



CLINICAL PROFILE, BIOCHEMICAL ABNORMALITIES AND OUTCOME IN SCRUB TYPHUS PATIENTS: A PROSPECTIVE OBSERVATIONAL STUDY

Medicine

Dr. Abrar Husain* Junior Resident, Department of Medicine. *Corresponding Author

Dr. Azhar Ali Khan MD Medicine, Professor Department of Medicine.

Dr. Sudheer Yadav MD Medicine, Associate Professor, Department of Medicine

Dr. Bechan Kumar Gautam MD Medicine Assistant professor.

ABSTRACT

Background: Scrub typhus is an acute zoonotic infection caused by *Orientia tsutsugamushi*, transmitted via bites from infected chigger mites. Common in Southeast Asia and India, this disease often presents with nonspecific febrile symptoms that overlap with other infections like dengue and malaria. Delayed diagnosis can lead to severe complications and death, particularly in older individuals and those with comorbidities. **Aims & Objectives:** This study aimed to evaluate the clinical, and biochemical abnormalities in scrub typhus-positive patients to identify key factors predicting survival outcomes. **Methodology:** A prospective observational study was conducted from January 1, 2023, to December 31, 2023, at BRD Medical College, Gorakhpur. A total of 150 patients aged 18 to 75 years, diagnosed with scrub typhus via IgM ELISA, were included. Clinical data, laboratory parameters, and Glasgow Coma Scale (GCS) scores were analyzed. Statistical analysis was performed using SPSS. **Results:** The study demonstrated significant statistical differences in scrub typhus outcomes. Younger age groups (10-20: 90.63% survival, $p=0.6024$) and females had higher survival rates. Fever lasting less than 1 week was associated with 85% mortality ($p=0.033$). Comorbidities such as diabetes (66.67%, $p<0.0001$) and hypertension (55.56%, $p=0.0031$) increased mortality risk. Patients with lower GCS scores (3-6: 72% mortality, $p<0.0001$) and non-survivors had higher total leukocyte counts ($p=0.007$), lower platelet counts ($p<0.001$), and elevated creatinine and bilirubin levels ($p<0.001$). **Conclusions:** This study highlights that early diagnosis and management of key clinical and biochemical markers, such as age, organ involvement, and GCS scores, are vital for improving outcomes in scrub typhus patients.

KEYWORDS

Scrub typhus; Orientia tsutsugamushi; GCS score; organ involvement; mortality

INTRODUCTION

Scrub typhus is an acute zoonotic infection caused by *Orientia tsutsugamushi*, an obligate intracellular gram-negative bacterium, transmitted to humans through the bite of larval trombiculid mites, commonly known as chiggers.^[1] This disease is prevalent in regions with dense vegetation, including Southeast Asia and the Indian subcontinent, where environmental factors favor the proliferation of mites that act as vectors for the disease.^[2]

In India, the incidence of acute febrile illness spikes during and after the monsoon season, with viral infections, malaria, dengue, typhoid, leptospirosis, and scrub typhus being primary culprits.^[3] These diseases share overlapping clinical symptoms, such as fever, headache, and body aches, which often complicates the diagnosis of scrub typhus. Misdiagnosis or delayed recognition can lead to severe complications like multi-organ failure or even death.^[4] This study aims to provide diagnostic insights to help primary care physicians identify scrub typhus cases early, ensuring prompt treatment and improved patient outcomes.

According to the World Health Organization (WHO), scrub typhus is among the most underdiagnosed and underreported febrile illnesses requiring hospitalization.^[5,6] Despite its prevalence, it remains a neglected disease in India, with a mortality rate ranging from 7% to 30%. Recent observations at our institute have shown a rise in the number of scrub typhus cases, particularly during the monsoon season.^[7,8] Therefore, this study was designed to explore the demographic, clinical, and biochemical characteristics of patients diagnosed with scrub typhus, contributing to better understanding and management of this life-threatening disease.

MATERIALS AND METHODS

Study Design And Setting

This prospective observational study was conducted at the Department of Medicine, BRD Medical College, Gorakhpur, from January 1, 2023, to December 31, 2023. Ethical clearance was obtained from the Institutional Ethics Committee, and written informed consent was obtained from all participants.

Study Population and Inclusion/Exclusion Criteria

The study included patients aged between 18 and 75 years, presenting with acute febrile illness and confirmed scrub typhus via IgM ELISA. Patients with febrile illnesses due to other infections such as malaria,

dengue, leptospirosis, typhoid, and brucellosis were excluded. Patients who refused to provide consent were also excluded.

Data Collection

Data collection involved recording demographic information (age, gender, occupation) and clinical history, including fever duration, presence of skin eschar, and respiratory symptoms. All patients underwent a comprehensive physical examination, with attention to signs such as altered sensorium, icterus, hepatosplenomegaly, and respiratory distress.

Investigations

Laboratory investigations were performed, including Complete Blood Count (CBC), Liver Function Tests (LFTs), Kidney Function Tests (KFTs), and serology for dengue, chikungunya, and scrub typhus. Imaging studies like chest X-rays and abdominal ultrasounds were performed when needed. For patients with neurological symptoms, CT/MRI and cerebrospinal fluid (CSF) analysis were conducted.

Definitions Of Complications

Complications like Acute Kidney Injury (AKI), Acute Hepatitis, Acute Respiratory Distress Syndrome (ARDS), and Meningitis were defined according to established clinical criteria.

Treatment Protocol

All patients received empirical antibiotics, including Ceftriaxone and Doxycycline, along with supportive treatment such as intravenous fluids and symptomatic care.

Statistical Analysis

Data were entered into Microsoft Excel and analyzed using SPSS software. Descriptive statistics like proportions, percentages, and averages were calculated. A p-value of less than 0.05 was considered statistically significant.

RESULTS

Table 1 Age And Gender Distribution Of Survivors And Non-survivors In Scrub Typhus Patients

Table 1 presents the age and gender distribution of survivors and non-survivors among scrub typhus patients. Higher survival rates were observed in younger age groups and females, while older age groups showed a gradual increase in non-survivor percentages.

Parameter	Total (n=150)	Survivors	Non-Survivors	p-value
AGE GROUP				
10-20	32	29 (90.63%)	3 (9.37%)	0.6024
20-30	49	46 (93.88%)	3 (6.12%)	-
30-40	34	27 (79.41%)	7 (20.59%)	-
40-50	19	14 (73.68%)	5 (26.32%)	-
50-60	10	8 (80.00%)	2 (20.00%)	-
60-70	5	3 (60.00%)	2 (40.00%)	-
70-80	1	1 (100.00%)	0 (0.00%)	-
GENDER				
Male	73	65	8	-
Female	77	63	14	-

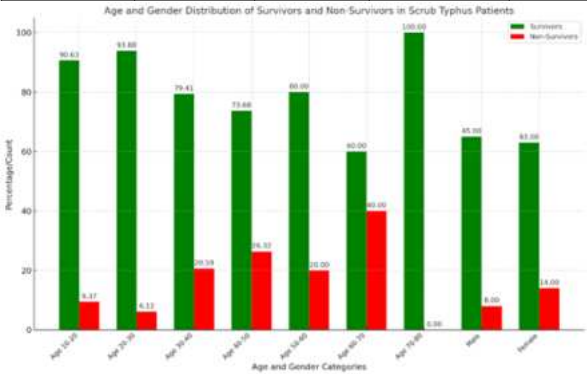


Table 2 Comparative Analysis of Clinical Parameters, Comorbidities, and Urine Output in Scrub Typhus Patients

This table presents a comparative analysis of survival and non-survival rates across various clinical parameters, including fever duration, sensorium alteration, and comorbidities like diabetes and hypertension. The p-values indicate statistical significance for some parameters, highlighting the potential correlation between clinical features and patient outcomes.

Parameter	Total (n=150)	Survivors	Non-Survivors	p-value
Fever < 1 Week	20 (13.33%)	3 (15.00%)	17 (85.00%)	$\chi^2=32.22$; p value=0.033
Fever > 1 Week	130 (86.67%)	125 (96.15%)	5 (3.85%)	
Altered Sensorium (Absent)	84 (56.00%)	74 (88.10%)	10 (11.90%)	-
Altered Sensorium (Present)	66 (44.00%)	54 (84.85%)	12 (15.15%)	$\chi^2=6.6$, 0.22
History of Seizure (Yes)	30 (20.00%)	13 (43.33%)	17 (56.67%)	p-value = 0.3
History of Seizure (No)	120 (80.00%)	115 (95.83%)	5 (4.17%)	-
Hepatomegaly (Absent)	148 (98.67%)	128 (86.49%)	20 (13.51%)	-
Hepatomegaly (Present)	2 (1.33%)	0 (0.00%)	2 (100.00%)	$\chi^2=5.913$ p=0.0150
Splenomegaly (Absent)	148 (98.67%)	128 (86.49%)	20 (13.51%)	-
Splenomegaly (Present)	2 (1.33%)	0 (0.00%)	2 (100.00%)	$\chi^2=5.913$ p=0.0150
Diabetes	12 (8.00%)	4 (33.33%)	8 (66.67%)	$\chi^2=19.67$ p<0.0001
Hypertension	9 (6.00%)	4 (44.44%)	5 (55.56%)	$\chi^2=8.752$ p=0.0031
TB	3 (2.00%)	0 (0.00%)	3 (100.00%)	$\chi^2=11.96$ p=0.0005
No Comorbidity	126 (84.00%)	120 (96.03%)	6 (3.97%)	$\chi^2=43.00$ p<0.0001
SpO2 < 90%	15 (10.00%)	13 (86.67%)	2 (13.33%)	$\chi^2=0.09809$ p=0.7541
SpO2 > 90%	135 (90.00%)	115 (85.19%)	20 (14.81%)	-

BP > 90	134 (89.3%)	116 (86.57%)	18 (13.43%)	$\chi^2=1.53$ p=0.216
BP < 90	16 (10.70%)	12 (75%)	4 (25%)	
URINE OUTPUT				
Adequate	134 (89.3%)	116 (86.56%)	18 (13.44%)	$\chi^2=6.32$, p=0.042
Oliguria	15 (10.0%)	12 (80.0%)	3 (20.0%)	
Anuria	1 (0.7%)	0 (0.0%)	1 (100.0%)	

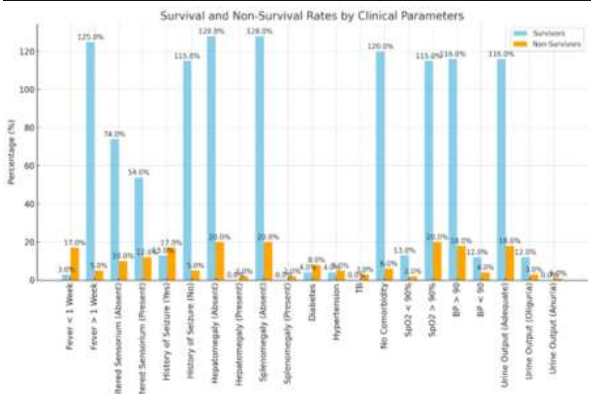


Table 3 Comparative Analysis Of Biochemical Parameters Between Survivors And Non-survivors In Scrub Typhus Patients

Table 3 shows a comparative analysis of various biochemical parameters between survivors and non-survivors among scrub typhus-positive patients. Parameters like hemoglobin levels, total leukocyte count, and platelet count were notably different, with significant variations observed in non-survivors.

Parameter	Total (n=150)	Survivors	Non-Survivors	p-value
Hemoglobin (<6 g/dL)	19 (12.67%)	17 (89.47%)	2 (10.53%)	0.6209
Hemoglobin (6-10 g/dL)	32 (21.33%)	25 (78.13%)	7 (21.88%)	0.6209
Hemoglobin (>10 g/dL)	99 (66.00%)	86 (86.87%)	13 (13.13%)	0.6209
TLC Count (Survivors)	11284 ± 8103	9867 - 12701	-	0.007
TLC Count (Non-Survivors)	18360 ± 21961	-	8623 - 28098	0.007
Platelet Count (Survivors)	53689 ± 19896	50209 - 57169	-	<0.001
Platelet Count (Non-Survivors)	21447 ± 12597	-	15862 - 27032	<0.001
S. Creatinine (Survivors)	1.43 ± 0.522	1.34 - 1.53	-	<0.001
S. Creatinine (Non-Survivors)	3.10 ± 0.772	-	2.76 - 3.44	<0.001
S. Bilirubin (Survivors)	1.35 ± 0.573	1.25 - 1.45	-	<0.001
S. Bilirubin (Non-Survivors)	2.89 ± 0.524	-	2.66 - 3.12	<0.001
SGOT (Survivors)	131 ± 52.3	122 - 141	-	<0.001
SGOT (Non-Survivors)	245 ± 64.0	-	216 - 273	<0.001
SGPT (Survivors)	103 ± 41.0	96 - 110	-	<0.001
SGPT (Non-Survivors)	190 ± 33.2	-	175.7 - 205	<0.001

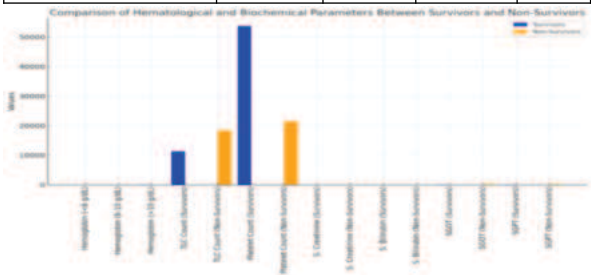
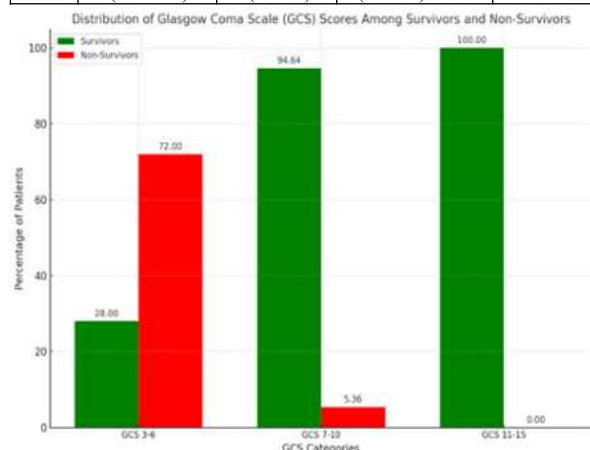


Table 4 Distribution Of Glasgow Coma Scale (GCS) Scores Among Survivors And Non-survivors In Scrub Typhus Patients

Table 4 presents the distribution of Glasgow Coma Scale (GCS) scores among scrub typhus patients, comparing survivors and non-survivors. A statistically significant difference was observed, with a higher mortality rate seen in patients with lower GCS scores (3-6), while all patients with GCS scores between 11-15 survived.

GCS	Total [n=150]	Survivors	Non-Survivors	P value
3-6	25 (16.67%)	7 (28.00%)	18 (72.00%)	X=50.42
7-10	56 (37.33%)	52 (94.64%)	4 (5.36%)	p<0.0001*
11-15	69 (46.00%)	69 (100%)	0 (0.00%)	



DISCUSSION

In our study, younger age groups demonstrated higher survival rates, while older patients, particularly those in the 60-70 age range, had increased mortality. Notably, 40% of patients aged 60-70 did not survive. This aligns with the findings of Sharma et al.^[9], who also reported that older age is a significant risk factor for severe disease and organ failure in scrub typhus. Deshmukh et al.^[10] similarly observed that patients over 50 experienced more complications. Regarding gender, while males had a higher survival rate (89.04%) compared to females (81.82%), our study contrasts with Lee et al.^[11], who found higher mortality in older males. This discrepancy may stem from regional or healthcare differences.

In our study, several clinical factors were significantly associated with increased mortality in scrub typhus patients. Fever lasting less than one week was a strong predictor of poor outcomes, with an 85% mortality rate, indicating that delayed diagnosis and shorter fever duration may reflect more severe disease progression. The presence of hepatomegaly and splenomegaly was significantly associated with mortality, as all patients with these conditions did not survive. These findings align with studies by Palanivel et al.^[13] and Sarkar et al.^[12], which also noted that organ involvement, particularly hepatomegaly, is linked to poor prognosis in scrub typhus. These studies support the observation that organ involvement may indicate more severe systemic infection, leading to higher mortality.

Comorbidities such as diabetes and tuberculosis were also linked to worse outcomes, with mortality rates of 66.67% and 100%, respectively. This finding echoes the results of Saluja et al.^[14], who found that comorbidities, particularly diabetes, significantly compromised immune function, increasing the severity and mortality of scrub typhus. Similarly, Verma et al.^[16] reported that patients with tuberculosis had a higher likelihood of mortality due to immune suppression and increased vulnerability to severe complications.

The role of urine output in predicting mortality was also evident in this study. Non-survivors were more likely to experience oliguria or anuria, which were strongly associated with worse outcomes. Kim et al.^[15] found similar trends in their study, where patients with reduced urine output, particularly those with oliguria, had significantly higher mortality rates, highlighting the importance of renal function in predicting patient prognosis.

Biochemical markers, including elevated total leukocyte count (TLC) and low platelet count, were significantly different between survivors and non-survivors. Our study found that non-survivors had a higher mean TLC (18,360 cells/mm³) and lower platelet counts (21,447

cells/mm³), corroborating Kim et al.^[15] and Deshmukh et al.^[10], who identified these as indicators of poor outcomes.

Neurological involvement, as measured by Glasgow Coma Scale (GCS) scores, was also critical. Patients with lower GCS scores (3-6) had a 72% mortality rate, whereas all patients with higher GCS scores (11-15) survived. Verma et al.^[16] similarly found that lower GCS scores were strongly associated with worse outcomes, underscoring the importance of GCS in assessing prognosis.

In conclusion, this study identifies several clinical and biochemical markers, including age, gender, organ involvement, and neurological status, as key predictors of survival in scrub typhus patients. Early diagnosis and management of these factors are essential to improving outcomes.

CONCLUSION

The study reveals significant differences in survival rates among scrub typhus patients based on age, gender, clinical features, and biochemical parameters. Younger age groups and females had higher survival rates, while older age groups and those with comorbidities like diabetes and hypertension were more likely to be non-survivors. Clinical features such as longer fever duration, altered sensorium, hepatomegaly, and lower Glasgow Coma Scale (GCS) scores were linked to higher mortality. Non-survivors showed worse biochemical markers, including elevated total leukocyte counts, lower platelet counts, and increased levels of serum creatinine, bilirubin, SGOT, and SGPT. A statistically significant association was observed between lower GCS scores (3-6) and higher mortality rates. These findings indicate that age, gender, comorbidities, and specific clinical and biochemical parameters are crucial in determining the prognosis of scrub typhus patients.

Conflict Of Interest: The authors confirm that there are no conflicts of interest associated with this study.

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Consent:

In accordance with international or institutional guidelines, written informed consent was obtained from all participants and is retained by the authors.

Ethical Approval:

The study was conducted following ethical standards, and written ethical approval was obtained and maintained by the authors, as per institutional or international protocols.

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