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Epidemiology, Clinical Profile and Management Outcome of Fourniers Gangrene in a Tertiary Teaching Hospital

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Abstract

Background: Fournier's gangrene is a polymicrobial necrotizing fasciitis, affecting the genital, perineal and peri anal region which requires prompt and aggressive treatment. This study assessed the prevalence, clinical presentations and management outcome.

Methods: This retrospective observational study involved 39 patients with Fournier's gangrene managed between January 2020 and December 2024. Socio-demographics, clinical features and management outcome were collated from medical records. Data was analyzed using SPSS version 27.0.

Result: Majority of patients in this study 35.9% of patients are ≥ 60 years. The mean age was 51.26 ± 14.37 years. Prevalence of Fournier's gangrene is 32.27/100,000. Scrotal pain and discoloration were the commonest symptoms in 38 (97.4%) patients. Gangrene involved the scrotum in 39(100%) patients, 38 patients (97.4%) had perineal involvement while 24 (61.5%) had penile involvement. Alcohol consumption was the commonest predisposing factor in 19 (48.7%) participants. Amongst etiological factors, anorectal abscess occurred in 15 (44.1%), urethral stricture and epididymo-orchitis occurring in 9 (26.5%) patients respectively. E. coli was commonest isolate in 19(65.5%) patients. Thirty-seven (94.9%) patients had urinary diversion while 31 (79.5%) patients had colostomy. Ceftriaxone-based antibiotic and metronidazole were the most used antibiotic combination in 37(94.9%) patients. Patients had a median of 3 debridement with hydrogen peroxide/honey dressing in 36 (92.3%). Majority of patients, 12 (35.3%) had secondary wound closure. Mean duration of admission was 39 days.

Conclusion: The prevalence of Fournier's gangrene was 32.27/100000. Anorectal abscess being commonest cause. Aggressive wound care with hypertonic saline and honey and a multidisciplinary approach to closure of extensive wound is recommended.

Keywords: Anorectal abscess, Debridement, Fournier's gangrene, Prevalence, Scrotal, Wound closure.



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INTRODUCTION

Fournier's gangrene is an infection with polymicrobial origin, which typically can have a fulminant course. It is described as a necrotizing fasciitis of genital, perineal and perianal region commonly affecting men.¹ This entity was described by Jean Alfred Fournier, a French venereologist in 1883, he was a Professor of venereology at the Paris Faculty of Medicine, when he identified 5 young men suffer progressive and rapid gangrene involving the penis and scrotum which was termed as idiopathic.^{2,3} Though Fournier's name was credited the eponym, earlier physicians described this disease more accurately,^{4,5} in majority of cases a cause is now found.⁶ Early diagnosis is important, a decline in mortality globally in recent times has been attributed to early recognition and treatment. Delays in diagnosis and treatment can confer as much as 88% mortality.⁷⁻⁹ Fournier's gangrene occurs commonly amongst these in their 5th and 6th decade of life.¹⁰

A cause is often identifiable in 95% of cases, arising from anorectal, genitourinary and cutaneous sources.¹¹ Several risk factors have been identified as responsible for Fournier's gangrene including diabetes mellitus which is the commonest occurring in up to 20- 70% of cases in some series,¹² others include alcohol abuse, obesity, extremes in age, chronic renal failure, immunosuppression, hypertension, lymphoproliferative disease, malignancy, chronic steroid use, cytotoxic drugs and malnutrition.¹³⁻¹⁵ The purpose of investigations is to assess the extent of physiologic derangement, identify predisposing and etiological factors responsible for this condition. Objective use of this investigations could positively impact decision making and improve outcome of management.¹⁶ The key to successful management include aggressive resuscitation, which may require hemodynamic support, broad spectrum antibiotics and radical surgical debridement and wound cover.¹⁷ Though Fournier's gangrene is described as a rare condition with varying clinical course, it can sometimes be very fulminant with devastating outcome. The literature reports varying mortality, which can be very high in most cases because of late presentation, therefore it is important to review its epidemiology, clinical presentations and management outcome in order to develop protocols and initiate management policies to improve outcome. This study reviewed the prevalence, presentations, management and outcome of Fournier's gangrene in our institution.

METHODS

Study Area: This study was carried out in the Urology unit of University of Benin Teaching Hospital, a multi-specialty tertiary hospital, in Benin city, Edo State, Nigeria. It is a 900-bed hospital.

Study Setting: This study was conducted in a Nigerian Tertiary Teaching Hospital, over a period of 5 years from January 2020 to December 2024.

Study Design: This was a retrospective observational cohort study.

Study Population: Electronic medical records, case notes and theatre records of 39 male patients diagnosed of Fournier's gangrene were retrieved, these include biodata, anthropometry, predisposing factors, etiological factors, clinical presentations, wound care, duration of admission and outcome (survivals and non-survivals). The data collated was entered into a structured pro forma. Patients with incomplete medical records were excluded from this study.

Sampling Method: All consecutive patients diagnosed with Fournier's gangrene during the study period with complete medical records were retrospectively recruited for the purpose of this study.

Study Instrument: Electronic medical records, Case notes and Questionnaires were used as instrument for data collection in this study.

Study Variables: This includes independent variables like age, level of education, occupation, socioeconomic status, anthropometry and dependent variables which included clinical presentations, risk factors for Fournier's gangrene, Etiology of Fournier's gangrene, debridement and wound care, duration of admission, tissue culture antibiotics used and method of wound closure.

Ethical consideration: The approval of the institutional ethics and research committee was sought and approval granted with protocol number: ADM/E22/A/VOL. VII/14831262. This study was carried out in accordance with Helsinki declaration.

Statistical analysis: Data were collated and analyzed using International Business Machine Statistical Package for Social Sciences (IBM SPSS) version 27.0. Categorical data such as age, educational level, international standard classification of occupation, socioeconomic status and tribe were presented in proportion while continuous data were represented in mean and standard deviation.

RESULTS

Table 1: Socio-Demographic and Anthropometric Characteristics of Study Participants

Socio-demographic Characteristics	Frequency (n = 39)	Percent (%)
Age Group (years)		
20-29	1	2.6
30-39	10	25.7
40-49	7	17.9
50-59	7	17.9
60 and above	14	35.9
Mean \pm SD age (years)	51.26 \pm 14.37	
Sex		
Male	39	100.0
Female	0	0.0
Level of Education		
None	7	17.9
Primary	22	56.4
Secondary	10	25.6
Tertiary	0	0
Occupation		
Trader	12	30.8
Farmer	9	23.1
Driver	6	15.4
Artisan	5	12.8
Carpenter	2	5.1
Mechanic	2	5.1
Electrician	1	2.6
Business	1	2.6
Unemployed	1	2.6
International Standard Classification of Occupation		
Skill level 1	14	35.9
Skill level 2	25	64.1
Socio-economic Status*		
High	0	0.0
Middle class	7	17.9
Lower class	32	82.1
Height		
Mean \pm SD Height (m)	1.70 \pm 0.06	
Weight		
Mean \pm SD Weight (Kg)	74.08 \pm 7.09	
Body Mass Index (BMI)		

Socio-demographic Characteristics	Frequency (n = 39)	Percent (%)
Mean \pm SD BMI (Kg/m ²)	26.06 \pm 3.38	
BMI Category	Freq. (%)	
Normal weight	18 (46.2)	
overweight	18 (46.2)	
Obese	3 (7.7)	

*Classification using Ibadin and Akpede¹⁸

In Table 1, the study included 39 participants, with a mean age of 51.26 years (SD = 14.37). Majority of participants 14 (35.9%) were aged 60 years and above, followed by those in the 30–39 age group 10 (25.7%). Participants aged 40–49 and 50–59 each were 7 accounting for 17.9% of the sample respectively, while the 20–29 age group had the lowest representation 1(2.6%) participant. In terms of educational attainment, more than half of the participants, 22 (56.4%) had only primary education, while 10 (25.6%) had secondary education. Seven participants, a notable 17.9% had no formal education, and none of the participants had tertiary education. Regarding occupation, 12(30.8%) participants were traders, making it the most common occupation. Farmers constituted 9 (23.1%) of the sample, while 6 (15.4%) were drivers. Other occupations included artisans 5(12.8%), carpenters 2(5.1%), mechanics 2(5.1%), electricians 1(2.6%), and business owners 1 (2.6%). Additionally, 1(2.6%) participant was unemployed. Based on the International Standard Classification of Occupation (ISCO), 25(64.1%) participants were categorized under skill level 2, while 14 (35.9%) fell under skill level 1.

Socio-economic classification showed that none of the participants belonged to the high socio-economic class. Instead, the majority 32(82.1%) fell into the lower socio-economic class, while 7(17.9%) were classified as middle class.

The anthropometric characteristics of the Study Participants as shown in Table 1 The mean height of the participants was 1.70 meters (SD = 0.06), while the mean weight was 74.08 kg (SD = 7.09). The average Body Mass Index (BMI) was 26.06 kg/m² (SD = 3.38).

Based on BMI classification, 18(46.2%) of the participants were within the normal weight range, while an equal proportion 18 (46.2%) were classified as overweight. A smaller proportion 3(7.7%) were categorized as obese, as shown in Table 1.

Prevalence of Fournier's Gangrene in University of Benin Teaching Hospital (institutional prevalence) in 5-year period (2019-2024) consisting of new cases: There were 120,839 hospital admissions over this period
Prevalence of Fournier's gangrene = $39/120,839$
= $32.27/100,000$ patients

Table 2: Clinical presentation of Study Participants

Variable	Frequency (n = 39)	Percent (%)
PRESENTING SYMPTOMS		
Fever		
Yes	37	94.9
No	2	5.1
Scrotal Pain		
Yes	38	97.4
No	1	2.6
Scrotal Discoloration		
Yes	38	97.4
No	1	2.6
Foul Smelling Discharge		
Yes	38	97.4
No	1	2.6
EXAMINATION FINDINGS		
Gangrene involving Scrotum		
Yes	39	100.0
No	0	0.0
Gangrene involving Penis		
Yes	24	61.5
No	15	38.5
Gangrene involving Perineum		
Yes	38	97.4
No	1	2.6
Crepitus		
Yes	27	69.2
No	12	30.8
Gangrene involving Abdomen		
Yes	7	17.9
No	32	82.1
Extent of Abdominal Gangrene (n=7)		
Lower abdomen below umbilicus	4	57.1

Variable	Frequency (n = 39)	Percent (%)
Below the umbilicus	2	28.6
Above umbilicus and below subcostal margin	1	14.3

Table 2 shows clinical presentation of Study Participants; among the participants, fever was reported by 37(94.9%), while only 2 (5.1%) did not experience this symptom. Scrotal pain was the most reported symptom, affecting 38(97.4%) participants. Similarly, scrotal discoloration was observed in 38(97.4%) cases, with only one participant (2.6%) not experiencing this symptom. Additionally, foul-smelling discharge was present in 38(97.4%) participants, while 1 (2.6%) did not report this symptom.

All participants (100%) presented with gangrene involving the scrotum. Gangrene extended to the penis in 61.5% of cases, while 38.5% of participants did not have penile involvement. Additionally, gangrene affected the perineum in 38 (97.4%) cases, with only one participant (2.6%) showing no perineal involvement. Crepitus, a clinical sign indicating gas formation in the tissues, was detected in 69.2% of participants, whereas 30.8% did not exhibit this sign. Gangrene extended to the abdomen in 17.9% of cases, while the majority (82.1%) had no abdominal involvement. Among the seven participants with abdominal gangrene, 57.1% involved the lower abdomen below the umbilicus, 28.6% had gangrene extending just below the umbilicus, and 14.3% had gangrene extending above the umbilicus but below the subcostal margin as shown in Table 2.

Table 3: Risk Factors of Fournier's Gangrene in Study Participants

Risk Factor	Frequency (n = 39)	Percent (%)
Alcohol Consumption		
Yes	19	48.7
No	20	51.3
Mean \pm SD Quantity of Alcohol Consumed weekly	27.73 \pm	13.40
Diabetic		
Yes	13	33.3
No	26	66.7
Retroviral Disease		

Risk Factor	Frequency (n = 39)	Percent (%)
Yes	2	5.1
No	37	94.9
Malignancy		
Yes	2	5.1
No	37	94.9
Type of (n=2)		
Malignancy		
Acute Leukemia	2	100.0
Renal Disease		
Yes	2	5.1
No	37	94.9
Liver Disease		
Yes	2	5.1
No	37	94.9
Steroid Use		
Yes	0	0.0
No	39	100.0
Morbid Obesity		
Yes	0	0.0
No	39	100.0
Use of Cytotoxic Chemotherapy		
Yes	4	10.3
No	35	89.7

Table 3 shows the risk factors of Fournier's gangrene in Study participants; regarding the risk factors of gangrene, among the study participants, 19 (48.7%) reported alcohol consumption, while 51.3% did not consume alcohol. The mean quantity of alcohol consumed weekly was 27.73 ± 13.40 units.

Diabetes was present in 13 (33.3%) participants, while 66.7% were non-diabetic. Retroviral disease and malignancy were each observed in 2 (5.1%) participants. Among the two participants with malignancy, both were diagnosed with acute leukemia.

Renal and liver diseases were also noted in 2 (5.1%) of participants each. None of the participants reported the use of steroids or had morbid obesity. The use of cytotoxic chemotherapy was documented in 4 (10.3%) cases, while 35 (89.7%) had no history of such treatment, as shown in Table 3.

Table 4: Etiology of Fournier's Gangrene in Study Participants

Aetiologic Factor	Frequency (n = 34)	Percent (%)
Anorectal Abscess		
Yes	15	44.1

Aetiologic Factor	Frequency (n = 34)	Percent (%)
No	19	55.9
Anal Fissure		
Yes	0	0.0
No	34	100.0
Inflammatory Bowel Disease		
Yes	0	0.0
No	34	100.0
Colorectal Malignancy		
Yes	2	5.9
No	32	94.1
Colonic Diverticulitis		
Yes	0	0.0
No	34	100.0
Urethritis		
Yes	3	8.8
No	31	91.2
Urethral Strictures		
Yes	9	26.5
No	25	73.5
Epididymorchitis		
Yes	9	26.5
No	25	73.5
Indwelling Urethral Catheter/Urethral Instrumentation		
Yes	2	5.9
No	32	94.1
Hydradenitis Suppurative		
Yes	1	2.9
No	33	97.1
Scrotal Ulceration		
Yes	5	14.7
No	29	85.3
Genital Piercing		
Yes	0	0.0
No	34	100.0
Strangulated Hernia		
Yes	0	0.0
No	34	100.0
Post Hernia Surgery		
Yes	1	2.9
No	33	97.1

Table 4 shows etiology of Fournier's gangrene amongst study participants; among the study participants, anorectal abscess was identified as the most common aetiologic factor, affecting 15 (44.1%) cases, while 19 (55.9%) did not present with this condition.

Colorectal malignancy was observed in 2(5.9%) participants, whereas the majority 32 (94.1%) had no malignancy.

Urethral conditions such as urethritis and urethral strictures were present in 3 (8.8%) and 9(26.5%) of cases, respectively. Similarly, epididymo-orchitis was documented in 26.5% of participants. Indwelling urethral catheter use or urethral instrumentation was reported in 5.9% of cases.

Less common aetiologic factors included hidradenitis suppurativa 1(2.9%), scrotal ulceration 5(14.7%), and post-hernia surgery complications 1(2.9%). Other potential causes, such as anal fissure, inflammatory bowel disease, colonic diverticulitis, genital piercing, circumcision, insect bites, and strangulated hernia, were not observed in any of the participants.

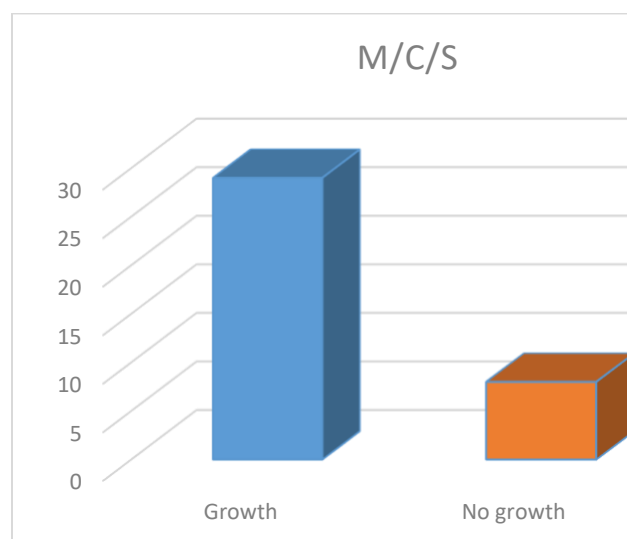


Figure 1: Tissue M/C/S Results of Study Participants

Among the study participants, microbiological culture and sensitivity (M/C/S) analysis was performed on tissue samples obtained from all 37 individuals. The results revealed that majority of samples (78.4%) showed bacterial growth. However, in 21.6% of cases, bacterial growth was not detected. The identified organisms in these cases included *Escherichia coli*, *Staphylococcus epidermidis*, and *Klebsiella* species in all patients with positive tissue culture as polymicrobial growth. *Escherichia coli* growth was found as an isolate in 19 participants (65.5%), *Staph epidermis* in 13 (44.8%) participants and *Klebsiella* species in 12 (41.3%) of participants, as shown in Figure 1.

Table 5: Urinary and Faecal Diversion among Study Participants

Variable	Freq (n = 39)	Percent (%)
Faecal Diversion		
Yes	8	20.5
No	31	79.5
Urinary Diversion		
Yes	37	94.9
No	2	5.1
Type of Urinary Diversion (n=37)		
Urethral catheterization	25	67.6
Suprapubic cystostomy	12	32.4

Table 5 shows urinary and faecal diversion amongst study participants; Among the study participants, 8 (20.5%) underwent faecal diversion, while the majority 31 (79.5%) did not require this procedure. However, urinary diversion was far more common, with 37 (94.9%) participants undergoing some form of urinary diversion, while only 5.1% did not.

Of those who underwent urinary diversion (n = 37), 25(67.6%) had urethral catheterization, while 12(32.4%) underwent suprapubic cystostomy. The high prevalence of urinary diversion highlights its importance in the management of patients with severe infections and gangrenous involvement in the perineal region, as in Table 5.

Table 6: Type of Antibiotics used and wound care of Study Participants

Type of Antibiotics	Freq (n = 39)	Percent (%)
Ceftriaxone / Sulbactam / Metronidazole	21	53.8
Ceftriaxone / Metronidazole	16	41.0
Metronidazole / Meropenem	2	5.2
Tandak / Meropenem / Metronidazole	1	2.6
Debridement		
Yes	38	97.4
No	1	2.6
Median (Range) Number of Debridement Performed	3(1 – 8)	
Wound Dressing Material		
	Frequency (n = 39)	Percent (%)
Hydrogen peroxide / Honey / Saline	26	66.7
Hydrogen peroxide / Honey	7	17.9
Hydrogen peroxide / Honey / Povidone	3	7.7
Iodine / Saline		
Hydrogen peroxide	2	5.1
Hydrogen peroxide / Saline	1	2.6

Table 6 showing type of antibiotics used and wound care of Study Participants; The antibiotic regimen used among the study participants varied, with the most administered combination being Ceftriaxone, Sulbactam, and Metronidazole, which was prescribed to 21(53.8%) of patients. This was followed by Ceftriaxone and Metronidazole, used in 41.0% of cases. A smaller proportion of participants 2 (5.2%) received Metronidazole and Meropenem.

The frequent use of Ceftriaxone and Metronidazole-based regimens suggests a preference for broad-spectrum coverage against both aerobic and anaerobic pathogens. The inclusion of Meropenem in select cases indicates the need for escalation, possibly due to the presence of resistant infections or more severe presentations of Fournier's gangrene based on sensitivity pattern, as in Table 6.

Majority, 97.4% (n=38) of study participants had debridement performed with the median (range) number of debridement performed being 3(1-8).

A variety of wound dressing materials were employed in the management of study participants. Most used combination was hydrogen peroxide, honey, and saline, which was applied to 26 (66.7%) of patients. This was followed by hydrogen peroxide and honey alone 7 (17.9%).

A smaller proportion of participants 3(7.7%) received a more extensive dressing regimen consisting of hydrogen peroxide, honey, povidone-iodine, and saline. Meanwhile, 2 (5.1%) patients were treated with hydrogen peroxide alone, and 2.6% had dressings comprising hydrogen peroxide and saline.

The frequent use of honey, either in combination with other agents or alone, suggests its perceived effectiveness in wound healing and infection control. Similarly, hydrogen peroxide was universally included across all dressing regimens, highlighting its role in wound decontamination. All patients had sitz bath with hypertonic saline, as shown in Table 6.

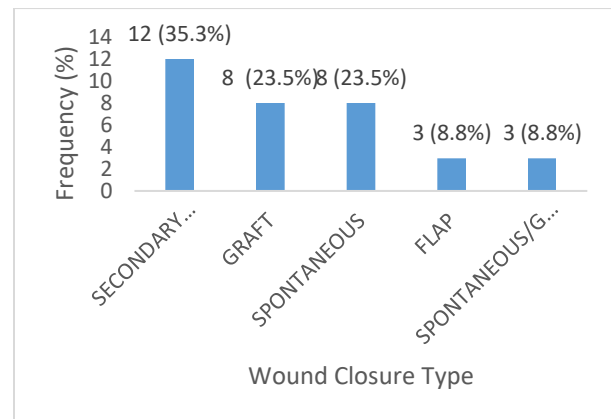
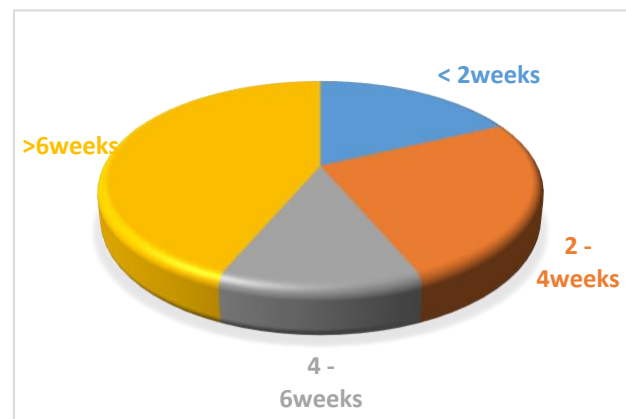


Figure 2: Wound Closure Type used for Study Participants



This bar chart illustrates the different wound closure methods used among study participants. The most common method was secondary closure 12(35.3%), followed by grafts 8(23.5%) and spontaneous healing 8(23.5%). Less frequently used methods included flaps 3(8.8%) and a combination of spontaneous healing with grafting 3(8.8%), as in Figure 1.

Figure 3: Duration of Admission of Study Participants
Figure 3. Showing duration of admission of study participants; The duration of hospital admission shows that majority of participants (43.6%) had hospital stays lasting more than 6 weeks, while 25.6% stayed between 2 to 4 weeks, and 12.8% stayed between 4 to 6 weeks. A smaller percentage (17.9%) were discharged in less than 2 weeks.

The median duration of admission was 39 days, with a range of 1 to 112 days, indicating a wide variation in hospital stays as in Table 1

DISCUSSION

Fournier's gangrene is considered a rare disease entity that has been proven to affect all ages, studies have shown it has a predilection for ages above 50.¹⁹ Majority of the patients in this study are 60 years and above with mean age put at 51.26 years, similar to several reports in the literature that put mean age at 57.95, 58.10 and 56 years in the work done by Tosun, Gul and Obiesie respectively.²⁰⁻²² All participants were male, emphasizing male predominance as documented in the literature.^{23,24} The prevalence of Fournier's gangrene in this study was 32.27/100,000 patient population, in the literature after an extensive search no previous report of prevalence of Fournier's gangrene in Nigeria was documented, this finding shows it is not as uncommon as previously thought in this clime. However, reports in the literature have shown varying prevalence across the globe, a study carried out in Tanzania reported a prevalence of 1000/100,000 hospitalized patient population,²⁵ this shows a wide variation compared to findings from a study in US that documented a prevalence of 1.9/100,000 patient population.¹⁹ Using the international standard classification of occupation all participants belonged to either skill level 1 or 2, accounting for 35.9% and 64.1% of participants respectively, with further classification into socioeconomic status (SES) according to Ibadin et al,¹⁸ most of the patient were stratified in the lower socioeconomic class representing 82.1% of participants while others belonged to the middle class representing 17.9% of participants, this was corroborated by several studies.^{26,27} It is widely believed that Fournier's gangrene is commoner in the low socioeconomic class.

The commonest clinical presentation in this study was presence of scrotal pain, scrotal discoloration occurring in most participant (97.4%), followed by fever. Similar pattern was documented in previous studies.^{24,25,28,29} Findings in this study also reveal that the scrotum is commonest site involved in Fournier's gangrene, with all participants having scrotal gangrene, while involvement of the perineum and penis was in 97.4% and 61.5% of participants respectively, there was extension to the abdomen in 17.9% of cases. This agrees with findings reported by some other studies.^{27,30} There is no consensus agreement on frequency of anatomic involvement of the genitals, perineum and anorectal region in Fournier's gangrene, some studies have reported anorectal region as the most common site involved.^{10,17,23} Alcohol abuse is amongst risk factors for

Fournier's gangrene, 25-50% of cases are said to have a history of alcohol abuse,³¹ in this study the mean alcohol consumption was about 27.73 units weekly, 47.8% of the study participants had alcohol misuse as a risk factor for Fournier's gangrene. Diabetes mellitus accounted for 33.3% of risk factors for developing fasciitis in this study, it however accounted for the commonest risk factor for Fournier's gangrene in several other studies,^{21,22,24} this was at variance with findings in this study. The perspective once held that Fournier's gangrene is an idiopathic entity has been discarded with a source identified in vast majority of cases, in this study, in 87.18% of cases a source was identified. In the literature it is widely believed that a cause is identified in up to 95% of cases.^{11,27,32} In this study anorectal abscess accounted for the single most common etiology occurring in 44.1% of participants. The work by You et al³³ also reported perianal abscess as the commonest source of Fournier's gangrene, it was reported to account for 91.3% of cases, similar findings were reported by several other studies.³⁴ Conversely, Eke's study had a different report.²³ A different outcome was also reported by Citgez et al,³⁵ with urogenital infections accounting for the commonest etiology in 52.1% of cases, in this study characterizing etiology according to region of origin shows that genitourinary source contributed most to the etiology with urethritis, urethral stricture, Epididymo-orchitis, urethral instrumentation accounting for 8.8%, 26.5%, 26.5% and 5.9% respectively with some participants having multiple sources of infection, this finding was in agreement with study by Citgez et al.³⁵

It is noteworthy that availability of tissue for culture is an important aspect of management, as it establishes isolates and possibly sensitivity to antibiotics which tend to reduce resistance to antibiotics. In this study 37 (94.87%) of participant had tissue for culture, of these 29 (78.4) had positive culture with bacterial growth. This study revealed that the culture was polymicrobial, perhaps, *Escherichia coli* (*E. coli*), *Staphylococcus epidermidis* and *Klebsiella* species were the commonest isolates. Individually, *E. coli* was isolated in 65.5% of participants, *Staphylococcus epidermidis* cultured in 44.8% of participants and *Klebsiella* species in 41.3% of participants. Many studies similarly reported *E. coli* as the most common isolate from tissue culture.^{13,33,35-37} However, it was difficult to culture anaerobic organisms in our institution, hence absence of anaerobes in the culture reports. It is imperative to state that aggressive

management is the pillar to a successful outcome, therefore it is important to allow wound healing to take place unhindered, part of the strategies would include urinary and fecal diversion to avoid wound soilage. Urinary diversion was carried out in 94.9% of the patients, it was either in the form of urethral catheterization in 67.6% of cases or suprapubic cystostomy in 32.4% of patients, majority of these who had suprapubic cystostomy had urethral stricture. Fecal diversion was carried out in form of colostomy in these who had anorectal disease and colorectal malignancy to prevent wound soilage. In the study by Lesso et al²⁵ they recorded urinary diversion in 97% of patients and colostomy in 19.4% of cases. Taken et al²⁶ also described use of colostomy for fecal diversion and urethral catheterization for urinary diversion for wound healing, he opined that cystocatheter is only required for urinary diversion when there is urethral disruption, which was the case in patients with suprapubic cystostomy in this study.

Use of antibiotics is a key part in the management of Fournier's gangrene; it formed part of the strategies for managing patients in this study. Fournier's gangrene was defined as polymicrobial in origin hence multiple antibiotics are used covering aerobic and anaerobic organisms. Majority of participants (53.8%) had a combination of Ceftriaxone/sulbactam and metronidazole and a combination of ceftriaxone/metronidazole combination in 41% of participants. Ceftriaxone /metronidazole combination was based on the urology unit's protocol, it was the antibiotics of choice for initial treatments which were mostly empirical, thereafter appropriate antibiotics were administered to reflect sensitivity pattern from tissue culture, when it differs from empirical antibiotics, these changes were noted in 5.2% of the patients who had meropenem and metronidazole. The study by Oyelowo et al³⁶ adopted similar empirical antibiotics in management of Fournier's gangrene, contrary to this was the study by Atila et al³⁷ who had a different choice of antibiotics in their combination preference, ceftriaxone /metronidazole only accounted for 26% of their choice., their preferred choice was imipenem-teicoplanin in 49% of cases. Mainstay of management was resuscitation, use of broad-spectrum antibiotics and radical debridement³⁸, in this study most patients had radical debridement, in 97.4% of patients, only one patient (2.6%) did not have a debridement because he presented unstable clinically and died during

resuscitation. Patients had a median of 3 debridement (1-8), followed by cleansing of wound with hydrogen peroxide and saline this was similar to study by Chalya et al,^{27,35} in majority of cases wound was dressed with honey in 84.6% of participants, in studies carried out to assess beneficial effect of honey on wounds, it was found to inhibit bacterial growth due to its low pH, high viscosity, its hygroscopic effect and presence of inhibin and antioxidants, and found to be beneficial in Fournier's gangrene.^{22,39} In 7.7% of cases honey was combined with povidone iodine to dress the wound. All patients had sitz bath twice daily with hypertonic saline. In this study wound closure was achieved by varying means, this would be attributed to the fact that choice of wound closure may be determined by degree of tissue loss and extent of regeneration following wound debridement and dressings.²² Majority (35.3%) of patients had secondary wound closure, these were mostly amongst those with scrotal involvement, while spontaneous wound closure was achieved in 23.5% of patients, this group also had wound confined to the scrotum but less extensive than in these with secondary wound closure. Grafting as a form of wound closure was carried out mostly in patients with penile involvement, this occurred in 23.5% of patients while spontaneous closure /grafting was carried out in these with both scrotal and penile wound. Fascio-cutaneous flap was used in these with extensive wound. Wound management in this group of patients was multidisciplinary with plastic surgeon involved in wound graft and fascio-cutaneous flaps. The study by Nnabugwu et al,⁴⁰ reported similar findings to this study, majority had secondary wound closure, while spontaneous closure occurred in 17.3% of participants and grafting and flap cover in 8.7% respectively. Oyelowo et al,³⁶ corroborated our approach to wound closure as grafting was carried out when the penis was involved and secondary wound closure achieved in scrotal and perineal infections. Median duration of admission in this study was 39 days with a range of 1-112 days, the patient who was admitted for 1 day was elderly and presented unconscious with sepsis, he died same day of admission. Duration of admission was dependent on systemic involvement and extent of wound involvement and wound closure was achieved in same admission. The study by Lesso et al,²⁵ similar to this study had a range of 1 -124 days of admission with a mean of 24 days, Chalya,²⁷ and Aliyu,⁴¹ in their study reported admission of an average of 4 weeks, while

Oyelowo reported in -hospital admission of 24 days,³⁶ perhaps this long duration of admission could be attributed to wound care and systemic involvement of most patients with Fournier's in these studies.

Limitations: This study is limited by its retrospective nature, as it may introduce bias to the outcome of study. The small sample size and single center nature of the study has limited the statistical power to generalization of the outcome of the study.

Implications of the findings

Findings in this study, has shown that prompt and aggressive management is desired in the management of Fournier's gangrene for good outcome. Immediate resuscitative measures should be put in place once Fournier's gangrene is identified at the emergency room. Wound care with hypertonic saline and honey should be highly considered to limit local sepsis and improve tissue regeneration.

Prospective study on impact of health seeking behavior amongst patients with Fournier's gangrene on outcome will be important in order to institute community-based health talks aimed at early presentation.

CONCLUSION

This study has shown that hospital prevalence of Fournier's gangrene is 32.27/100,000, with evolving narrative that this condition is not as rare as previously thought. It reinforces the fact that in most cases a cause is identified with anorectal abscess being the single most common entity identified as causation. An aggressive approach to wound care with use of hypertonic saline and honey and a multidisciplinary approach to closing extensive wound yields optimal result.

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Ethical Approval: Ethical approval of University of Benin Teaching Hospital institutional ethical committee was sought and approval granted with protocol number: ADM/E22/A/VOL VII/14831262. The research work was carried out according to Helsinki declaration.

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