

Original Article

Clinical & Microbiological profile of Fournier's Gangrene in a Tertiary Care Hospital in Bangladesh : A prospective observational study

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Abstract

Background: Fournier's gangrene is the necrotising fasciitis of the genitalia and perineum, with associated poly microbial infection. Evidence based data in the very recent years suggest that it is associated with significant and potential risk of organ failure or death.

Aim: This study was designed to be conducted among the patients suffering from Fournier's gangrene with a view to assess the probable prevalence rate of potentially adverse clinical consequences during course of treatment, overall mortality and to observe the microbiological pattern in our surgical practice.

Method & materials: This cross sectional study was conducted among the 69 patients of Fournier's gangrene in BIRDEM General Hospital, Dhaka, Bangladesh from Jan 10.2013 to Sept 01 .2016, using the purposive sampling method.

Results: The results of this study reflects that majority (43.4%) of the study population were in 51 to 60 years age group (Mean age 43 ± 1.7 years) in study population. By using the Laboratory Risk Indicator for Necrotizing Fasciitis (LRINEC) score, it was found that in most of the patients (approx 56.5%), a suspicious score ranging 06-08 was observed and only in 10.1% patients, a specific score of ≥ 08 was observed. In 27.5% patients systemic complications like DIC, ARDS, MODS, MSOF and severe sepsis were observed in 1.4%, 4.3%, 10.1%, 4.3% and 5.7% cases respectively. Mortality rate was approximately 4.3%. Majority (84.1%) of the patients were associated with type 1 (Polymicrobial) bacterial infection, whereas in case of 15.9% patients, it was associated with type 2 (Monomicrobial) infection. *Escherichia coli* was the most frequently observed micro-organisms associated with approximately 39.1% of all cases. *S. aureus*, *Staphylococcus pyogenes*, *Enterococci species*, *E.coli* and *Pseudomonas species* were recorded to be associated with 17.4%, 27.5%, 21.7%, 39.1 and 10.1% cases respectively.

Conclusion: This study suggests that Fournier's gangrene is associated with significant systemic complications. Poly microbial infections are most predominant and *E coli* infection was commonest organism involved.

Keywords: Fournier's gangrene, sepsis, microbial profile.

Introduction:

Fournier's gangrene is an uncommon, rapidly progressive infection of the male external genital, perineal and perianal regions with occasional cranial extension to the abdominal wall. It is characterized by a synergistic, necrotizing fasciitis (NF) leading to the thrombotic occlusion of small subcutaneous vessels and the development of gangrene¹.

There are two types of Fournier's gangrene such as Type I and II^{2,3}. The majority of patients with Fournier's gangrene are immunocompromised and thus the primary wound might have been minor or might have arisen from an otherwise uneventful surgery^{3,4}. Diabetes mellitus, malignant disease, obesity, peripheral vascular disease, local trauma, urethral stricture and perianal disease have been cited as the main predisposing factors⁵. Early diagnosis, supportive measures and the use of broad-spectrum antibiotics with prompt and aggressive surgical debridement remain the cornerstone of management⁶. In spite of recent advancements in management, mortality is still high and averages 20-30 percent⁴.

NF is a rapidly spreading, inflammatory infection of the deep fascia, associated with secondary necrotic changes of subcutaneous tissue⁷. It is perhaps the most aggressive form of necrotizing soft tissue infection⁸ and can spread rapidly to entire limb within hours⁹. The first description of NF was given in the fifth century B.C by Hippocrates¹⁰. In 1921, Wilson coined the term "NF" which aptly describes its pathologic process¹¹. Many other terminologies are used to describe same disease process such as Fournier's gangrene (perineum), phagedena gangrene, bacterial synergistic gangrene, and Meleney's gangrene (abdominal wall)¹².

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At the initial stages of presentation, it has a paucity of clinical signs and is difficult to differentiate it from cellulitis. A high index of suspicion is needed to diagnose it. According to the microbiological characteristics, NF is classified into Type 1 (synergistic polymicrobial infections including anaerobes) and Type 2 (mono microbial infections), the former being more common^{13,14}. The most common mono microbial infection causing organisms include Beta-hemolytic *Streptococcus*, *Staphylococcus aureus*, and *Clostridial* species. Common poly microbial synergistic infection causing organisms includes *S. aureus*, *Staphylococcus pyogenes*, *Enterococci* species, *Escherichia coli*, *Pseudomonas* species, and anaerobic organisms such as *Bacteroides*^{15,16}.

The precise pathogenesis of Fournier's gangrene is unclear. Inoculation of microbes can occur through minor trauma, snake or insect bite, surgical incisions, etc. Under favorable environmental conditions such as immune compromised states, diabetes mellitus, liver failure and renal failure, organisms multiply to cause disease process etc.^{17,18}. The process of NF in first starts in deep tissue plane, so superficial skin signs may not be evident initially. This usually leads to a delayed diagnosis of this condition. Many patients present with toxic features due to sepsis without any/minimal underlying signs. Later, they may develop edema, tenderness, vesicle, bullae, and crepitus^{17,19}.

NF in general is usually diagnosed by clinical features, but other investigations may help to confirm it. Plain X-ray may show subcutaneous gas. Computed tomography scan and magnetic resonance image may show asymmetrical fascial thickening, fat stranding, and gas tracking along fascial planes¹⁸. Tissue biopsy reveals necrosis, polymorph nuclear infiltration and thrombosis of vessels. The management includes initial resuscitation, supportive care, adequate control of risk factors such as blood sugars; extensive debridement which may have to be repeated, intravenous antibiotics, and occasionally radical procedures such as amputations¹⁷.

The mortality rates of NF have remained alarmingly high with reported mortality rates ranging from 20% to 30%¹⁸. Multiple studies have shown that delay in the diagnosis and consequently delayed operative debridement which has caused increase in the mortality¹⁹. The purpose of this study is to look at Fournier's gangrene in terms of its clinical consequences and microbiological characteristics.

Materials and Methods:

This was as a cross sectional study among the 69 patients of Fournier's gangrene at BIRDEM General Hospital, Dhaka, Bangladesh from a period between Jan 10 .2013 and Sept 09.2016 with aim of assessing the infectious profile, microbiology pattern and clinical complications. Study subjects were between 20 to 70 years of age.

Purposive sampling was used as the sampling technique. Data was processed, presented in tabulated form and discussed with compare & comparison on the basis of statistical analysis. In this study, Laboratory Risk Indicator for

Necrotizing Fasciitis (LRINEC) score is used among the study population²⁰ (Figure I).

Variable, Units	Score
C-Reactive protein, mg/L	
<150	0
≥150	4
Total white cell count, per mm³	
<15	0
15-25	1
>25	2
Haemoglobin, g/dL	
>13.5	0
11-13.5	1
<11	2
Sodium, mmol/L	
≥135	0
<135	2
Creatinine, μmol/L	
≤141	0
>141	2
Glucose, mmol/L	
≤10	0
>10	1

Figure I:

Results

Among the 69 study subjects, the age distribution is shown in Table 1.

Table 1:

Age in years	n=69	%
20-30	03	4.3
31-40	04	5.8
41-50	13	18.8
51-60	30	43.4
61-70	19	27.5
Total	69	100
Mean±SD	43±1.7	

Following admission all patients were assessed by LRINEC score, the results of which are shown in Table 2. Adverse complications in course of treatment are in Table 3. Microbiological type of Fournier’s gangrene is represented in Figure 1.

Table 2:

Score	Interpretation	No. of case	%
≥08	Specific	07	10.1
06-08	Suspicion	39	56.5
03-05	Less specific	17	24.6
<03	Non-specific	06	8.7
Total		69	100

Table 3:

Complications	Cases	%
Systemic manifestation	19	27.5
DIC(Disseminated Intra Vascular Coagulation)	01	1.4
ARDS (Acute Respiratory Distress Syndrome)	03	4.3
MODS(Multiple Organ Dysfunction Syndrome)	07	10.1
MSOF (Muli System Organ Failure)	03	4.3
Severe sepsis	04	5.7
Death	03	4.3

We have observed that 84.10 % cases and 15.90 % cases among our study subjects were Type I (Poly microbial) and Type II (Mono microbial) respectively.

Predominant micro-organisms based on culture sensitivity of pus and tissues of cases are shown in Figure 2.

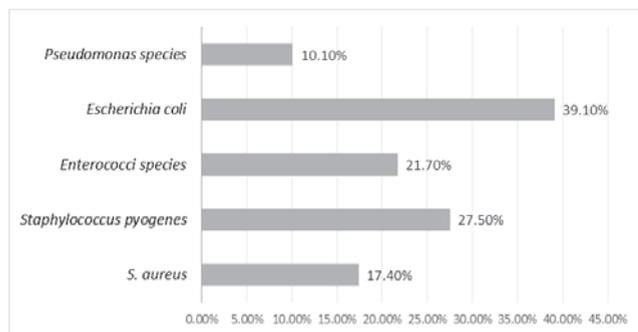


Figure 2:

Discussion:

In our study majority (43.4%) of the study population were in 51 to 60 years age group followed by 27.5% who were in 61 to 70 years age group. In a study by Wong CH and Wang YS

who studied 30 patients with Fournier’s gangrene²¹ and observed that, mean age of occurrence was 48 years, who were predominantly male farmers. The age range varied between 22 years and 84 years. There were 28 males (93.3%) and only 2 females (6.7%).

LRINEC is a robust laboratory measurement score capable of determining even clinically early cases of necrotizing fasciitis²². Using logistic regression analysis of independent variables from 89 cases of necrotizing fasciitis factors were identified to be independent predictors. Of the cohort of 89 patients in one study only 13 (14.6%) patients had a diagnosis or suspicion of necrotizing fasciitis on admission²³. In our study it was found that LRINEC score in majority of the cases (56.5%) showed a suspicious score of 06-08 whereas in about 10.1% patients, result was specific (≥08). Therefore a majority of cases were therefore missed initially, resulting in delayed operative debridement.

According to Wong et al, the biochemical and hematologic changes in necrotizing fasciitis develop early in the evolution of the disease and the LRINEC score can stratify patients into high and moderate risk categories even when the clinical picture is still equivocal²⁴.

In a large retrospective study of 68 patients, Corcoran et al.²⁵ described significant differences between non-survivors and survivors on admission laboratory parameters. Non survivors had high serum creatinine and lactate, and low serum calcium.

E. coli was found to be the most frequently associated micro-organisms which was discovered in approximately 39.1% of all cases of our study. *S. aureus*, *Staphylococcus pyogenes*, *Enterococci* species, *Pseudomonas* species and anaerobic organisms were recorded to be associated with 17.4%, 27.5%, 21.7%, 10.1% and 20.3% cases respectively.

In one study²⁶, 50% samples culture had no growth and 50% showed some growth of micro organism. 40% growth were mono microbial and 60% were poly microbial. Of all the cultures, 80% were aerobic, 6.6% anaerobic and 13.3% mixed. The most common organism isolated was *Pseudomonas aeruginosa* (33%) followed by *S. aureus* (20%) and *Klebsiella* (13.3%) in poly microbial culture. *Beta-hemolytic Streptococcus* and *E. coli* were found to be the important cause of mono microbial infection in that study.

In their experience of 38 patients Hejase et al²⁷ found that 90% of the patients grew polymicrobial organisms, including gram-positive and gram -negative rods and gram-positive cocci. The main strains grown were *Staphylococcus aureus*, *β-hemolytic Streptococcus*, *Pseudomonas sp.*, *E. coli* and *Klebsiella sp*²⁷. In 5% of their cases no growth was reported. Korkut et al²⁸ had a 64% positive culture rate of the 36 patients in their case series who had cultures sent during their initial debridement, and the leading micro-organism was *Escherichia coli*²⁸. In their review of 70 patients with Fournier’s gangrene Ersay et al²⁹ found that the most frequent bacterial organisms cultured from the wounds were *Escherichia coli* (40.0%), *Bacteroides spp.* (38.6%), *Streptococcus spp.* (37.1%), *Enterococcus spp.* (27.1%), *Staphylococcus spp.* (25.7%), *Pseudomonas spp.* (24.3%),

Klebsiella pneumoniae (20.0%), and *Proteus spp.* (18.6%). The bacterial organisms cultured from wound however were not independent predictors of outcome²⁹. Kuo et al cultured a variety of organisms in their series of 44 patients in northern Taiwan³⁰. These were cultured from necrotic tissue or pus during surgery or at the bedside. Only 1 organism was identified in 13 patients whilst culture results in 28 patients demonstrated polymicrobial infection. In 3 patients wound cultures were negative. The most commonly isolated organisms from wound were *Escherichia coli* in 26 patients, *Bacteroides fragilis* in 17 patients, *Klebsiella pneumoniae* in 16 patients, *Enterococcus spp.* in 14 patients and *Proteus mirabilis* in 10 patients. Similar to the case series by Ersay et al²⁹, mortality was not related to the specific isolated organism.

In their review of 43 reconstructive patients Ferreira et al had a positive culture from 35 of the 43 patients, with 29 (82.9%) of these being polymicrobial³⁰. The most common organisms isolated were *Staphylococcus aureus* (21 patients), *Escherichia coli* and *Pseudomonas aeruginosa* (11 patients).

In their review article on Fournier's gangrene Thwaini et al³¹ found that cultures from the wounds commonly show poly microbial infections by aerobes and anaerobes, which included coliforms, *klebsiella*, *streptococci*, *staphylococci*, *Clostridia*, *Bacteroides* and *Cornybacteria*. On average, at least three organisms were found to grow from each diagnosed patient³¹.

Along with the above organisms mentioned there have been cases reported of Fournier's gangrene caused by unusual organisms such as *Clostridium perfringens* and *Clostridium tetani*³².

Conclusion:

In our study on Fournier's gangrene, E coli was the most predominant organism obtained from culture studies. There were significant number of systemic complications. However mortality was fairly low. Poly microbial infection (Type I NF) was significantly high. Microbiological positivity pattern in our study was unique and positivity pattern varied among different studies internationally.

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