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A STUDY IN MICROBIOLOGICAL PROFILE OF NECROTISING FASCIITIS IN NON-DIABETIC PATIENTS

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ABSTRACT

Background: Human beings are generally well build, well-nourished and well cared, in general terms they are otherwise healthy. Metabolic diseases are more common during maturity of age. Diabetes is one of the most common metabolic disease prevailing and is recently in the raising side of the curve. Though Diabetes is a metabolic disease, it's a state of immune compromise. Generally Necrotising Fasciitis is most common in diabetic patients. It is also called as flesh eating disease. For a non-diabetic otherwise healthy individual, getting Necrotising Fasciitis is quite rare. **Materials and Methods:** The key aim of this study is to identify the most common and prevalent causes for organisms responsible for Necrotising Fasciitis in Non-Diabetic patients. In this study, 50 patients presenting with painful swelling in the leg with / without blisters or ulcers to the Department of General Surgery, SBMCH were selected, segregated, Prepared and treated, following which serial wound swabs were taken from the wound site and studied. **Results:** The most common organism grown is gram negative rods and gram positive cocci. Streptococcus pyogenes followed by proteus mirabilis were the most common organism. Methicillin sensitive Staphylococcus aureus were also grown in common. Piperacillin tazobactam and 3rd generation cephalosporins were the sensitive antibiotics and are also the choice of empirical antibiotics. **Conclusion:** It has been concluded that poor wound care, local application of

native medicine and low socioeconomic state can be the cause of Necrotising Fasciitis but under strict asepsis during perioperative period along with rational use of antibiotics to prevent the development of resistance and proper wound care, this can be treated

Keywords: Necrotising Fasciitis, antibiotics sensitivity, wound care

INTRODUCTION

Necrotising Fasciitis is the spreading infection and inflammation of the skin, deep fascia and soft tissue with extensive tissue destruction and toxemia, often due to mixed infections like anaerobes, coliforms, gram-negative organisms. On hospitalisation, proper wound care is provided mostly surgical debridement is done followed by daily dressing, if necessary continuous negative pressure wound therapy was given, once no growth was ensured in culture and sensitivity, SSG was proposed and planned. This study aims at organism involved in Necrotising Fasciitis in the non-diabetic patient. A Study in Microbiological profile of Necrotising Fasciitis in Non-Diabetic Patients. To assess antibiotics sensitivity and their rational usage.

METHODS & MATERIALS

Patient selection: Patients presenting with features of cellulitis, with / without necrotic patch. The main criteria of patient selection are they should not be diabetic at present or previously diabetic now under adiabatic state.

Patients with above criteria are selected; hospitalisation was advised and done,

extensive wound debridement done under anaesthesia, followed by serial wound dressing and debridement as and when required. Once healing and asepsis is ensured patient is proceeded with continuous negative pressure wound therapy (CNPWT) until healthy granulation tissue fills the void. Once all set split skin grafting is done.

Sample size: 50 patients

Study area: Department of General Surgery, SBMCH, Chennai, Tamil Nadu, India.

Inclusion criteria:

- Age 25 to 45 years
- Mode of onset
- Non Diabetic state

Exclusion criteria:

- Presence of Diabetes Mellitus – I / II

Methodology: It was a prospective study. 50 patients presenting with Necrotising Fasciitis were subjected to following routines:

- I. Elaborate history of patient
- II. Complete General examination

- III. Complete Systemic examination
- IV. Complete examination of the affected region
- V. Routine investigations and X-ray of the affected limb

Once all the above routines of hospitalization and case management protocols, patient is taken up for surgical debridement under anaesthesia depending on the condition and site of the lesion. On hospitalization 1st wound swab will be taken, following which an empirical antibiotic therapy was initiated. Following surgical debridement, serial dressing and wound care is given. In the meantime swab is sent for culture and sensitivity once in 7 days to ensure there is no growth, and decrease in the bacterial colony.

A consecutive swab was taken if there is increased slough, even after 2 debridements, purulent discharge persists and if myonecrosis spreads. On all these circumstances a 2nd or 3rd swab is warranted.

Wound Swab Collection: wound was thoroughly washed with 500ml of Isotonic Normal saline, followed by wash with 300ml Metronidazole 1500mg. 1st and 2nd wound swab was taken from the deep tissues and sent for Microbiological testing. Last swab was taken prior to SSG, to ensure nil growth before graft placement.

Types of Necrotising Fasciitis: Based on the organism isolated, Necrotising Fasciitis can be classified as per **Table 1**.

Table 1: Types of Necrotising Fasciitis	
Types of Necrotising Fasciitis	Organism isolated
Type I	Polymicrobial
Type II	Monomicrobial
Type III	Gram Negative Rods / Bacteriodes
Type IV	Fungal

RESULTS

Males were predominant in this prospective study accounting 62% and the rest 38% were females presenting with Necrotising Fasciitis (**Figure 1**). Patients presenting were mostly within age group as in inclusion criteria, hence the study is not altered by the age factor. Mode of injury, previous medical history and on-going treatment history plays a pivotal role in this

study. In this prospective, single centre study most of the organisms occurring in Necrotising Fasciitis were gram negative rods and gram positive cocci. Polybacterial growth was 70%, monobacterial growth was 25%, fungal growth was 3% and No growth was 2%. Streptococcus pyogenes was the predominant species showing 27% growth (**Figure 2**).

Initially most of the Gram negative rods are sensitive to Penicillin group of drugs, due to irrational usage of antibiotics; they show resistance to most of the antibiotics, with increased virulence.

In our study Methicillin sensitive *staphylococcus aureus* showed 4% of the grown culture. Initially we expected MRSA to be the major grower in the culture, MRSA was on a raising trend accounted for only 3% in our study, on view of this raising trend dressings were done under utmost sterile conditions.

Other gram negative organism grown during this study in the given sample size like *Proteus mirabilis* 17%, *Bacteriodes* 15% and *E.coli* 11% (**Table 2**). These were treated meticulously with appropriate antibiotics and proper Post debridement wound care.

In our study we encountered fungal growth also 3% (**Figure 3**), though fungal cause of Necrotising Fasciitis is also possible and rare, we delineated our study only pertaining to Bacterial causes. Our fungal c/s was mainly for statistical purpose and to confirm the possibilities of fungal cause, which was more evident now.

Antibiotic Sensitivity:

In our study the most common causative organism of Necrotising Fasciitis in non-diabetic study group was streptococcus pyogenes. These organisms are mostly

sensitive to 3rd generation Cephalosporins and Glycopeptide group of antibiotics.

2nd commonly occurring organism in our study was *Pseudomonas*. These are mostly sensitive to Aminoglycoside group of antibiotics such as amikacin, high dose of gentamicin and Carbapenems like Meropenem / Imepenem.

All the organism showed variable resistance to Quinolones, Colistin, Amoxicillin clavulanate and Erythromycin. In our study we tried two antibiotics regimen, this includes 1 highly sensitive antibiotics combined with 1 moderately sensitive antibiotics, thus enabling us to control the Polymicrobial growth in our wound, which in turn provided us with better results and prognosis.

One of the key milestones is identifying a fungal colony in our wound swab. Thus it helped us to conclude and confirm, Necrotising Fasciitis can not only be caused by bacteria alone, and it can also be caused by fungi. Patients with fungal growth showed good improvement with intravenous Amphotericin B.

MRSA (Methicillin Resistant *Staphylococcus aureus*) is always a pathogen of concern. These are sensitive to vancomycin, linezolid and doxycycline. These have shown resistance to clindamycin, penicillin group of drugs and Macrolides.

All antibiotics were given intravenously, only after test dose. Prior to administration Renal function of the patients were assessed. Few combinations we tried in our patients which yielded better results are

Glycopeptides combined with Aminoglycosides, Carbapenem's combined with Metronidazole / Quinolones. Piperacillin Tazobactam combined with Aminoglycosides, thus controlling the Polymicrobial proliferation.

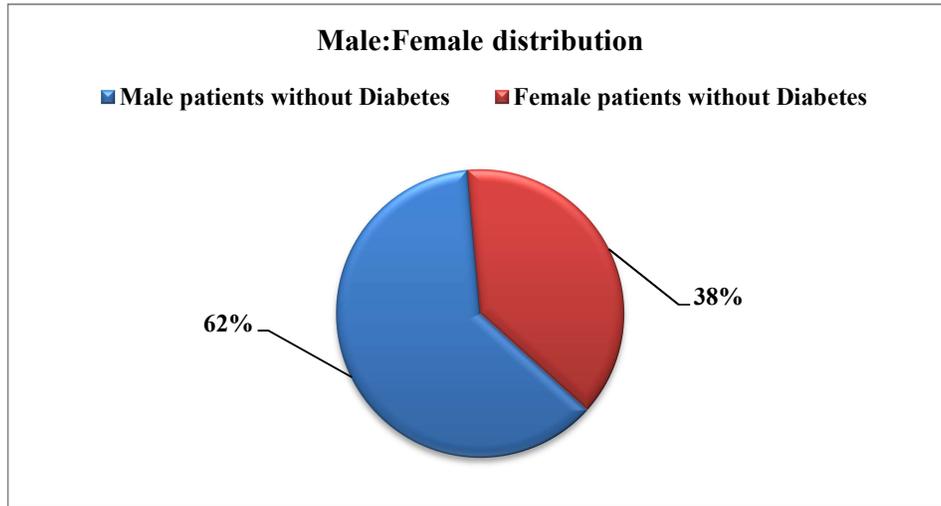


Figure 1: Male: Female distribution

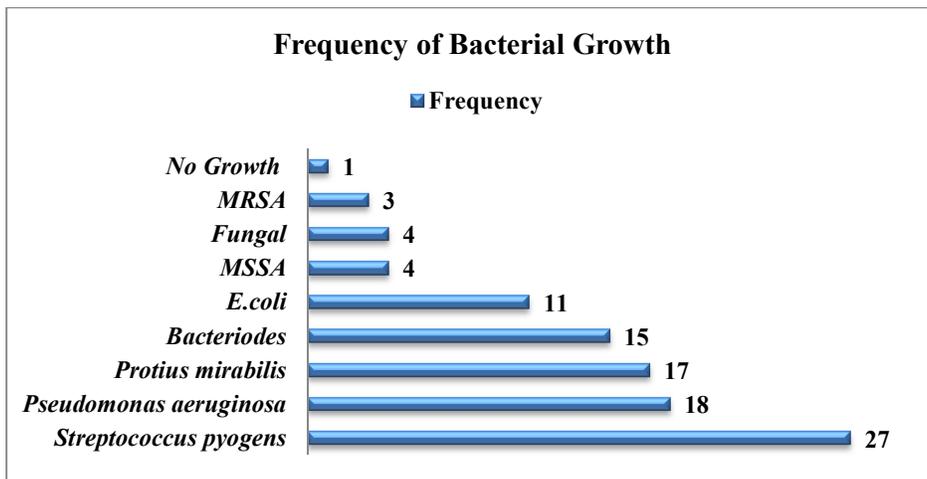


Figure 2: Frequency of Bacterial Growth

Organism	Frequency	Percentage (%)
No growth	1	1
MRSA	3	3%
Fungal	4	4
MSSA	4	4
E.coli	11	11
Bacteriodes	15	15
Proteus mirabilis	17	17
Pseudomonas aeruginosa	18	18%
Streptococcus pyogens	27	27
Total	100	100

Table 3: LRINEC scoring system	
C-Reactive protein	More than 150mg/L
Total Count	More than 25,000 cells / cubic mm
Hemoglobin	Less than 11
Serum Sodium	Less than 135 mEq / dl
Serum Creatinine	More than 1.6
Blood Sugar	More than 180mg / dl
Each one is given a score of 2 or 0 >8 is severe, 6-8 is moderate, <6 is good	

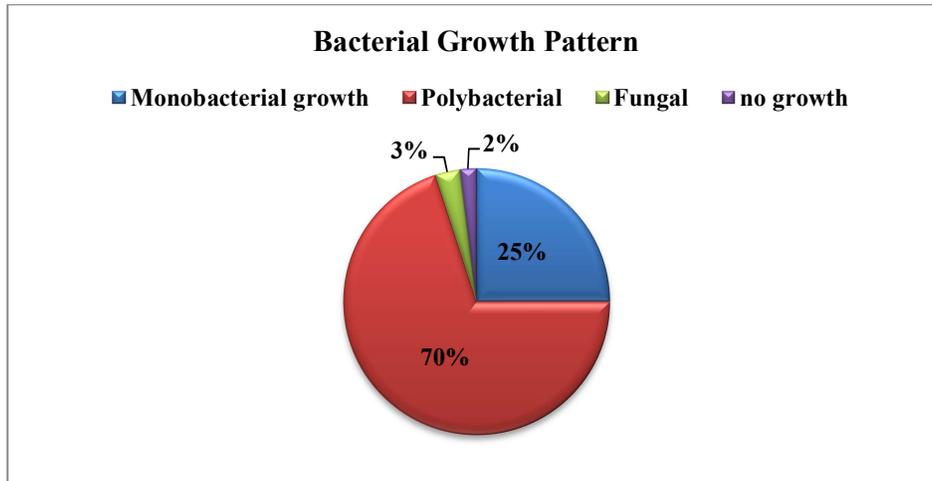


Figure 3: Bacterial Growth Pattern

DISCUSSION

Necrotising Fasciitis results from a Polymicrobial, synergistic infection which can be seen in anywhere in our body. It is most common among the diabetic fraternity. In our study we have taken a non-diabetic group as this trend is seen rising.

The most common cause of non-diabetic Necrotising Fasciitis are Smoking, penetrating trauma, pressure sores, immunocompromised state (acquired / Medically induced), intravenous substance abuse, skin infection.

In our study we used LRINEC (Laboratory Risk Indicator for Necrotising Fasciitis)

scoring system to assess the severity (Table 3).

All the patients come to our OPD with delayed presentation, after failed home remedies. Clinical features include pain, swelling and oedema of the region, discoloration with necrotic patch, foul smelling discharge, high grade fever, hypotension, oliguria with features of AKI, rapid spread in short period of time are few of the most commonly presented symptoms.

Once patient is hospitalized,

- Wide bore IV cannula 18g is fixed and IV fluids are started, this helps to wash out the toxins in blood and

helps in recovery of AKI and dehydration.

- Blood investigations such as complete hemogram, renal function test, liver function test, serum electrolytes, urine routine and blood grouping and typing are sent.
- Wound swab is also sent for culture and sensitivity, following with empirical antibiotics is started based on the trending sensitivity pattern.
- LRINEC scoring is done, if score is more than 8, patient is taken up for extensive surgical debridement under anaesthesia as an emergency.
- Catheterization is done and hourly urine output is monitored to assess the renal function,

The virulent infection causing organism produces substances such as haemolysin, proteases, collagenases and short chain fatty acids, which slow down or inhibit the wound healing process and leads to chronic infection and non-healing deep seated ulcer. Resistant organism causes more rapid tissue destruction and sometimes might lead to amputation.

We at SBMCH, after thorough assessment of the patient, advice the proper in-hospital wound care management protocol. 1st wound swab is collected and sent for study, in the meantime empirical antibiotics were started. Based on the wound status once /

twice / thrice a day wound care is advised. During each wound care routine the areas are sprayed with 10% Lignocaine, following which wound is washed with 500ml of isotonic normal saline solution, followed by 300ml of Metronidazole 1500mg solution. If sloughed tissue is present, they are removed and debrided. If extensive slough is present, chemical debridement is opted. This routine is followed until there is healthy granulation bed formed and the raw area is ready to receive an autologous split skin graft.

Empirical antibiotics were selected based on clinical features, disease severity and local antimicrobial resistance patterns. Empirical antibiotics are continued or modified based on sensitivity response.

In our study there was 95% response in 70% of the patients.

Most of Necrotising Fasciitis was Polymicrobial in this study, but because of improper antibiotic exposure without assessing sensitivity few organisms were killed resulting in monomicrobial growth which are resistant to low level narrow spectrum antibiotics used as empirical antibiotics in the past. At present there is a shift in choosing empirical antibiotics from quinolones to 3rd generation cephalosporins.

The most interesting part of our study is we encountered 3 cases. They are 15 days post

coronary artery bypass grafting for Triple vessel disease. They all had Necrotising Fasciitis in their vessel donor site, all they presented was fever with redness around the donor site.

The most common organism occurred in this study is *Streptococcus Pyogens* followed by *Pseudomonas aerogenosa* and *Proteus mirabilis*. Gram negative organisms occurred more frequently than gram positive organisms and are more virulent.

JPY Cheng, *et al.* concluded that Necrotising Fasciitis is more common in the extremities, in which lower limbs are more frequently involved with an exception of hand craft workers, for whom upper limbs are more frequently involved. This is correlated in our study.

MS Morgan, *et al.* described multiple drug resistant organism (MDRO) were extremely common in hospitalized patients and also emphasized combined antibiotic regimen along with Hyperbaric oxygen therapy and Intravenous immunoglobulin therapy, which is also correlated in our study

Dr Lazzeri, *et al.* described a case of periorbital Necrotising Fasciitis, which we uncountered during our study, a patient following an RTA went to a general practitioner who treated him, he had a abrasion in the temporal aspect of his orbit, which was left unattended, which got

infected and turned into a periorbital Necrotising Fasciitis, and was successfully treated.

Proper identification and treatment of minor lesions like removing of abrasions, needle prick injuries, thorn prick injuries, RTA's with minor trauma with proper use of topical and oral antibiotics for initial stages is essential in prevention of full blown Necrotising Fasciitis.

In addition to all the preventive measures, when a Necrotising Fasciitis presents, proper in hospital wound care is advised. Chain of sterility is maintained throughout the dressing period.

CONCLUSION

It has been concluded that poor wound care, local application of native medicine and low socioeconomic state can super add the cause Necrotising Fasciitis but under strict asepsis during perioperative period along with rational use of antibiotics to prevent the development of resistance and proper wound care, this can be treated.

By our study we conclude the most common organism occurring in the Necrotising Fasciitis in non-diabetic patients are gram negative rods and gram positive cocci, being sensitive to Glycoprotein antibiotics such as Vancomycin, 3rd Generation cephalosporins. Through this study we delineate the usage of broad spectrum

antibiotics as first line of treatment in Necrotising Fasciitis. Along with all this proper wound care, rational usage of antibiotics, proper debridement Necrotising Fasciitis has good prognosis and minimal scar tissue.

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