Section: General Surgery

Original Research Article

PREDICTIVE FACTORS AND TREATMENT OUTCOMES IN FOURNIER'S GANGRENE: A RETROSPECTIVE ANALYSIS OF CLINICAL MANAGEMENT AND PROGNOSIS

Syed Mohsin Aijaz[1], Mohd Talha Zargar[2], Gowhar Aziz Bhat[3], Muneer A. Wani[4], Jibreel Youuf[5]

[1]FNB Minimal Access Surgery, Department of General and Minimal Invasive Surgery, SKIMS Soura, Srinagar, Jammu and Kashmir, India.
[2]Senior Resident, Department of General and Minimal Invasive Surgery, SKIMS Soura, Srinagar, Jammu and Kashmir, India.
[3]Assistant Professor, Department of General and Minimal Invasive Surgery, SKIMS Soura, Srinagar, Jammu and Kashmir, India.
[4]Professor Department of General and Minimal Invasive Surgery, SKIMS Soura, Srinagar, Jammu and Kashmir, India.
[5]Senior Resident, Department of General and Minimal Invasive Surgery, SKIMS Soura, Srinagar, Jammu and Kashmir, India.

Received : 16/12/2024
Received in revised form : 09/02/2025
Accepted : 24/02/2025

Keywords:
Fournier's Gangrene, outcomes, prognosis, necrotizing fascitis, debridement, Fournier's Gangrene severity index, Blood Urea Nitrogen

Corresponding Author:
Dr. Gowhar Aziz Bhat,
Email: gowharirjk@gmail.com

DOI: 10.47009/jamp.2025.7.1.198

Source of Support: Nil,
Conflict of Interest: None

Int J Acad Med Pharm
2025; 7 (1); 1011-1016

Abstract

Background: Fournier's gangrene (FG) is a rapidly progressing, gas-forming, necrotizing soft tissue infection primarily affecting the perineum. Characterized by swift spread along deep fascial planes, it is associated with a high mortality rate. While it can affect individuals of all ages and genders, there is a notable male preponderance. Despite therapeutic advancements, the mortality rate remains between 3% and 67%, with an incidence ranging from 1:7,500 to 1:750,000. **Materials and Methods:** A retrospective review of 50 patients diagnosed with FG at our institution from 2020 to 2025 revealed that 30 patients had diabetes mellitus, 15 had multiple comorbidities, and 5 were bedridden due to severe illnesses. Twenty patients required intensive care unit admission, 12 underwent colostomy, and 15 required reconstruction with grafting or skin flaps for wound healing. Five patients' extensive wounds healed using vacuum-assisted closure (VAC®) dressing without additional surgery. **Results:** The mortality rate was 30%, with poor prognosis associated with a Fournier's Gangrene Severity Index (FGSI) score above 9 points or a blood urea nitrogen (BUN) level exceeding 50 mg/dl. **Conclusion:** Aggressive surgical treatment, including wide debridement and stoma creation, should be considered promptly to improve survival rates. Additionally, VAC dressing is beneficial in healing extensively debrided wounds without additional reconstructive surgery.

INTRODUCTION

Fournier's gangrene (FG) is a polymicrobial form of necrotizing fasciitis, characterized by the endarteritis of the perineal, urogenital, or perianal subcutaneous tissues, leading to gangrenous changes in the skin and deeper tissues.[1,2] First described by Jean Alfred Fournier in 1883, it was initially recognized as a rapidly progressing condition primarily affecting young men, with no clear etiology.[3] Over time, however, extensive studies have shown that FG often arises from identifiable predisposing factors and can affect a broader demographic, including women, infants, and the elderly.[4]

Early detection, prompt diagnosis, and immediate treatment, including aggressive debridement, drainage, and broad-spectrum antibiotic therapy, are critical for effective management.

ISSN (O): 2687-5365; ISSN (P): 2753-6556

A case of a patient with colostomy developing Fournier's gangrene (A) Fournier's gangrene. Necrotizing fasciitis spread to the scrotum. (B) After debridement. (C) After second debridement and serial dressings. (D) Reconstruction with skin graft. Skin defect was repaired with a skin graft from the left thigh.

Due to its rarity and the limited experience of healthcare providers in diagnosing this condition, it remains a challenge to identify FG before extensive necrosis or gangrene sets in, and its progression can be swift and fatal. Consequently, delayed diagnosis and inadequate treatment are associated with significantly increased mortality rates.

The reported mortality rate for FG varies widely, ranging from 0% to 67%, with no substantial improvements despite advances in medical care. In particular, the incidence of FG appears to be rising in developing countries, where late presentation, poor socioeconomic status, and growing rates of metabolic diseases such as diabetes mellitus contribute to the growing burden of the disease. As such, it is essential to enhance our understanding of the risk factors, pathophysiology, and clinical trajectory of Fournier's gangrene.

In this study, we sought to examine the clinical characteristics and course of patients diagnosed with Fournier's gangrene at our institution over the past five years. Our objective was to identify key risk factors and prognostic indicators associated with this life-threatening condition.

MATERIALS AND METHODS

The medical records of 50 patients diagnosed with Fournier's gangrene and admitted to the department of General and Minimal Access Surgery at our institution from 2020 to 2025 were reviewed retrospectively. There were no specific exclusion criteria. We investigated the following: gender, age, body mass index (BMI), previous operative history and predisposing factors of patients, the number of debridements, details regarding the formation of diverting stoma, pathology and bacteriology results and laboratory results [e.g. white blood cell count, haemoglobin, haematocrit, sodium, potassium, bicarbonate, glucose, blood urea nitrogen (BUN), creatinine, aspartate aminotransferase, alanine aminotransferase, cholesterol, triglyceride, protein, albumin, C-reactive protein and haemoglobin Alc]. In addition, predisposing factors, aetiological factors and Fournier's Gangrene Severity Index (FGSI) scores were examined to determine risk factors and prognostic factors. The FGSI score was devised by Laor et al. (6), and this index included the parameters of temperature, heart rate, respiratory rate, serum sodium, serum potassium, serum creatinine, serum bicarbonate, haematocrit and white blood cell count to evaluate the severity of the disease.

Data were analysed using IBM SPSS version 20.0 (SPSS®Inc., Chicago, IL). Numerical data, such as age or scale score, were represented as mean + standard deviation, and the data about patient characteristics and univariate analysis of prognostic factors were analysed with the x^2-test and Fisher's exact test. The mean values of laboratory examination in patients who survived and patients who expired were compared using Student's t-test. We considered P-values less than 0.05 to be statistically significant.

RESULTS

Demographic characteristics and the proportion of patients with a medical history of comorbidities were described in Table 1. Thirty patients (60%) were diabetics, twenty patients (40%) were hypertensive, ten patients (20%) had end stage renal disease, eight patients (10%) had some underlying malignant condition, and five patients (10%) had liver cirrhosis. [Table 1]

Table 1: Demographic characteristics of patients.

Characteristics n (%)		
Gender	Male Female	33 (66%) 17 (34%)
Age (years)	Mean age <65 >65	62 14(28%) 36 (72%)
BMI (Kg/m2)	Mean BMI <25 >25	24.6 30 (60%) 20 (40%)
History of anorectal surgery	Yes No	10 (20%) 40 (80%)
Predisposing factors	Diabetes mellitus Hypertension End stage renal disease Liver cirrhosis Cerebrovascular accident Malignancy Colorectal surgery	30 (60%) 20 (40%) 10 (20%) 5 (10%) 10 (20%) 8 (16%) 10 (20%)

BMI, body mass index.

The most common aetiology of fournier's gangrene in this study was perianal or perirectal infection occurring in thirty five (70%) of patients. Infection of sore occurred in ten (20%) patients. Trauma was a cause in two (4%) patients, Cancer related

ISSN (O): 2687-5365; ISSN (P): 2753-6556

radiotherapy in two (4%) and Genitourinary infection in one (2%) patient. [Table 2].

Table 2: Aetiology of Fournier's gangrene in this study

Aetiology n(%)	
Perianal or perirectal infection	35 (70%)
Infection of sore	10 (20%)
Trauma	2 (4%)
Cancer related radiotherapy	2 (4%)
Genitourinary infection	1 (2%)

The mean FGSI score was 7±5·1; thirty patients (60%) had a score >9 points. Twenty patients required treatment in the intensive care unit (ICU) with a mean duration of ICU stay of 5.2±6.1days. Twenty patients (40%) underwent >2 debridements. Colostomy was required in 12 patients (24%) due to an anal sphincter impairment or contamination of a debrided wound. Fifteen patients (30%) required reconstructive surgery with skin grafting/ flap due to a broad wound defect [Figure 1], and vacuum-assisted closure (VAC®) dressing successfully decreased the size of the debrided wound without additional surgical requirement, in five patients (10%). Fifteen patients (30%) died because of gangrenous infection [Table 3].

Table 3: Clinical course of patients in this study

Characteristics	**n (%)**	
FGSI (points)	Mean score	7±5.1
	≤9	30 (60%)
	>9	20 (40%)
Septicaemia	Yes	28 (56%)
	No	22 (44%)
Mean hospitalisation (days)	Mean duration (days)	5.2±6.1
ICU care	Yes	20 (40%)
	No	30 (60%)
Timing of operation	Mean hospital day of operation (HD)	2.1±1.5
	HD #1 or #2	35 (70%)
	≥ HD #3	15(30%)
Number of debridements	1	30 (60%)
	2	15 (30%)
	≥3	5 (10%)
Colostomy	Yes	12 (24%)
	No	38 (76)
Reconstruction with grafting/ skin flap	Yes	15 (30%)
	No	35 (70%)
Vacuum-assisted closure		
	Yes	5 (10%)
	No	45 (90%)
Mortality	Yes	15 (30%)
	No	35 (70%)

FGSI. Fournier's gangrene severity index; HD, hospital day; ICU, intensive care unit.

Statistical analysis was performed to determine prognostic factors, which may have distinguished survivors and non-survivors. The only statistically significant predictor of mortality in our series was the number of debridement surgeries performed on each patient. Patients were 4.8 times more at risk of dying if they were required to have more than one surgical debridement under general anesthesia. [Table 4]

Table 4: Statistical Analysis

	Survivors n=35	**non-survivors n=15**	**p value**
Age (mean, median)	55,57	60,62	0.69
Etiologies			
Skin wound/infection	14 (40%)	6 (40%)	
Abscess	8 (22.8%)	5 (33.3%)	
Postoperative complication	3 (8.5%)	1 (6.6%)	0.7
Genitourinary source	1(2.8%)	1 (6.6)	
Anorectal/colorectal source	7 (20%)	2 (13.3%)	
Trauma	2 (5.7%)	0	
No. debridement surgeries			
1	24 (68%)	10 (66.6%)	0.04
2 or more	11 (31.4%)	5 (33.3%)	

ISSN (O): 2687-5365; ISSN (P): 2753-6556

Time (hours) between ER admission and surgery (mean, median)	18.23,6.45	46.22,48.8	0.50
Extent of debridement			
Peno-scrotal ± anal/perirenal	23 (65.7%)	3 (20%)	0.45
Beyond	12 (34.2%)	12 (80%)	

We investigated the correlation between prognosis and old age (>65 years), high BMI [>25 kg/m²], diabetes mellitus, liver cirrhosis, renal failure, malignancy and FGSI score. There was no significant association between diabetes mellitus and mortality (p=0.413). Nor was there a significant association for hypertension, liver cirrhosis, renal failure, malignancy, cerebrovascular events and alcohol abuse (P<0.05). Patients with an FGSI score greater than 9 points had a higher mortality rate in univariate analysis (P=0.035).

In terms of laboratory analysis, the mean level of BUN was higher and that of albumin was lower in patients who died than in those who survived. However, these findings did not show a statistical association with prognosis (P= 0.091 and 0.052, respectively). On the other hand, when prognosis was examined according to BUN level, those with a level> 50mg/dl had a higher mortality rate than those with levels < 50 mg/dl. On the other hand, there was no significant difference in the prognosis between patients with and without hypoalbuminemia (P=0.160) [Table 5].

Table 5: Risk factors for poor prognosis in fournier's gangrene

	Total (n=50)	Expired (n=15)	P-value
Age (years)			
<65	14	3 (21.4%)	0.125
≥65	36	12 (33.33%)	
Gender			
Male	33	8 (24.2%)	O.376
Female	17	6 (35.2%)	
BMI (kg/m2)			
<25	30	7 (23.3%)	0.377
≥25	20	8 (40%)	
FGSI (points)			
≤9	30	4 (13.33%)	0.035
>9	20	11 (55%)	
Diabetes mellitus			
Yes	30	12 (40%)	0.413
No	20	3 (15%)	
Liver cirrhosis			
Yes	5	3 (60%)	0.382
No	45	12 (26.6%)	
Renal failure			
Yes	16	8 (50%)	0.346
No	34	7 (20.5%)	
Malignancy			
Yes	8	3 (37.5%)	0.528
No	42	12 (28.5%)	
Timing of operation			
HD#1or #2	35	9 (25.7%)	0.625
≥HD #3	15	6 (40%)	
Number of debridements			
≥2	20	5 (25 %)	0.573
1	30	10 (33.3%)	
Diversion stoma			
Yes	12	4 (33.3%)	0.456
No	38	11 (28.9%)	
ICU care			
Yes	20	10(50%)	0.135
No	30	5 (16.6%)	
BUN level (mg/dl)			
<50	35	5 (14.2%)	0.091
≥50	15	10 (66.6%)	
Albumin level (mg/dl)			
<3.0	30	10 (33.3%)	0.052
≥3-0	20	5 (25%)	

FGSI. Fournier's gangrene severity index; HD, hospital day; ICU, intensive care unit; BMI, Body mass index; BUN, Blood urea nitrogen.

DISCUSSION

Fournier's gangrene remains a rare yet potentially fatal condition despite advances in medical care. Recent trends indicate an increasing prevalence, largely due to various predisposing factors, including diabetes mellitus, immune-related diseases, and malignancies.[7] The reported incidence of Fournier's gangrene ranges from 1:7,500 to 1:750,000 people,[2] with mortality rates ranging from 3% to 67%.[2,9] In

ISSN (O): 2687-5365; ISSN (P): 2753-6556

this study, the mortality rate was 30%, which aligns with other studies, such as one from Korea that reported a 27.2% mortality rate.[10]

This disease predominantly affects men, with a male-to-female ratio of 10:1.[2,11] In our study, the male-to-female ratio was 1.9:1. Bilton et al,[12] reported that Fournier's gangrene typically occurs in individuals aged 30-60 years, and other studies support this finding, noting the disease's peak incidence in patients in their fifties.[2] However, the mean age of patients in our study was 61.8 ± 12.7 years, and 36% of patients were over 65 years of age, indicating that the disease is now affecting older populations more frequently.

Regarding BMI, 20% of patients in our study were classified as obese according to World Health Organization (WHO) criteria [Table 1]. Norton et al,[13] suggested that obesity may be a predisposing factor for Fournier's gangrene, but our study did not find a significant association between BMI and prognosis.

Underlying diseases significantly contribute to the development and progression of Fournier's gangrene. Diabetes mellitus, alcohol abuse, immune suppression, malignancy, liver disease, and renal disease have been reported to increase the risk of mortality,[2,14,15] with diabetes being the most common and influential factor.[2,16] However, the relationship between diabetes and mortality remains controversial, with some studies linking it to both incidence and mortality,[17,18] while others show an association with incidence but not mortality.[6,16] In our study, 60% of patients had diabetes, but no significant association with mortality was observed. The time from symptom onset to hospital presentation varies, with some patients presenting within 1-30 days.[19,20] In our cohort, patients generally presented with advanced perineal inflammation.

Fournier's gangrene often arises from poor hygiene in the perineal area, with infectious sources typically stemming from anorectal diseases, urological conditions, intra-abdominal diseases, or trauma.[9] In our study, the most common causes were perianal or perirectal infections. Notably, two patients developed severe infections following radiotherapy for rectal cancer, supporting previous findings that malignancies and immunosuppression due to treatment are risk factors for Fournier's gangrene.[15] Given the increasing number of rectal cancer cases and the role of radiotherapy, surgeons should remain vigilant about the potential connection between cancer treatment and Fournier's gangrene.

The most common causative organisms in Fournier's gangrene are aerobic Gram-negative bacilli or Gram-positive cocci, often in mixed infections.[14-19] with bacteria such as Escherichia coli, Proteus, Enterococcus, Pseudomonas, and Klebsiella species being frequently identified.[15-22] The predominant organism in our study was E. coli (36%), followed by Streptococcus species (18%). Other organisms included Enterococcus, Acinetobacter, Staphylococcus, Klebsiella, Proteus, and Pseudomonas, with two patients showing polymicrobial infections.

Management of Fournier's gangrene includes early detection, immediate and aggressive debridement, and appropriate broad-spectrum antibiotic therapy.[2,6,19] Norton et al,[13] emphasize patient stabilization, broad-spectrum antibiotics, and timely surgical intervention, with prompt debridement being crucial. In this study, all patients underwent aggressive debridement and broad-spectrum antibiotics, with a mean of 1.7 debridements performed. A total of 24% of patients required an ostomy; however, no significant association was found between ostomy and prognosis, despite other studies reporting poor outcomes in ostomy patients.[23-25] Ostomy can aid in the healing of wounds caused by anorectal infections in Fournier's gangrene.[2] Fifteen patients (30%) required skin grafts, while five patients' wide wounds healed with the use of vacuum-assisted closure (VAC) dressings. VAC devices promote debridement, increase perfusion, stimulate fibroblast migration, and facilitate wound closure, reducing the need for additional skin grafts.[2]

The mortality rate for Fournier's gangrene remains high, with reported rates ranging from 3% to 67%.[2,9] Key prognostic factors include age, comorbid conditions like hypertension, diabetes mellitus, heart failure, renal failure, coagulopathy, and procedures such as ostomy or mechanical ventilation.[2,25] Other factors like necrotic area size, FGSI score, and the presence of sepsis or shock at admission are also linked to outcomes.[26-28] In this study, while 60% of patients had diabetes, no significant association was found between diabetes and mortality. Only patients with an FGSI score higher than 9 had a higher mortality rate, which is consistent with the use of FGSI to guide therapeutic decisions.[6]

In terms of laboratory results, high BUN levels (>50 mg/dl) have been associated with poorer prognosis,[29] while hypoalbuminemia is also a negative prognostic factor.[30] Although our study found that a BUN level >50 mg/dl predicted a poorer prognosis, there was no significant difference in outcomes based on hypoalbuminemia. While these prognostic markers are useful, the most critical factor in improving outcomes is the prompt, aggressive management of patients based on clinical presentation, vital signs, and laboratory results.

A significant limitation of this study is the small sample size. However, given the low incidence of Fournier's gangrene, the 50 patients included in this study are representative of the disease within a single institution.

CONCLUSION

The incidence of Fournier's gangrene is expected to rise, driven by the aging population and an increase in metabolic and immune-related diseases in

ISSN (O): 2687-5365; ISSN (P): 2753-6556

developed countries. Despite advancements in medical care, the mortality rate remains high. The most effective approach to managing this disease is aggressive debridement combined with broad-spectrum antibiotic therapy. Additionally, the use of vacuum-assisted closure (VAC) dressings can significantly promote wound healing and reduce the need for reconstructive surgery, such as skin grafting. A comprehensive understanding of Fournier's gangrene by treating physicians is essential for improving patient outcomes. Surgeons should be aware that prognosis can be enhanced by recognizing predisposing diseases and prognostic factors early in the course of the disease. Procedures such as diverting stoma or hemodialysis may also improve the prognosis in select cases.

REFERENCES

1. Korkut M, Içöz G, Dayangac M, Akgün E, Yeniay L, Erdoğan O, Cal C. Outcome analysis in patients with Fournier's gangrene: report of 45 cases. Dis Colon Rectum 2003;46:649–52. [DOI] [PubMed] [Google Scholar]
2. Shyam DC, Rapsang AG. Fournier's gangrene. Surgeon 2013;11:222–32. [DOI] [PubMed] [Google Scholar]
3. Czymek R1, Hildebrand P, Kleemann M, Roblick U, Hoffmann M, Jungbluth T, Bürk C, Bruch HP, Kujath P. New insights into the epidemiology and etiology of Fournier's gangrene: a review of 33 patients. Infection 2009;37:306–12. [DOI] [PubMed] [Google Scholar]
4. Murakami M, Okamura K, Hayashi M, Minoh S, Morishige I, Hamano K. Fournier's gangrene treated by simultaneously using colostomy and open drainage. J Infect 2006;53:e15–8. [DOI] [PubMed] [Google Scholar]
5. Lim JH, Kim HS, Kim MK, Jeong YB, Park JK, Kim HJ, Kim YG, Park YK. Analysis of prognostic factors in patients with Fournier's gangrene. Infect Chemother 2006;38:192–7. [Google Scholar]
6. Laor E, Palmer LS, Tolia BM, Reid RE, Winter HI. Outcome prediction in patients with Fournier's gangrene. J Urol 1995;154:89–92. [PubMed] [Google Scholar]
7. Kim KM, Seong SH, Won DY, Ryu H, Kim IY. The prognostic factors and severity index in Fournier's gangrene. J Korean Soc Coloprotol 2010;26:29–33. [Google Scholar]
8. Martinschek A, Evers B, Lampl L, Gerngroβ H, Schmidt R, Sparwasser C. Prognostic aspects, survival rate, and predisposing risk factors in patients with Fournier's gangrene and necrotizing soft tissue infections: evaluation of clinical outcome of 55 patients. Urol Int 2012;89:173–9. [DOI] [PubMed] [Google Scholar]
9. Ersay A, Yilmaz G, Akgun Y, Celik Y. Factors affecting mortality of Fournier's gangrene: review of 70 patients. ANZ J Surg 2007;77:43–8. [DOI] [PubMed] [Google Scholar]
10. Kim SK, Park JI, Joo YT, Park ST, Ha WS, Hong SC, Lee YJ, Jung EJ, Jeung CY, Choi SK. Fournier's gangrene: clinical analysis of 11 patients. J Korean Surg Soc 2006;71:274–9. [Google Scholar]
11. Mehl AA, Nogueira Filho DC, Mantovani LM, Grippa MM, Berger R, Krauss D, Ribas D. Management of Fournier's gangrene: experience of a university hospital of Curitiba. Rev Col Bras Cir 2010;37:435–41. [DOI] [PubMed] [Google Scholar]
12. Bilton BD, Zibari GB, McMillan RW, Aultman DF, Dunn G, McDonald JC. Aggressive surgical management of necrotizing fasciitis serves to decrease mortality: a retrospective study. Am Surg 1998;64:397–400; discussion 400-1. [PubMed] [Google Scholar]
13. Norton KS, Johnson LW, Perry T, Perry KH, Sehon JK, Zibari GB. Management of Fournier's gangrene: an eleven year retrospective analysis of early recognition, diagnosis, and treatment. Am Surg 2002;68:709–13. [PubMed] [Google Scholar]
14. Paty R, Smith AD. Gangrene and Fournier's gangrene. Urol Clin North Am 1992;19:149–62. [PubMed] [Google Scholar]
15. Morpurgo E, Galandiuk S. Fournier's gangrene. Surg Clin North Am 2002;82:1213–24. [DOI] [PubMed] [Google Scholar]
16. Barreda JY, Scheiding MM, Fernandez CS, Campana JMC, Aguilera JR, Miranda EF, Biondo S. Fournier's gangrene. A retrospective study of 41 cases. Cir Esp 2010;87:218–23. [DOI] [PubMed] [Google Scholar]
17. Jones RB, Hirschmann JV, Brown GS, Tremann JA. Fournier's syndrome: necrotizing subcutaneous infection of the male genitalia. J Urol 1979;122:279–82. [DOI] [PubMed] [Google Scholar]
18. Wolach MD, MacDermott JP, Stone AR, deVere WRW. Treatment and complications of Fournier's gangrene. Br J Urol 1989;64:310–4. [DOI] [PubMed] [Google Scholar]
19. Baskin LS, Carroll PR, Cattolica EV, McAninch JW. Necrotising soft tissue infections of the perineum and genitalia. Bacteriology, treatment and risk assessment. Br J Urol 1990;65:524–9. [DOI] [PubMed] [Google Scholar]
20. Benizri E, Fabiani P, Migliori G, Chevallier D, Peyrottes A, Raucoules M, Amiel J, Mouiel J, Toubol J. Gangrene of the perineum. Urology 1996;47:935–9. [DOI] [PubMed] [Google Scholar]
21. Eke N. Fournier's gangrene: a review of 1726 cases. Br J Surg 2000;87:718–28. [DOI] [PubMed] [Google Scholar]
22. Rudolph R, Soloway M, DePalma RG, Persky L. Fournier's syndrome: synergistic gangrene of the scrotum. Am J Surg 1975;129:591–6. [DOI] [PubMed] [Google Scholar]
23. Efem SE. Recent advances in the management of Fournier's gangrene: preliminary observations. Surgery 1993;113:200–4. [PubMed] [Google Scholar]
24. Nisbet AA, Thompson IM. Impact of diabetes mellitus on the presentation and outcomes of Fournier's gangrene. Urology 2002;60:775–9. [DOI] [PubMed] [Google Scholar]
25. Sorensen MD, Krieger JN, Rivara FP, Klein MB, Wessells H. Fournier's gangrene: management and mortality predictors in a population based study. J Urol 2009;182:2742–7. [DOI] [PMC free article] [PubMed] [Google Scholar]
26. Vick R, Carson CC 3rd. Fournier's disease. Urol Clin North Am 1999;26:841–9. [DOI] [PubMed] [Google Scholar]
27. Spirnak JP, Resnick MI, Hampel N, Persky L. Fournier's gangrene: report of 20 patients. J Urol 1984;131:289–91. [DOI] [PubMed] [Google Scholar]
28. Yanar H, Taviloglu K, Ertekin C, Guloglu R, Zorba U, Cabioglu N, Baspinar I. Fournier's gangrene: risk factors and strategies for management. World J Surg 2006;30:1750–4. [DOI] [PubMed] [Google Scholar]
29. Clayton MD, Fowler JE Jr, Sharifi R, Pearl RK. Causes, presentation and survival of fifty-seven patients with necrotizing fasciitis of the male genitalia. Surg Gynecol Obstet 1990;170:49–55. [PubMed] [Google Scholar]
30. Chawla SN, Gallop C, Mydlo JH. Fournier's gangrene: an analysis of repeated surgical debridement. Eur Urol 2003;43:572–5. [DOI] [PubMed] [Google Scholar]

ISSN (O): 2687-5365; ISSN (P): 2753-6556