figure 2).
Microorganisms Isolated

Among the polymicrobial growth (30%), organisms isolated were a combination of Gram-positive organisms such as *S. aureus*, *Enterococcus faecalis*, and *Streptococcus pyogenes* and Gram-negative bacteria such as *E. coli*, *Pseudomonas aeruginosa*, *Klebsiella pneumonia*, and *Proteus vulgaris*. *P. aeruginosa* (46.67%) was the most common organism isolated among polymicrobial growth. While among the monomicrobial growth (46%), the most common organism isolated was *S. aureus* (43.48%), followed by *Klebsiella* (21.74%), while other organisms being *Pseudomonas*, *E. coli*, and *Streptococcus*. No growth was detected in 12 patients (24%).

Antimicrobial Sensitivity Testing

Among the antibiotic susceptibility pattern of isolates, maximum resistance pattern was found to cefixime and cotrimoxazole. Organisms were mostly sensitive to amikacin, gentamicin and ofloxacin. Also organisms were moderately sensitive to amoxicillin and clavulanic acid (Co-amoxyclyl).

**DISCUSSION**

Being a surgical emergency with a high degree of morbidity and mortality, NF requires early recognition and aggressive debridement to avoid sepsis and subsequent death from it. Most of the studies have reported a mortality rate of 30-70%. NF has affected wide age group, but most commonly affected age of presentation was between age group 51 and 60 years (36%) and minimum in young age group of 21-30 years (2%) in our study. The incidence being more common male gender by far. The reason for male gender was most of them being agriculturist who used to work in field for long time and ignoring minor pricks and trauma leading to larger infected wound. Other associated
reason being lack of education, unhygienic environment, and lack of access to healthcare facilities in rural area. Among the sites involved, the most common site of involvement was the calf region (56%) followed by foot (14%). Diabetes mellitus was the most common risk factor present in majority of the cases of NF (44%), followed by increasing age more than 60 years (24%). These patients usually have a pre-existing disease which increases the susceptibility to infection. Most common ones are diabetes mellitus, age >60 years, hypertension, and chronic renal failure. Other factors being chronic liver disease and HIV infection. A number of co-morbidities are associated with NF. Clinicians should have a higher index of suspicion when patients with diabetes or liver cirrhosis present with cutaneous infection.\(^\text{13}\)

Diabetes mellitus was the most common risk factor present in majority of the cases in our study of NF (44%), followed by increasing age more than 60 years (24%). The presence of diabetes mellitus as the most common predisposing risk factor in our study is also consistent with other studies.\(^\text{12,13}\)

Culture in 38 patients (76%) showed positive growth, while no growth was present in 12 patients (24%) of cases. Among culture positive patients, monomicrobial growth was present in 46% cases, which was slightly more than patients with polymicrobial growth (30%). In a study conducted by Goh \textit{et al}., the overall positive wound culture rate was 76.5% which is very similar to our study.\(^\text{13}\)

In this study, among the polymicrobial growth (30%), organisms isolated were a combination of Gram-positive organisms such as \textit{S. aureus}, \textit{E. faecalis}, and \textit{S. pyogenes} and Gram-negative bacteria such as \textit{E. coli}, \textit{P. aeruginosa}, \textit{K. pneumonia}, and \textit{P. vulgaris}. \textit{P. aeruginosa} (46.67%), was the most common organism isolated among polymicrobial growth. While among the monomicrobial growth (46%), the most common organism isolated was \textit{E. coli} and \textit{Streptococcus} (43.48%), followed by \textit{S. aureus} (34.78%) and \textit{Klebsiella} (13.01%) while other organisms being \textit{Pseudomonas}. No growth was detected in 24% of cases. Organisms common in polymicrobial infections in other studies were: \textit{Staphylococcus} spp., \textit{Streptococcus} spp., \textit{Bacteroides} and \textit{E. coli}.\(^\text{16-18}\) Among monomicrobial infections, \textit{S. pyogenes} was found in the study by Nisbet \textit{et al}.;\(^\text{19}\) \textit{S. aureus} was reported by Huang \textit{et al}.\(^\text{20}\) In a study conducted by Mathew \textit{et al}., 55.6% were monomicrobial and 44.4% were polymicrobial growth. Most common organism isolated was \textit{P. aeruginosa} (23%) among polymicrobial growth followed by \textit{K. pneumonia} (16%) and \textit{S. aureus} (16%).\(^\text{21}\) \textit{E. coli} and beta hemolytic \textit{Streptococcus} is also reported to be an important cause of monomicrobial infection (45.6%) in NF in other studies.\(^\text{12}\)

Among the antibiotic susceptibility pattern of isolates, maximum resistance pattern was found to cefixime and co-trimoxazole. Organisms were mostly sensitive to amikacin, gentamicin and ofloxacin. Also organisms were moderately sensitive to amoxicillin and clavulanic acid (Co-amoxiclav). Control of diabetes with oral hypoglycemics and insulin, treatment of various co-morbidities, use of appropriate antibiotics, and surgical debridement along with skin grafting and amputation wherever needed were the various modalities of treatment employed in these patients.

\textbf{CONCLUSION}

NF is a rapidly progressive disease with systemic toxicity and proves to be fatal if not treated. It is a surgical emergency, so requires aggressive approach. The presence of the infection should be determined by clinical findings and appropriate wound cultures and thus treatment should be based on culture reports. Sometimes culture reports are negative and in such cases molecular techniques may help in identifying microorganisms and thus helps in treatment. Patient education, proper care of feet, and a multidisciplinary approach is essential for patients with NF.

\textbf{REFERENCES}

Muni, et al.: Clinical Features and Microbiological Profile of Necrotizing Fasciitis at a Tertiary Care Centre


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