Assessing Mortality Risk in Fournier's Gangrene: A Study Using the Simplified Prognostic Scoring System

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ABSTRACT

Background: Fournier's gangrene (FG) is an uncommon yet serious type of necrotising fasciitis that impacts the perineal, genital, and perianal areas. The simplified prognostic scoring system for Fournier's gangrene emphasizes essential clinical indicators, including age, body mass index (BMI), comorbidity status, and presentation timing, to develop a practical tool that facilitates rapid decision-making. **Objective:** To study the Risk factors for mortality using Simplified Prognostic Scoring System in patients with Fournier's gangrene. **Method:** A prospective study utilised a non-probability consecutive sampling technique. This investigation took place within the urology department of the Sindh Institute of Urology and Transplantation from January 2018 to June 2022. All patients admitted with the working diagnosis of Fournier's gangrene through emergency services, from January 2018 to June 2022. Demographic information (age, gender, co-morbidities), vital signs, presentation (mode of onset), and primary body areas affected were noted. All these patients will receive conservative management, which encompasses broad-spectrum antibiotics, nutritional management, and nursing care. Additionally, each will receive debridement, and their wounds will be evaluated on a daily basis. **Result:** A total of 130 patients were discharged without any reported deaths from early presentations. In contrast, 183 patients were discharged, with 9 deaths noted from delayed presentations. Additionally, 2 individuals were discharged, while 17 patients succumbed during treatment due to late presentations with septic shock. **Conclusion:** The simplified prognostic scoring system is a valuable tool for risk stratification in patients with Fournier's gangrene and should be routinely used in clinical practice to improve patient outcomes.

INTRODUCTION

Necrotising fasciitis is a serious and swiftly advancing soft tissue infection, recognised for its aggressive characteristics and elevated mortality rates.[1,2] This disease is characterised by significant fascial necrosis resulting from microbial infection, which swiftly leads to tissue destruction and toxic shock, presenting a serious risk to the patient's life.[3] The dissemination of inflammation and infection may result in vascular thrombosis, which can then lead to ischaemia and necrosis of nearby soft tissues and fascia.[4] Consequently, the disease might first remain undetected or unacknowledged, given that there could be few or no visible skin signs during its initial phases. Necrotising fasciitis that manifests in the scrotum, perianal, and perineal areas is referred to as Fournier's Gangrene.[5] FG exhibits a notably aggressive progression and is associated with a mortality rate exceeding 20%.[6] Immediate intervention is essential, encompassing resuscitation manoeuvres, intravenous antibiotic

therapy, and early surgical debridement.[6] Multiple reconstructive surgical options are available, focussing on testicular coverage, preservation of function, and achieving satisfactory cosmetic outcomes, all while aiming to reduce morbidity and mortality. Surgery remains the definitive approach for the treatment of FG. Nonetheless, the optimal timing and surgical approach remain subjects of discussion, and there are currently no definitive guidelines available.[7,8]

The present study advocated an eight- scale simplified prognostic scoring system with a maximum score of eighteen points denoting the highest risk of mortality and a minimum score of eight points carrying a relatively lower risk of mortality. The proposed system contains patient's age, BMI, temperature, pulse, systolic blood pressure, timing of presentation, area involved and comorbidity. Many studies found obesity,[9,10] the timing of patient presentation and patient's comorbidity as important parameters for outcome prediction of Fournier's gangrene and is considered as a major risk factor for mortality.[11,12] The simplified prognostic scoring consists of eight factors outlined below.

The simplified prognostic scoring system[13]
An eight-scale simplified prognostic scoring system, where a maximum score of eighteen points indicates the highest risk of mortality, while a minimum score of eight points reflects a comparatively lower risk of mortality.

I.   Patient's age: ≤50years=I point. ≥50years=2 points.
II.   BMI: BMI<25=I point. BMI <30=2 points BMI >30 =3 points.
III. Temperature: <38°C= I point. >38°C= 2 points.
IV.   Pulse: <100 beats/min=I point. >100 beats/min 2 points.
V.   Systolic blood pressure: >90mm Hg= I point. <90mm Hg= 2 points.
VI.   Presentation: Early=1 point. Delayed=2 points. Late=3 points.
VII. Area involved: Single=1 point. multiple=2 points.
VIII. Comorbidity: DM=1 point. multiple=2 points.

There were three grades according out simplified prognostic scoring system; grade I from 8-10 points, grade II from 11-14 points and grade III from 15-18 points. Patients with grade I carried a lower mortality rate and less hospital stay than those with grade II and grade III. [13]

Traditional prognostic tools such as the Fournier's Gangrene Severity Index (FGSI) and the Uludag Fournier's Gangrene Severity Index (UFGSI) offer important frameworks for evaluating the severity of FG. Nonetheless, these scoring systems frequently necessitate various parameters, rendering them intricate to implement swiftly, particularly in resource-constrained or urgent situations. The Simplified Fournier's Gangrene Prognostic Scoring System (SFGPS) addresses the necessity for a more streamlined and user-friendly tool, effectively minimising complexity while maintaining predictive accuracy. The SFGPS emphasises a limited set of critical clinical parameters, enabling healthcare providers to swiftly evaluate mortality risk and inform treatment choices while maintaining the scoring system's dependability.

It is crucial to validate the SFGPS in various clinical environments to assess its practical application and reliability among different patient groups. While recent studies indicate that SFGPS may effectively predict mortality outcomes, additional research is essential to confirm its applicability and efficacy across diverse healthcare environments, particularly in areas with restricted access to diagnostic resources. This investigation seeks to examine mortality outcomes in FG patients.

METHODOLOGY
A prospective study, utilised a non-probability consecutive sampling technique. This study was conducted at the urology department of Sindh Institute of Urology and Transplantation during January 2018 till June 2022. All the patients enrolled with the working diagnosis of Fournier's gangrene through emergency, between January 2018 till June 2022. Inclusion criteria were all patients who presented with the Fournier's gangrene irrespective of gender, age, co-morbidities. Exclusion criteria was none. Sample size was calculated using the WHO software with the following assumptions. Level of significance

α=0.05 Power of study = 80% and 341 patients were enrolled. We reviewed the files of patients and preformed proforma had filled which includes factors such as Demographics (age, gender, co-morbidities), Vitals, presentation (mode of onset), primary body parts involved. Patient will be assigned scoring on the basis of which they will be shifted to their desire wards. All these patients got conservative management which included broad spectrum antibiotics, nutritional management and nursing care.

Furthermore, each underwent debridement and their wound will be assessed on the daily basis. Sampling technique was Consecutive non-probability sampling. Confidentiality and privacy of subjects will be maintained by giving unique ID codes. The data will be stored in lock and key with access to only principal investigator. Data analysis will be done using SPSS v20. Frequency and percentage of age, BMI, comorbidities, systolic BP, pulse, temperature, presentation and outcome were noted. The level of significance used to evaluate the different outcomes will be 5%, the Chi-square test will be used to compare categorical variables.

RESULTS

A total of 341 patients participated in our study. The majority of patients diagnosed with Fournier's gangrene were over 50 years of age, accounting for 60.7%. 51% of patients had a BMI of less than 25, 130 (38.1%) patients had a BMI between 26 and 30, and 37 (10.9%) patients had a BMI of more than 30. Additionally, 307 (90%) patients had a systolic blood pressure greater than 90 mmHg. Out of the total, 227 individuals, representing 58.1%, did not experience fever. 198 (58.1%) did not have a normal pulse, while 41.9% were admitted with tachycardia. Out of the total, 146 patients, representing 42.8%, reported a past history of diabetes mellitus. The patient arrived at the emergency department exhibiting early (38.1%), delayed (56.3%), and late (5.6%) responses. 92.4% of patients admitted with Fournier's gangrene were successfully discharged, while 7.6% unfortunately did not survive. • A significant proportion of patients (82.1%) exhibited involvement in a singular region (scrotum or perineum). A smaller percentage (17.9%) exhibited infection or

involvement across multiple regions, including the inguinal, abdominal, and thigh areas. (table1)

Table 1

Demographic, Clinical, and Outcome Data for Patients with Fournier's gangrene

Age	Frequency	Percent	Valid Percent	Cumulative Percent
<50 years	134	39.3	39.3	39.3
>50 years	207	60.7	60.7	100.0
Total	341	100.0	100.0	
BMI				
<25	174	51.0	51.0	51.0
26-30	130	38.1	38.1	89.1
>31	37	10.9	10.9	100.0
Total	341	100.0	100.0	
SYSTOLIC BP				
>90 mmHg	307	90.0	90.0	90.0
<90 mmHg	34	10.0	100.0	100.0
TOTAL	341	100.0	100.0	
TEMPERATURE				
<38 c	227	66.6	66.6	66.6
>38 c	114	33.4	33.4	100.0
Total	341	100.0	100.0	
PULSE				
<100 b/m	198	58.1	58.1	58.1
>100 b/m	143	41.9	41.9	100.0
Total	341	100.0	100.0	
COMOBIDIES				
DM	146	42.8	42.8	42.8
Multiple (renal failure, hepatic failure, IHD, HIV)	119	34.9	34.9	77.7
none	76	22.3	22.3	100.0
Total	341	100.0	100.0	
Presentation				
Early (cellulitis without gangrene).	130	38.1	38.1	38.1
Delayed (SIRS with fever tachycardia tachpnea along with discharge and gangrene)	192	56.3	56.3	94.4
late (septic shock with gangrene)	19	5.6	5.6	100.0
Total	341	100.0	100.0	
Areas Involved				
Single (scrotum in males, perineum in females)	280	82.1	82.1	
multiple(inguinal, anterior abdominal walls, thigh)	61	17.9	100.0	
Total		341	100.0	
OUTCOME				
discharged	315	92.4	92.4	92.4
death	26	7.6	7.6	100.0
Total	**341**	**100.0**	**100.0**	

Table 2

Impact of Clinical Factors on Patient Outcomes (Discharge vs. Mortality)

BMI	Outcome		Total	P-value
	Discharged	Death		
<25	160(46.9%)	14(4.1%)	174(51%)	
26-30	121(35.4%)	9(2.6%)	130(38.1%)	0.929
>31	34(9.97%)	3(0.8%)	37(10.8%)	
Total	315(92.3%)	26(7.6%)	341	
Age	Outcome		Total	p-value
	Discharged	Death		
<50 years	128(37.5%)	6(1.7%)	134(39.2%)	0.000
>50 years	187(54.8%)	20(5.8%)	207(60.7%)	
	315(92.3%)	26(7.6%)	341	
Temperature	Outcome		Total	p-value
	Discharged	Death		
<38 c	225(65.9%)	2(0.5%)	227(66.5%)	
>38 c	90(26.3%)	24(7.0%)	114(33.4%)	0.000
Total	315(92.3%)	26(7.6%)	341	
Pulse	Outcome		Total	p-value
	Discharged	Death		
<100 b/m	196(57.5%)	2(0.5%)	198(58.0%)	
>100 b/m	119(34.8%)	24(7.0%)	143(41.9%)	
Total	315(92.3%)	26(7.6%)	341	
Systolic BP	Outcome		Total	p-value
	Discharged	Death		
>90 mmHg	298(87.3%)	9(2.6%)	307(90.0%)	0.000
<90 mmHg	17(4.9%)	17(4.9%)	34(9.9%)	
Total	315(92.3%)	26(7.6%)	341	
Presentation	Outcome		Total	p-value
	Discharged	Death		
Early (cellulitis without gangrene).	130(38.1%)	0	130(38.1%)	0.000
Delayed (SIRS with fever tachycardia, tachypnea along with discharge and gangrene)	183(53.6%)	9(2.6%)	192(56.3%)	
Late (septic shock with gangrene)	2(0.5%)	17(4.9%)	19(5,5%)	
Total	315(92.3%)	26(7.6%)	341	

Chi- square test

Table 2 indicates that BMI does not significantly influence patient outcomes, as evidenced by a p-value of 0.929. Patients over 50 years old demonstrated a higher mortality rate of 5.8% in comparison to those under 50, who had a rate of 1.7%. This difference is statistically significant, with a p-value of 0.000. In terms of temperature, individuals exhibiting a fever exceeding 38°C experienced a mortality rate of 7.0%, which is markedly higher than the 0.5% mortality rate observed in patients with temperatures below 38°C (p-value: 0.000). A pulse rate exceeding 100 bpm correlated with a heightened mortality rate of 7.0%, in contrast to 0.5% for individuals with a pulse below 100 bpm (p-value: 0.000). Individuals exhibiting systolic blood pressure levels below 90 mmHg experienced a notably elevated mortality rate of 4.9%, in contrast to those with systolic BP exceeding 90 mmHg, who had a mortality rate of 2.6% (p-value: 0.000). The timing of presentation was crucial, as patients who presented late (septic shock with gangrene) exhibited the highest mortality rate of 4.9%, in contrast to 0% for those who presented early (p-value: 0.000). In summary, age, fever, elevated pulse rate, low blood pressure, and delayed presentation are statistically significant factors affecting mortality, whereas BMI does not seem to have a substantial effect.

Table 3

Simplified prognostic scoring system grading and their association with discharge and Mortality Outcomes

Grade according to simplified prognostic scoring system of Fournier gangrene	outcome		Total	p-value
	Discharged	Death		
Grade 1(0-10)	142(41.6%)	1(0.2%)	143(41.9%)	
Grade 2(11-14)	162((47.5%)	8(2.3%)	170(49.8%)	0.000
Grade 3(15-18)	11(3.2%)	17(4.9%)	28(8.2%)	
Total	**315(92.3%)**	**26(7.6%)**	**341**	

Table 3 indicates that the severity of Fournier gangrene, as classified by the simplified prognostic scoring system, has a significant impact on patient outcomes. For Grade 1 (score 0-10), 142 patients were discharged (41.6%), and 1 died (0.2%), making up 143 patients (41.9% of the total). In Grade 2 (score 11-14), 162 were discharged (47.5%), and 8 died (2.3%), accounting for 170 patients (49.8%). For Grade 3 (score 15-18), only 11 were discharged (3.2%), while 17 died (4.9%), representing 28 patients (8.2%). The p-value of 0.000 indicates a statistically significant relationship between the prognostic score and patient outcomes, with higher scores correlating with increased mortality.

DISCUSSION

Two significant validated scoring systems exist for predicting outcomes in Fournier's gangrene. The systems in question are the Fournier's Gangrene Severity Index (FGSI)[14] and the Uludag Fournier's Gangrene Severity Index (UFGSI).[15] The Fournier's Gangrene Severity Index (FGSI) was introduced by Laor et al.[16] This index comprises nine metabolic and physiological parameters. Laor et al discovered that a FGSI score exceeding 9 suggested a 75% probability of mortality, whereas a score of 9 or lower correlated with a 78% probability of survival. Nonetheless, this scoring system does not incorporate the timing of patient presentation, BMI, and medical comorbidity, which have been considered in the simplified prognostic scoring system. Yilmazlar et al.[15] proposed a novel scoring system, the Uludag FGSI (UFGSI), which incorporates age and the extent of the disease scores into the FGSI. Several studies indicated that FGSI scores demonstrated both sensitivity and specificity in predicting mortality rates. When comparing UFGSI to FGSI, it was concluded that, despite the inclusion of additional variables, UFGSI does not appear to be more effective than FGSI. The simplified clinical prognostic scoring system was proposed by Sabre et al, featuring a maximum score of 18 points, indicating the highest risk of mortality, and a minimum score. A score of 8 points indicates a reduced risk of mortality.[17] The current study has evaluated a system that includes the patient's age, body mass index, temperature, pulse rate, systolic blood pressure, time of presentation, the affected body region, and comorbidity.

The current study clearly demonstrated that all the affected individuals were male, with an average age at presentation of 56.27 years. FG is identified as resulting from either intentional or accidental trauma to the anorectal (30%–50%) or urogenital area (60%), leading to the introduction of bacteria into the surrounding tissue.[15] In our study, majority of patients diagnosed with Fournier's gangrene were over 50 years of age, accounting for 60.7%. 51% of patients had a BMI of less than 25, 130 (38.1%) patients had a BMI between 26 and 30, and 37 (10.9%) patients had a BMI of more than 30. A significant proportion of patients (82.1%) exhibited involvement in a singular region (scrotum or perineum). A smaller percentage (17.9%) exhibited infection or involvement across multiple regions, including the inguinal, abdominal, and thigh areas.

Previous studies have reported varying mortality rates for this disease, ranging from 20 to 80%.[18] With increased attention to the disease and advancements in treatment, the reported mortality rate for FG now ranges between 7.5% and 16%.[19] In another research, the mortality rate for FG was determined to be 6.5%, consistent with the most recent literature. The findings of our study indicated a mortality rate of 7.6%, which aligns with existing literature.[20]

The study provides important insights into the prediction of mortality risk, while also highlighting some limitations. A significant limitation is the restricted accuracy of the simplified scoring system, particularly in contrast to other more intricate scoring systems such as the complete Fournier's Gangrene Severity Index (FGSI) or the Uludag Fournier's Gangrene Severity Index (UFGSI). The inclusion of a wider array of clinical variables in these systems can enhance the precision of mortality assessments. A further limitation is the potential insensitivity of the simplified system to more nuanced variations in clinical presentation. For example, it classifies patients according to general factors (such as age above or below 50, binary pulse rates), which could lead to an oversimplification of intricate cases where various interconnected issues play a role in mortality risk. This can pose significant challenges in older or diabetic patients, whose conditions may vary considerably even within the "high-risk" category. Furthermore, investigations indicate that

although the Simplified Prognostic Scoring System is more straightforward to apply in clinical environments, it may not be suitable for all patient demographics or hospitals with varying resource capacities, which restricts its generalisability. In environments with greater resources, healthcare professionals might find it advantageous to employ a more comprehensive assessment tool to inform treatment decisions and enhance the accuracy of outcome predictions, especially in scenarios involving high-risk factors, such as advanced-stage presentations or the presence of multiple comorbidities. To validate the results of this study, a multi-institutional prospective randomised control trial is necessary.

CONCLUSION

In conclusion, the use of a simplified prognostic scoring system to predict mortality in patients with Fournier's gangrene is an effective tool. The study found that advanced age, low BMI, higher temperature, tachycardia, hypotension and late presentation with septic shock were significant risk factors in determining mortality. The simplified scoring system is a life-saving tool that can be easily applied in clinical settings to predict the outcomes of patients with Fournier's gangrene. In summary, the simplified scoring system is a valuable tool for risk stratification in patients with Fournier's gangrene and should be routinely used in clinical practice to improve patient outcomes.

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