

**A Clinical Study of Acute Kidney Injury in Tropical Acute Febrile Illness****Tarliboyina Rama Krishna<sup>1</sup>, Diganta Das<sup>2</sup>, Madhumita P. Das<sup>3</sup>, Soumik Dey<sup>4</sup>, Bhupali Talukdar<sup>1</sup>, Rajib Kumar Roy<sup>1</sup>**<sup>1</sup>Post Graduate Trainee, General Medicine, Gauhati Medical College & Hospital, Guwahati, India<sup>2</sup>Associate Professor, General Medicine, Gauhati Medical College & Hospital, Guwahati, India<sup>3</sup>Professor & Head of the department, General Medicine, Gauhati Medical College & Hospital, Guwahati, India

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Conflict of interest: Nil

**Abstract****Background:** Acute kidney injury (AKI) is a serious complication of tropical acute febrile illness (TAFI) and contributes significantly to morbidity, mortality, and healthcare burden in endemic regions. Early recognition of AKI and associated systemic complications is essential for improving clinical outcomes.**Methods:** A hospital-based observational study was conducted among 100 patients with AKI complicating TAFI. Demographic characteristics, clinical presentation, laboratory parameters, etiological profile, AKI severity according to the RIFLE classification, complications, dialysis requirement, intensive care unit (ICU) admission, and clinical outcomes were evaluated. Statistical analysis was performed to assess associations between selected variables and AKI severity.**Results:** The mean age of participants was 40.14 ± 15.04 years, with male predominance (62%). Fever was present in all patients, while myalgia (51%), vomiting (50%), rash (50%), and decreased urine output (49%) were common presenting symptoms. Pedal edema (57%), tachycardia (53%), conjunctival congestion (48%), and icterus (47%) were the predominant clinical signs. Dengue (32%) was the leading etiology, followed by malaria (21%), leptospirosis (17%), scrub typhus (14%), enteric fever (8%), and undifferentiated fever (8%). RIFLE classification showed Risk in 38%, Injury in 34%, and Failure in 28% of patients. Major complications included sepsis (53%), ARDS (52%), shock (51%), and MODS (51%). Dialysis was required in 26% and ICU admission in 34% of patients. Complete recovery occurred in 64%, partial recovery in 22%, and mortality was 14%. A significant association was observed between age category and AKI severity (p=0.026).**Conclusion:** TAFI-associated AKI is a multisystem disorder with substantial morbidity, dialysis requirement, and mortality. Early recognition, strict renal monitoring, and prompt management of sepsis, shock, and respiratory failure are crucial to improve renal recovery and reduce adverse outcomes.**Keywords:** Acute kidney injury; Tropical acute febrile illness; RIFLE classification; Dengue; Dialysis; Sepsis; Mortality.**DOI:** 10.25258/ijcpr.18.6.20This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.**Introduction**

Among the many complications of tropical febrile illnesses, Acute Kidney Injury (AKI) stands out as one of the most clinically significant and prognostically important conditions. AKI is not only a marker of severity of infection but also a direct contributor to morbidity and mortality [1]. It frequently complicates severe infections by causing fluid and electrolyte imbalance, metabolic acidosis, accumulation of toxins, and failure to maintain internal homeostasis. In practical clinical settings, AKI is associated with increased need for intensive care, dialysis, higher treatment costs, and reduced survival rates [2]. Hence, early recognition and systematic evaluation of AKI among febrile

illnesses is now considered essential for improving outcomes. The association between Tropical Acute Febrile Illness (TAFI) and AKI has gained attention because tropical infections produce kidney injury through multiple mechanisms, often simultaneously. Fever-related dehydration can reduce effective circulating volume and precipitate pre-renal azotemia. Severe infections can trigger systemic inflammation and sepsis-induced microvascular dysfunction, leading to acute tubular injury. Hemodynamic instability, capillary leak, and hypotension worsen renal perfusion [3]. In addition, rhabdomyolysis, hemolysis, toxin-mediated injury, and immune complex deposition can contribute to

renal damage. These multiple pathways make AKI in tropical febrile illness clinically complex and demand an integrated approach combining clinical monitoring, laboratory assessment, and timely supportive care.

TAFI-associated AKI is also complicated by factors such as late hospital presentation, self-medication, and use of nephrotoxic drugs like NSAIDs, certain antibiotics, or herbal remedies. In many low-resource settings, patients may initially receive symptomatic treatment only, resulting in dehydration and worsening renal perfusion. Furthermore, delayed referral to tertiary care often means patients reach hospitals with established organ dysfunction [4]. Therefore, AKI in tropical febrile illness is not only a clinical condition but also a reflection of systemic barriers to early diagnosis and timely treatment. Identifying patterns of AKI in such contexts helps refine triage and management protocols.

The burden of AKI in tropical febrile illness also carries major implications for healthcare systems. AKI increases the requirement for dialysis facilities, ICU beds, laboratory monitoring, and prolonged hospitalization. In tertiary centers, this may overload services during outbreak seasons. For patients, AKI leads to higher out-of-pocket expenditure, loss of productivity, and long-term risk of chronic kidney disease. Importantly, AKI survivors may carry persistent renal impairment even after apparent recovery, suggesting that AKI should be treated as a significant long-term health risk rather than only an acute hospital complication [5]. These consequences highlight why AKI-focused research in febrile illness populations is a public health priority.

Given these challenges, a clinical study on AKI in TAFI was conducted. Studies from Indian tertiary hospitals have demonstrated that AKI prevalence in tropical febrile illness can be substantial, reinforcing the clinical relevance of systematic assessment.

### Materials and Methods

The observational cross-sectional study was conducted in the Department of General Medicine, Gauhati Medical College & Hospital (GMCH), Guwahati, over a period of 12 months, from September 2024 to August 2025. Using a hospital-based sampling technique, a total of 100 subjects were selected for the study. Institutional Ethical clearance was obtained before the commencement of the study.

**Inclusion Criteria:** Patients aged more than 18 years admitted with Acute Kidney Injury (AKI) in the setting of Tropical Acute Febrile Illness (TAFI).

**Exclusion Criteria:** Patients aged less than 18 years, with nosocomial infections, fever associated with multiple system involvement, non-infectious

aetiologies of fever, fever of unknown origin, chronic kidney disease (CKD), AKI secondary to non-infectious aetiologies, Immunocompromised individuals, Immunosuppressed individuals, Pregnant females.

Written and informed consent was obtained from each patient prior to inclusion. Demographic details and clinical history were recorded at enrollment.

All admitted patients in the Department of General Medicine with symptoms suggestive of acute febrile illness were clinically evaluated. Eligible patients were identified based on adult age group criteria and evidence of AKI in the setting of acute febrile illness. After confirming eligibility, each participant was enrolled in the study after obtaining written informed consent.

A detailed clinical evaluation was conducted for each enrolled patient. This included history taking focusing on fever pattern, associated systemic symptoms, gastrointestinal symptoms, musculoskeletal symptoms, and swelling. Specific emphasis was given to exposure history such as travel, mosquito exposure, and contact with contaminated water because these factors were clinically relevant to tropical infections.

Baseline demographic details and clinical history were recorded at enrollment. Clinical examination was performed thoroughly to record vital signs and systemic findings. Fever and tachycardia were documented, and additional features like conjunctival congestion, rash, joint pain, and other markers of tropical infection were noted. Physical examination findings including vital parameters and systemic signs were documented. Provisional clinical diagnosis was formulated based on clinical presentation and early laboratory investigations.

Routine blood and urine investigations were performed and recorded. Special investigations for tropical infections were documented based on the clinical suspicion. Each patient was catheterized to ensure accurate urine output monitoring. Urine output was recorded sequentially and correlated with renal function tests. Serum creatinine levels were monitored sequentially during hospital stay to assess progression or improvement of AKI. AKI staging was performed using the RIFLE Classification, integrating urine output and creatinine trends.

Patients were managed as per standard institutional protocol under treating physicians. The study did not interfere with management, and therapeutic interventions were provided based on clinical diagnosis and severity. Supportive care and infection-specific treatment were implemented as required. Clinical improvement indicators including fever reduction, urine output normalization, and improving renal function tests were documented. The discharge decision was made based on these

clinical improvement trends. Outcome documentation was completed at the time of discharge.

All collected data were entered into Microsoft Excel.

Continuous variables such as age, serum creatinine, and electrolyte values were presented using mean and standard deviation or median values depending on distribution.

### Result

**Table 1: Demographic Profile of Study Participants (N = 100)**

Variable	Category	Frequency	Percentage
Age Category (Years)	18–30	24	24.0%
	31–40	28	28.0%
	41–50	21	21.0%
	51–60	17	17.0%
	>60	10	10.0%
Sex	Male	62	62.0%
	Female	38	38.0%

**Mean Age: 40.14 ± 15.04 years**

The demographic profile showed that the majority of patients belonged to the 31–40 years age group (28.0%), followed by the 18–30 years (24.0%) and 41–50 years (21.0%) age groups. Overall, 73.0% of patients were between 18 and 50 years of age, indicating that AKI associated with tropical acute febrile illness predominantly affected the economically productive adult population. The mean age of the study participants was 40.14 ± 15.04 years, reflecting a broad age distribution. A male

predominance was observed, with males accounting for 62.0% of cases and females for 38.0%, resulting in a male-to-female ratio of approximately 1.6:1. This higher prevalence among males may be related to greater occupational and environmental exposure to vectors and infectious agents responsible for tropical febrile illnesses. These findings suggest that young and middle-aged males constitute a major risk group for AKI complicating tropical acute febrile illness.

**Table 2: Distribution of Presenting Symptoms among Study Participants (N = 100)**

Symptom	Yes n (%)	No n (%)	Total n (%)
Fever	100 (100.0%)	0 (0.0%)	100 (100.0%)
Vomiting	50 (50.0%)	50 (50.0%)	100 (100.0%)
Diarrhoea	50 (50.0%)	50 (50.0%)	100 (100.0%)
Myalgia	51 (51.0%)	49 (49.0%)	100 (100.0%)
Decreased Urine Output	49 (49.0%)	51 (51.0%)	100 (100.0%)
Breathlessness	46 (46.0%)	54 (54.0%)	100 (100.0%)
Rash	50 (50.0%)	50 (50.0%)	100 (100.0%)

Fever was present in all patients (100.0%), confirming it as the universal presenting symptom of tropical acute febrile illness. Myalgia was the most common associated symptom (51.0%), followed by vomiting, diarrhoea, and rash (50.0% each). Decreased urine output was observed in 49.0% of patients, indicating early renal involvement, while

breathlessness was present in 46.0%, suggesting significant systemic and respiratory involvement. Overall, the findings demonstrate the multisystem nature of tropical febrile illnesses complicated by AKI and emphasize the need for early comprehensive assessment and prompt management.

**Table 3: Distribution of Clinical Signs among Study Participants (N = 100)**

Clinical Sign	Yes n (%)	No n (%)	Total n (%)
Tachycardia	53 (53.0%)	47 (47.0%)	100 (100.0%)
Hypotension	41 (41.0%)	59 (59.0%)	100 (100.0%)
Pedal Edema	57 (57.0%)	43 (43.0%)	100 (100.0%)
Icterus	47 (47.0%)	53 (53.0%)	100 (100.0%)
Conjunctival Congestion	48 (48.0%)	52 (52.0%)	100 (100.0%)

The clinical examination findings demonstrated substantial systemic involvement among patients with AKI associated with tropical acute febrile illness. Pedal edema was the most frequently observed sign (57.0%), followed by tachycardia (53.0%), conjunctival congestion (48.0%), icterus

(47.0%), and hypotension (41.0%). These findings suggest significant fluid imbalance, hemodynamic disturbances, and multisystem involvement, reflecting the severity of the underlying infectious process and renal dysfunction.

Early recognition of these clinical signs is essential for timely intervention and improved patient outcomes.

**Table 4: Renal Function and Electrolyte Parameters (N = 100)**

Parameter	Mean $\pm$ SD
Serum Creatinine (mg/dL)	3.40 $\pm$ 1.40
Blood Urea (mg/dL)	88.56 $\pm$ 32.37
Urine Output (ml/day)	769.68 $\pm$ 274.41
Sodium (mEq/L)	135.67 $\pm$ 4.49
Potassium (mEq/L)	4.72 $\pm$ 0.69

The elevated mean serum creatinine (3.40  $\pm$  1.40 mg/dL) and blood urea (88.56  $\pm$  32.37 mg/dL) confirm significant renal dysfunction in the study population. The reduced mean urine output (769.68  $\pm$  274.41 ml/day) reflects impaired renal excretory

function. Electrolyte analysis showed near-normal sodium levels, while potassium levels were moderately elevated, highlighting the risk of hyperkalemia in AKI associated with tropical infections.

**Table 5: Etiological Distribution of Tropical Acute Febrile Illness (N = 100)**

Etiology	Frequency	Percentage
Dengue	32	32.0%
Malaria	21	21.0%
Leptospirosis	17	17.0%
Scrub Typhus	14	14.0%
Enteric Fever	8	8.0%
Undifferentiated Fever	8	8.0%
Total	100	100.0%

Dengue was the most common etiological agent (32.0%), followed by malaria (21.0%) and leptospirosis (17.0%). These findings indicate that vector-borne and zoonotic infections are the major contributors to AKI in tropical febrile illnesses.

**Table 6: RIFLE Classification of AKI (N = 100)**

RIFLE Stage	Frequency	Percentage
Risk	38	38.0%
Injury	34	34.0%
Failure	28	28.0%
Total	100	100.0%

Most patients were categorized under Risk and Injury stages (72.0%), while 28.0% presented with Failure stage AKI, indicating that a substantial proportion of patients had moderate to severe renal impairment at admission.

**Table 7: Major Complications of AKI among Study Participants (N = 100)**

Complication	Frequency	Percentage
Metabolic Acidosis	48	48.0%
Sepsis	53	53.0%
Shock	51	51.0%
ARDS	52	52.0%
MODS	51	51.0%

The study demonstrated a high prevalence of serious complications among patients with AKI associated with tropical acute febrile illness. Sepsis was the most common complication (53.0%), followed by ARDS (52.0%), shock (51.0%), MODS (51.0%), and metabolic acidosis (48.0%). The frequent occurrence of these complications indicates

substantial multisystem involvement and highlights the severe clinical course of tropical infections complicated by AKI. These findings emphasize the importance of early diagnosis, close monitoring, and aggressive supportive management to prevent progression to organ dysfunction and improve clinical outcomes.

**Table 8: Requirement of Dialysis and ICU Admission among Study Participants (N = 100)**

Parameter	Frequency	Percentage
Dialysis Required	26	26.0%
ICU Admission Required	34	34.0%

A total of 26.0% of patients required dialysis, indicating the presence of severe renal dysfunction necessitating renal replacement therapy. Additionally, 34.0% of patients required ICU admission, reflecting significant systemic illness and the need for intensive monitoring and supportive

care. These findings highlight the substantial burden of severe AKI and associated complications in patients with tropical acute febrile illness, emphasizing the importance of timely intervention and appropriate critical care management.

**Table 9: Clinical Outcome, Hospital Stay, Dialysis Requirement, and ICU Admission among Study Participants (N = 100)**

Parameter	Frequency (%) / Mean $\pm$ SD
<b>Clinical Outcome</b>	
Complete Recovery	64 (64.0%)
Partial Recovery	22 (22.0%)
Death	14 (14.0%)
<b>Dialysis Required</b>	26 (26.0%)
<b>ICU Admission Required</b>	34 (34.0%)
<b>Duration of Hospital Stay (days)</b>	10.35 $\pm$ 4.36

The majority of patients achieved complete recovery (64.0%), while 22.0% showed partial recovery and 14.0% succumbed to the illness. Dialysis was required in 26.0% of patients, reflecting the occurrence of severe renal dysfunction, whereas 34.0% required ICU admission due to critical illness and multisystem involvement. The mean duration of hospital stay was 10.35  $\pm$  4.36 days, indicating the

need for prolonged hospitalization and close monitoring in a substantial proportion of cases. Overall, these findings suggest that although favorable outcomes were achieved in most patients, AKI associated with tropical acute febrile illness remains a significant cause of morbidity, resource utilization, and mortality.

**Table 10: Association between Age Category and RIFLE Stage of AKI (N = 100)**

Age Category	Risk (Stage 1) n (%)	Injury (Stage 2) n (%)	Failure (Stage 3) n (%)	Row Total n (%)
18–30 years	8 (33.3%)	9 (37.5%)	7 (29.2%)	24 (100.0%)
31–40 years	6 (21.4%)	14 (50.0%)	8 (28.6%)	28 (100.0%)
41–50 years	14 (66.7%)	4 (19.0%)	3 (14.3%)	21 (100.0%)
51–60 years	7 (41.2%)	6 (35.3%)	4 (23.5%)	17 (100.0%)
>60 years	3 (30.0%)	1 (10.0%)	6 (60.0%)	10 (100.0%)
<b>Total</b>	<b>38 (38.0%)</b>	<b>34 (34.0%)</b>	<b>28 (28.0%)</b>	<b>100 (100.0%)</b>
$\chi^2 = 17.398$ , $df = 8$ , $p = 0.026$				

The analysis showed a statistically significant association between age category and severity of acute kidney injury based on RIFLE classification ( $\chi^2 = 17.398$ ,  $df = 8$ ,  $p = 0.026$ ). This indicates that the distribution of AKI severity varied significantly across different age groups.

Patients in the 41–50 year's age group predominantly presented with Risk stage AKI (66.7%), suggesting relatively milder renal involvement in this age category. In contrast, patients aged above 60 years demonstrated a higher proportion of Failure stage AKI (60.0%), indicating more severe renal dysfunction among the elderly population.

The observed trend suggests that advancing age is associated with increased severity of AKI in tropical

acute febrile illness. Elderly patients are more likely to have reduced renal reserve and associated comorbidities, which may contribute to poorer renal outcomes during acute systemic infections. These findings emphasize the need for early risk stratification, close monitoring, and aggressive management in older patients to prevent progression to severe AKI.

### Discussion

The aim of this study was to evaluate the clinical profile, etiological spectrum, severity, complications, management requirements, and outcomes of acute kidney injury (AKI) occurring in patients with tropical acute febrile illness (TAFI).

AKI complicating tropical acute febrile illness predominantly affected young and middle-aged

adults, with 73.0% of cases occurring between 18–50 years and a mean age of  $40.14 \pm 15.04$  years. This indicates a substantial burden on the economically productive population. Although younger adults constituted the majority of cases, older age has been associated with adverse outcomes and higher mortality in AKI, as reported by Ostermann & Chang [6] and Jayapalan Nair et al. [7]. Male predominance (62.0%) was observed, consistent with findings by Omar et al. [8], likely reflecting greater environmental exposure.

Fever was universal (100%), confirming it as the defining feature of tropical acute febrile illness. Myalgia (51.0%), vomiting (50.0%), rash (50.0%), decreased urine output (49.0%), and breathlessness (46.0%) were common associated symptoms. These findings support the multisystem nature of tropical infections and emphasize the importance of early renal evaluation in febrile patients. Similar observations highlighting the significance of early AKI detection in febrile illnesses have been reported by Cherian & Deodhar [9], and Hawkes et al. [10].

Pedal edema (57.0%) was the most common clinical sign, followed by tachycardia (53.0%), conjunctival congestion (48.0%), icterus (47.0%), and hypotension (41.0%). These findings indicate significant hemodynamic instability, fluid imbalance, and multisystem involvement. Comparable studies have shown that fluid overload, shock, and systemic inflammatory responses contribute substantially to AKI severity and outcomes Ostermann & Chang [6], Aslan [11], Omar et al. [8], Jayapalan Nair et al. [7].

The mean serum creatinine ( $3.40 \pm 1.40$  mg/dL) and blood urea ( $88.56 \pm 32.37$  mg/dL) indicated significant renal dysfunction. Mean urine output was reduced ( $769.68 \pm 274.41$  mL/day), consistent with the high prevalence of oliguria. Serum sodium remained near normal ( $135.67 \pm 4.49$  mEq/L), whereas potassium levels ( $4.72 \pm 0.69$  mEq/L) suggested a tendency toward hyperkalemia. Similar associations between severe biochemical derangements, dialysis requirement, and mortality have been reported by Ostermann & Chang [6], Jayapalan Nair et al. [7], Badge et al. [12].

Dengue (32.0%) was the leading etiology, followed by malaria (21.0%), leptospirosis (17.0%), scrub typhus (14.0%), enteric fever (8.0%), and undifferentiated fever (8.0%). This pattern demonstrates the predominance of vector-borne and zoonotic infections. However, etiological patterns vary geographically, with leptospirosis being the leading cause in the study by Jayapalan Nair et al. [7]. Similar observations were reported by Cherian & Deodhar [9] and Hawkes et al. [10].

According to RIFLE criteria, 38.0% were classified as Risk, 34.0% as Injury, and 28.0% as Failure. More than one-fourth of patients presented with

severe AKI. Similar findings highlighting the prognostic significance of advanced AKI stages have been reported by Ostermann & Chang [6], Badge et al. [12], and Jayapalan Nair et al. [7].

Sepsis (53.0%), ARDS (52.0%), shock (51.0%), and MODS (51.0%) were highly prevalent, indicating extensive multisystem involvement. These complications are recognized contributors to AKI progression through inflammatory, endothelial, and microcirculatory mechanisms. Comparable associations have been reported by Hawkes et al. [10], Aslan [11], Ostermann & Chang [6], and Cherian & Deodhar [9].

Dialysis was required in 26.0% of patients, indicating a substantial burden of severe AKI. This rate was higher than those reported by Jayapalan Nair et al. [7] and Badge et al. [12], but comparable to Omar et al. [8]. The need for dialysis reflects significant metabolic disturbances, fluid overload, and advanced renal dysfunction. ICU admission was also common, reflecting the high prevalence of shock, ARDS, sepsis, and MODS.

Complete recovery occurred in 64.0% of patients, while 22.0% had partial recovery and 14.0% died. The mortality rate reflects the severe systemic complications present in this cohort and is comparable with reports by Cherian & Deodhar [64], though higher than that reported by Jayapalan Nair et al. [7]. The mean hospital stay was  $10.35 \pm 4.36$  days, indicating considerable healthcare utilization. Similar observations regarding prolonged hospitalization and increased mortality in severe AKI have been reported by Ostermann & Chang [6] and Aslan [11].

A significant association was observed between age category and RIFLE stage ( $\chi^2 = 17.398$ ,  $p = 0.026$ ). Patients aged >60 years demonstrated the highest proportion of Failure-stage AKI, whereas the 41–50 year's group predominantly had Risk-stage disease. These findings indicate that increasing age is associated with greater AKI severity, consistent with the observations of Jayapalan Nair et al. [7], who reported that older age and higher AKI stages are important predictors of adverse outcomes and mortality.

The study included 100 patients with AKI complicating tropical acute febrile illness, providing adequate demographic and clinical representation. Comprehensive assessment of symptoms, clinical signs, laboratory parameters, etiological profile, and outcomes enabled a holistic evaluation of disease burden. AKI severity was objectively classified using the RIFLE criteria, facilitating risk stratification. Clinically relevant outcomes such as dialysis requirement, ICU admission, complications, recovery, and mortality were systematically analyzed.

The study also identified a significant association between age and AKI severity, enhancing its clinical applicability.

Limitations indicate as a single-center study with a relatively small sample size, the findings may have limited generalizability. Inclusion of only hospitalized AKI patients may have overrepresented severe disease and complication rates. The analysis was largely descriptive, without multivariable modeling to identify independent predictors of outcomes. Important variables such as baseline renal function, timing of presentation, fluid management, and ventilatory support were not evaluated. Long-term renal outcomes after discharge were not assessed, and comparisons with studies using KDIGO criteria may be limited due to the use of RIFLE classification.

### Conclusion

This clinical study of 100 patients with acute kidney injury complicating tropical acute febrile illness demonstrates that AKI in the tropical febrile context is predominantly a multisystem disorder affecting largely young and middle-aged adults, with a substantial burden of critical illness, organ failure, and clinically relevant mortality.

The study supports a practical conclusion that tropical acute febrile illness-associated AKI is common in working-age adults, frequently accompanied by severe systemic complications, and associated with meaningful dialysis need and mortality; early recognition within the first week of fever, strict urine output monitoring, prompt evaluation of creatinine/urea/electrolytes and acid-base status, and aggressive management of sepsis, shock, and respiratory failure are essential to reduce progression to severe AKI, shorten hospitalization, improve renal recovery, and lower the observed 14% mortality.

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