ORIGINAL ARTICLE

# Clinical Profile of Patients Presenting with Scrub Typhus at a Tertiary Care Center in Eastern India: A Cross-sectional Study

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*Received:* 07 May 2026; *Accepted:* 15 July 2026


## Abstract

**Background:** Scrub typhus is a reemerging rickettsial infection in India and remains an important cause of acute febrile illness with the potential for severe multi-organ involvement if diagnosis and treatment are delayed. Data from eastern India remain limited.

**Objectives:** To delineate the clinical and laboratory profile of patients diagnosed with scrub typhus admitted to a tertiary care center in eastern India.

**Methods:** A retrospective cross-sectional study was conducted at All India Institute of Medical Sciences (AIIMS) Patna, including adult patients (>15 years) with serologically confirmed scrub typhus admitted between January and December 2023. Demographic details, clinical features, laboratory parameters, and complications were retrieved from medical records. Descriptive statistics were used for analysis.

**Results:** A total of 69 patients were included; 58.0% were male. Fever was the most common presenting symptom (94.2%), followed by headache (66.7%) and myalgia (53.6%). Eschar was identified in 10.1% of patients. Thrombocytopenia was present in 82.6%, hyperbilirubinemia in 65.2%, and acute kidney injury in 20.3%. Meningoencephalitis occurred in 13.0%, while hypotension/shock and acute respiratory distress syndrome (ARDS) were infrequent (4.3 and 1.4%, respectively).

**Conclusion:** Scrub typhus commonly presents as acute febrile illness with significant hematological and hepatic involvement. Eschar, though specific, was infrequently observed. High clinical suspicion and early recognition are crucial to prevent complications.


**Keywords:** Biomarker, Clinical profile, Epidemiology, Scrub typhus, Severity.

*Journal of The Association of Physicians of India* (2026): 10.59556/japi.74.1700

## Introduction

Scrub typhus is an acute febrile infection caused by *Orientia tsutsugamushi*, an obligate intracellular bacterium transmitted to humans by the bite of larval trombiculid mites. It is endemic in the Asia-Pacific region and represents a significant cause of undifferentiated febrile illness worldwide. The disease is often under-recognized because of its heterogeneous and nonspecific clinical features, limited availability of confirmatory diagnostic tests in many regions, and inadequate clinical suspicion even in endemic areas. Despite the availability of effective antibiotic therapy, including doxycycline and azithromycin, scrub typhus remains a cause of largely preventable illness and death, largely due to underdiagnosis and delayed initiation of treatment. Hence, the true burden of scrub typhus is likely underestimated, particularly in resource-limited settings.

Scrub typhus shows a wide spectrum of clinical presentations, from mild febrile illness with constitutional symptoms to severe disease with multi-organ dysfunction involving the liver, kidneys, lungs, and central nervous system, with severe cases progressing to acute kidney injury,[1] hepatitis, acute respiratory distress syndrome (ARDS), meningitis or meningoencephalitis, circulatory shock, and hemorrhagic manifestations. Although eschar is considered a pathognomonic feature, its absence does not exclude the diagnosis, particularly in Indian patients.[2,3]

Clinical presentation typically follows an incubation period of approximately 6–21 days, after which patients develop acute-onset high-grade fever, often associated with headache, nausea, vomiting, cough, myalgia, conjunctival suffusion, and gastrointestinal symptoms. Although an eschar at the mite bite site, along with regional lymphadenopathy and a maculopapular rash, is considered characteristic and diagnostically helpful, these features are inconsistently observed. Several Indian studies have reported low detection rates of eschar, which limits its utility as a reliable diagnostic marker in routine clinical practice.

Scrub typhus is associated with considerable morbidity owing to its propensity to cause systemic inflammation and vascular endothelial injury, leading to multiple complications. Hepatic dysfunction and thrombocytopenia are common laboratory abnormalities. Studies from tertiary care centers in India have demonstrated that scrub typhus-associated acute kidney injury is a frequent and clinically significant complication, contributing to increased disease severity and poorer outcomes.[1] Mortality rates increase substantially in the presence of severe complications, particularly respiratory and neurological involvement.[3–5]

Recently, scrub typhus has reemerged in multiple parts of India.[5–7] However, data from eastern India, especially Bihar, remain sparse. Understanding the regional clinical and laboratory profile is essential to aid early diagnosis and guide management strategies.

In this context, the present study was undertaken at a tertiary care center in eastern India to characterize the clinical features, laboratory profile, and complications of scrub typhus among adult patients. Diagnosis was established using an IgM/IgG rapid test [enzyme-linked immunosorbent assay (ELISA)], which offers relatively higher sensitivity and specificity, with the objective of improving regional understanding of scrub typhus and aiding clinicians in timely recognition and treatment of this potentially fatal yet treatable infection.

## Methods

### Study Design and Setting

This was a retrospective cross-sectional study conducted at the Department of General Medicine, AIIMS Patna.

### Study Period

Records from 1st January 2023 to 31st December 2023 were reviewed.

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**How to cite this article:** Prakash J, Kumar A, Prasad J, *et al.* Clinical Profile of Patients Presenting with Scrub Typhus at a Tertiary Care Center in Eastern India: A Cross-sectional Study. J Assoc Physicians India 2026;74(9):26–31.

### Study Population

Adult patients (>15 years) admitted with a diagnosis of scrub typhus were included.

### Sampling Technique

Nonprobability convenience sampling. Patients admitted to the IPD of AIIMS Patna and meeting the suitable criteria were included.

### Inclusion Criteria

- Age >15 years.
- Serologically confirmed scrub typhus (IgM/IgG rapid test positive).

### Exclusion Criteria

- Preexisting chronic liver disease, chronic kidney disease, heart failure, or other chronic systemic illnesses.

### Data Collection

Clinical data were collected through detailed history, including symptoms, occupational and recreational exposure, travel to endemic areas, prior treatment, and thorough physical examination. Treatment outcomes were documented. Baseline investigations included complete blood count, urine routine, renal and liver function tests, coagulation profile, and blood cultures. Other causes of acute febrile illness were excluded using malaria testing, *Leptospira* IgM, Widal test, and dengue serology. Scrub typhus was confirmed by serum IgM enzyme-linked immunosorbent assay (ELISA). Chest X-ray, ultrasonography, and neuroimaging were performed when indicated. Fine-needle aspiration cytology was done for lymphadenopathy. Standard definitions from published scrub typhus studies were used to diagnose complications.[8,9]

### Sample Size Calculation

Based on the prevalence of scrub typhus reported in recent studies from the local region, the sample size was calculated using a 95% confidence level and a 5% margin of error. The estimated minimum sample size was 65.44, and therefore a total of 69 patients were included in the study.

### Statistical Analysis Plan

Data were entered into Google Forms and exported to spreadsheets.

The collected data were cleaned in Microsoft Excel and coded whenever necessary.

Normal distribution of the continuous data was tested by Q-Q plot.

The data collected were entered and analyzed using Jamovi (v2.3.28 or higher).

### Descriptive Statistics

Categorical variables are expressed as proportion, percentile, and frequency and presented with pie charts or bar graphs, as appropriate.

Continuous data are expressed as mean (SD, 95% CI) or median (IQR), depending on normality of distribution.

## Results

A total of 69 patients confirmed to have scrub typhus by IgM/IgG serological testing, which was positive in 100% of cases.

### Demographic Profile

A total of 69 subjects who fulfilled the inclusion and exclusion criteria were studied. The mean age was 36.7 years, with a standard deviation of 22.4 years, as shown in the histogram in Figure 1.

Among the study population, 40 patients (58.0%) were male and 29 (42.0%) were female, as shown in the bar graph in Figure 2.

| *Sex* | *Counts* | *% of total* |
|---|---|---|
| Female | 29 | 42.0% |
| Male | 40 | 58.0% |

Farmers formed the largest group (37.68%), emphasizing the link with agricultural and outdoor exposure. This was followed by unemployed individuals (26.09%) and homemakers (11.59%). Businesspersons and students each accounted for 7.25%, teachers for 4.35%, while drivers, retired persons, and a few others formed a small minority. Overall, scrub typhus mainly affected people with rural or outdoor exposure, consistent with its known epidemiology, as shown in Figure 3.

### Clinical Presentation

The most frequent presenting symptom was fever, in 65 patients (94.2%). This was followed by headache in 46 (66.7%), myalgia in 37 (53.6%), and rash in 26 (37.7%) patients, as shown in Table 1. Eschar was identified in seven patients (10.1%), with common sites being the axilla and thigh (Table 2). Lymphadenopathy was observed in 20 patients (29.0%), as shown in Table 3.

On systemic examination, the majority of patients had normal cardiovascular and respiratory findings. Respiratory abnormalities such as crepitations or wheeze were present in eight patients (11.6%). Neurological examination was largely normal, although meningeal signs were noted in a small proportion.

### Laboratory Findings

Hematological abnormalities were common. Thrombocytopenia (platelet count <150 × $10^3$/µL) was seen in 57 patients (82.6%), while leukopenia (<4 × $10^3$/µL) was observed in five patients (7.2%).

Low hemoglobin (<12 gm/dL in females and <13 gm/dL in males) was noted in 79.3 and 95% of females and males, respectively.

Biochemical derangements showed a predominance of hepatic involvement. Hyperbilirubinemia was present in 44 patients (63.8%), with total bilirubin elevation in 76.8% and direct bilirubin elevation in 97.1% of cases. Alanine aminotransferase (ALT) elevation was noted in 55 patients (79.7%), whereas aspartate aminotransferase (AST) elevation was less frequent (8.7%). Raised blood urea levels were observed in 35 patients (50.7%). The biochemical abnormalities have been tabulated in Table 4.

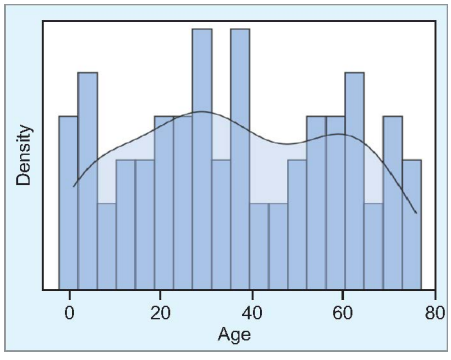


**Fig. 1:** Histogram showing a bimodal peak at 32 and 63 years of age

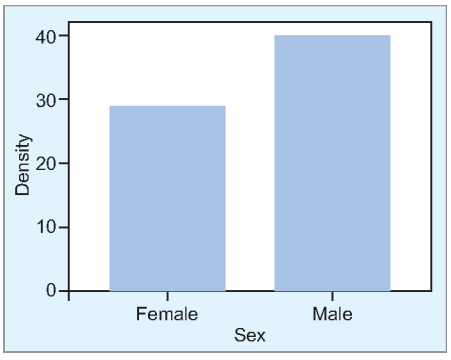


**Fig. 2:** Bar graph demonstrating the distribution of sex among the study population

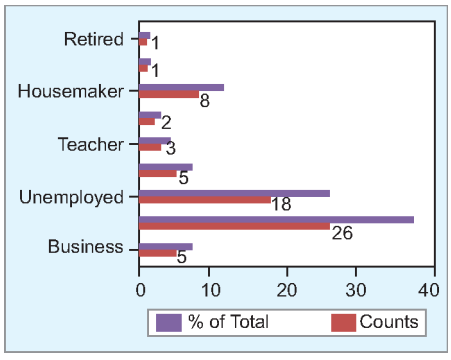


**Fig. 3:** Bar graph demonstrating the frequency of occupation among the study population

Thrombocytopenia was the most common laboratory abnormality (82.6%), followed by elevated total bilirubin (76.8%) and leukocytosis (49.3%).

**Table 1:** Frequency of clinical features among our study population

| *Clinical symptom* | *Number of patients (n)* | *Percentage (%)* |
|---|---|---|
| Fever | 65 | 94.2 |
| Headache | 46 | 66.7 |
| Myalgia | 37 | 53.6 |
| Rash | 26 | 37.7 |
| Lymphadenopathy | 20 | 29.0 |
| Eschar | 7 | 10.1 |
| Meningoencephalitis | 9 | 13.0 |
| Hyperbilirubinemia | 44 | 63.8% |
| Renal failure (AKI) | 14 | 20.3 |
| Hypotension/shock | 3 | 4.3 |
| ARDS | 1 | 1.4 |

**Table 2:** Frequencies of lymphadenopathy

| *Lymphadenopathy* | *Counts* | *% of total* |
|---|---|---|
| No | 49 | 71.0% |
| Yes | 20 | 29.0% |

**Table 3:** Demonstrating site of eschar if present

| *If eschar is present, specify location and size* | *Counts* | *% of total* |
|---|---|---|
| Back | 1 | 14.3% |
| Right axilla | 2 | 28.6% |
| Abdomen | 1 | 14.3% |
| Left axilla | 1 | 14.3% |
| Left thigh | 2 | 28.6% |

## Complications

It was found that 72.5% had an uncomplicated clinical course, presenting predominantly with fever and constitutional symptoms without significant organ dysfunction, owing to timely diagnosis and prompt treatment. A total of 27.5% had complications owing to later presentation or delayed diagnosis, as shown in Table 5. It is to be noted that isolated hepatic involvement was not considered a complication unless accompanied by severe disease manifestations. Hepatic dysfunction alone was excluded from the complication category, as it is a common and often self-limiting manifestation of scrub typhus.

This classification provides a more clinically meaningful assessment of disease severity and aligns with standard definitions used in scrub typhus literature.

The Chi-squared test was applied to assess the association between sex and disease complication status. The analysis showed a statistically significant association, with $\chi^2 = 4.74$, df = 1, and $p = 0.030$ ($N = 69$).

Complications were observed more frequently among males compared with females, indicating that male sex was significantly associated with a higher likelihood of complicated disease in the study.

**Table 5:** Distribution of complicated and uncomplicated scrub typhus among study population

| *Complicated* | *Counts* | *% of total* |
|---|---|---|
| Uncomplicated | 50 | 72.5% |
| Complicated | 19 | 27.5% |

| *$\chi^2$ tests* | | | |
|---|---|---|---|
| | *Value* | *df* | *p* |
| $\chi^2$ | 4.74 | 1 | 0.030 |
| *N* | 69 | | |

While uncomplicated cases were found with similar frequency among both genders, males were observed to have a higher rate of complications than females, which was statistically significant ($p < 0.05$), as shown in the bar graph (Fig. 4).

On multivariable logistic regression analysis evaluating predictors of complicated scrub typhus, as shown in Table 6, serum creatinine was identified as the only independent predictor of complicated disease, with increasing creatinine levels significantly associated with higher odds of complications ($\beta = 1.16$, SE = 0.41, $p = 0.005$).

Male sex showed a trend toward increased odds of complicated scrub typhus but was not

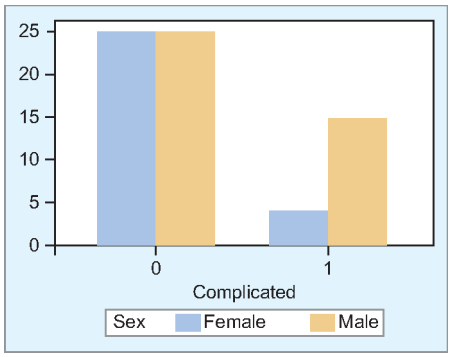


**Fig. 4:** Bar graph showing the distribution of complicated and uncomplicated cases among different sexes in the study population

**Table 4:** Lab parameters in patients with scrub typhus ($n = 69$)

| *Laboratory parameter* | *Category* | *Number of patients (n)* | *Percentage (%)* |
|---|---|---|---|
| White blood cell count | Low | 5 | 7.2 |
| | Normal | 30 | 43.5 |
| | High | 34 | 49.3 |
| Platelet count | Low (<150 × $10^3$/μL) | 57 | 82.6 |
| | Normal/high | 12 | 17.4 |
| Blood urea | Elevated | 35 | 50.7 |
| | Normal | 34 | 49.3 |
| Serum creatinine | Normal | 40 | 100.0 |
| Total bilirubin | Elevated | 53 | 76.8 |
| | Normal | 16 | 23.2 |
| Direct bilirubin | Elevated | 67 | 97.1 |
| | Normal | 2 | 2.9 |
| AST (SGOT) | Elevated | 6 | 8.7 |
| | Normal | 63 | 91.3 |
| Hemoglobin (females) | Low | 23 | 79.3 |
| | Normal | 6 | 20.7 |
| Hemoglobin (males) | Low | 38 | 95.0 |
| | Normal | 2 | 5.0 |

**Table 6:** Logistic regression analysis demonstrating predictors of severity of complicated scrub typhus

| *Model coefficients—complicated* | | | | |
|---|---|---|---|---|
| *Predictor* | *Estimate* | *SE* | *Z* | *p* |
| Intercept | −3.70501 | 2.7397 | −1.35234 | 0.176 |
| Age | −0.00403 | 0.0198 | −0.20372 | 0.839 |
| Creatinine | 1.15726 | 0.4143 | 2.79360 | 0.005 |
| Total bilirubin | −0.12947 | 0.1829 | −0.70790 | 0.479 |
| Hb | −0.14097 | 0.1869 | −0.75411 | 0.451 |
| Eschar | | | | |
| Yes–no | 1.50639 | 1.2487 | 1.20633 | 0.228 |
| Yes–no | 13.16403 | 2399.5454 | 0.00549 | 0.996 |
| Rash | | | | |
| Yes–no | 0.05840 | 0.8217 | 0.07107 | 0.943 |
| Sex | | | | |
| Male–female | 1.78806 | 0.9430 | 1.89619 | 0.058 |
| Platelet count | 7.25e-7 | 5.13e-6 | 0.14125 | 0.888 |
| Fever | | | | |
| Yes–no | 1.01839 | 2.1471 | 0.47430 | 0.635 |
| Yes–no | 1.47022 | 2.2841 | 0.64369 | 0.520 |

Note: Estimates represent the log odds of "complicated = 1" vs "complicated = 0"

statistically significant ($\beta = 1.79$, $p = 0.058$). Age did not show a significant association with complicated scrub typhus ($\beta = -0.004$, $p = 0.839$). Similarly, total bilirubin ($\beta = -0.13$, $p = 0.479$) and hemoglobin levels ($\beta = -0.14$, $p = 0.451$) were not significantly associated with disease complications.

In summary, renal dysfunction is the main marker of severe scrub typhus in our study, with a higher prevalence of complications noted among males. Early detection of rising creatinine and timely treatment are essential to reduce complications and improve outcomes.

## Discussion

Scrub typhus, being a reemerging rickettsial disease in India, manifests wide clinical heterogeneity and potential for severe multisystem involvement. The present retrospective cross-sectional study provides valuable regional data and highlights both concordance and variation with previously published Indian and international literature.

In the present study, males constituted 58.0% of cases, indicating a male preponderance. This finding is consistent with observations by Mahajan[10] and Narvencar et al.[8] in Goa, who reported male predominance (approximately 60%), and Varghese et al.[2] from South India, where males constituted 62–65% of cases. This male preponderance has been consistently attributed to increased occupational exposure among men engaged in farming and outdoor activities, rather than biological susceptibility. Similar male dominance has also been documented by Takhar et al.,[11] where males formed the majority during a scrub typhus outbreak in Rajasthan.

Occupationally, farmers (37.68%) formed the largest working group in our cohort, supporting the classical epidemiological association of scrub typhus with agricultural activity. Park, in Park's Textbook of Preventive and Social Medicine,[12] emphasizes that scrub typhus predominantly affects individuals involved in farming and outdoor occupations due to exposure to chigger-infested vegetation. Comparable occupational patterns were noted by Pathania et al.,[13] who reported farming as the most common occupation among scrub typhus patients. Mahajan et al. in the Himalayan region,[14] Narvencar et al.,[8] and Khan et al. in Northeast India[15] also reported similar findings, where agricultural workers and outdoor workers constituted the majority of affected patients.

Fever was the most common presenting symptom in 94.2% of patients in our study, reinforcing its role as the hallmark feature of scrub typhus. This mirrors findings by Philomena et al.,[16] who reported fever in nearly all patients (>95%), and by Saha et al.,[17] where fever was universally present. Comparable reports were found in studies by Narvencar et al. (100%),[8] Varghese et al. (96%),[2] and Mahajan (95–100%).[10]

Headache (66.7%) and myalgia (53.6%) were common associated symptoms in our cohort. Peesapati et al.[18] from North Andhra Pradesh reported headache in approximately 60% and myalgia in nearly half of their patients, closely aligning with our observations. The prevalence was also similar to that reported by Jim et al.[19] from Taiwan and Sirisanthana et al.[20] from Thailand, suggesting consistency in early clinical manifestations across regions.

Rash was observed in 37.7% of patients, which is comparable to the rates reported by Pathania et al.[13] (34–40%) but higher than those noted by Takhar et al.,[11] who documented rash in about one-third of cases. Eschar, though pathognomonic, was detected in only 10.1% of our patients. This low prevalence is consistent with Indian studies such as Saha et al.[17] (8–12%) and Takhar et al.,[11] who also reported eschar in <15% of cases. Narvencar et al.[8] reported eschar in 12%, Varghese et al.[2] in 9.5%, and Stephen et al.[21] in 7–15% of cases. These findings support the observation that eschar prevalence varies significantly by geography, skin pigmentation, patient awareness, and thoroughness of physical examination. Mahajan[10] emphasized that eschars are often overlooked in Indian patients due to darker skin and hidden sites, leading to low detection rates.

Among the study population, acute kidney injury was documented in 14 patients (20.3%). Meningoencephalitis was observed in nine patients (13.0%). Hypotension/shock occurred in three patients (4.3%), while ARDS was noted in one patient (1.4%). These complications were categorized in accordance with the definitions as per Harrison's Principles of Internal Medicine (21st ed), as shown in Table 7.[9]

**Table 7:** Glossary of terminologies for scrub typhus (definitions)

| | |
|---|---|
| Multiple organ dysfunction syndrome (MODS) | Simultaneous dysfunction of ≥2 organ systems in an acutely ill patient, necessitating medical intervention to preserve physiological equilibrium |
| Acute kidney injury (AKI) | Acute renal dysfunction characterized by a rise in creatinine ≥1.6 mg/dL or decrease in urine output <400 mL/24 hours, unresponsive to adequate volume resuscitation |
| ARDS | Acute hypoxemia defined by bilateral Lung infiltrates on chest imaging not attributable to cardiac causes, with a $PaO_2/FiO_2$ ratio ≤200 mm Hg |
| Hepatitis | Acute hepatic involvement indicated by elevation of serum aminotransferases (AST and/or ALT) >3 times the upper limit of normal and/or serum bilirubin levels more than three times normal values |
| Pancreatitis | Acute inflammatory condition of the pancreas diagnosed by a threefold or greater elevation of serum amylase or lipase levels, accompanied by characteristic epigastric pain or supportive radiological findings |
| Meningitis | Inflammation of the meninges presenting with altered mental status and meningeal signs such as neck stiffness or positive Kernig's sign, supported by cerebrospinal fluid abnormalities including elevated protein and/or polymorphonuclear pleocytosis |
| Disseminated intravascular coagulation (DIC) | A systemic disorder of coagulation manifested by bleeding, thrombocytopenia, and laboratory evidence of coagulation pathway activation, including prolonged PT/INR and aPTT with elevated fibrin degradation products; operationally defined as platelet count <80,000/μL or a ≥50% decline from baseline within 3 days |
| Myocarditis | Inflammatory myocardial disease characterized by global left ventricular systolic dysfunction on echocardiography, associated electrocardiographic abnormalities, and clinical evidence of cardiac dysfunction in patients without preexisting heart disease |
| Shock | A state of circulatory failure defined by sustained SBP <90 mm Hg for at least 1 hour despite adequate fluid resuscitation, resulting in impaired tissue perfusion |

Lymphadenopathy was present in 29.0% of cases, comparable to the findings of Philomena et al.[16] (approximately 25–30%). Most patients had normal cardiovascular and respiratory examinations, with only 10.1% showing respiratory signs and 2.9% demonstrating abnormal central nervous system (CNS) findings, reflecting the variable systemic involvement described by Tsay and Chang.[22] in severe scrub typhus.

Thrombocytopenia was a prominent laboratory abnormality, present in 82.6% of patients. This high prevalence is similar to that reported by Peesapati et al.[18] (75–85%), Khan et al.[15] (78%), and Rathi et al.[23] (80%), highlighting platelet consumption as a consistent feature of scrub typhus. Leukocytosis was observed in 49.3%, while leukopenia occurred in 7.2% of cases. Mahajan et al.[10] described leukocyte count abnormalities as variable, with both leukocytosis and leukopenia reported depending on disease severity.

Hepatic involvement was evident, with 76.8% having elevated total bilirubin and 79.7% showing elevated ALT. Chayakul et al.[24] and Rathi et al.[23] reported transaminase elevation as one of the earliest and most consistent biochemical abnormalities in scrub typhus, often preceding overt clinical hepatitis. Tsay and Chang[22] similarly noted hepatic dysfunction as a major contributor to disease severity. Mahajan et al.[10] (transaminase elevation in 70–85%) and Jim et al.[19] (hepatic involvement in 68%) reported similar findings. Varghese et al.[2] also reported elevated liver enzymes in >75% of hospitalized patients, confirming hepatic involvement as a consistent feature of scrub typhus.

Acute kidney injury was present in 20.3% of our patients, which aligns with findings from Vikrant et al. (35%),[25] Varghese et al.[2] (13%), and Jayaprakash et al.,[1] who reported AKI in approximately 22–30% of hospitalized scrub typhus patients. Differences in AKI prevalence across studies may be related to disease severity, referral bias, and diagnostic criteria used.

Meningoencephalitis was observed in 13.0% of cases, aligning with the findings of Tsay and Chang[22] who reported CNS involvement in 10–20% of severe scrub typhus cases. Indian Council of Medical Research (ICMR) guidelines[26] also recognize neurological involvement as a serious but under-recognized complication. Varghese et al.[27] reported meningitis/meningoencephalitis in 19.2% and also showed that scrub typhus meningitis can be distinguished from bacterial meningitis using combined clinical and laboratory parameters, supporting our observations.

Shock (4.3%) and ARDS (1.4%) were relatively uncommon in our cohort, which contrasts with higher rates reported by Varghese et al.[2] (43.5%) and Mahajan et al.[14] (30–40%). These lower rates may reflect early diagnosis and treatment, as emphasized by Varghese et al.,[28] who reported significantly higher complication rates in delayed presentations. Chayakul et al.[24] highlighted that scrub typhus pneumonitis and ARDS are often missed and contribute substantially to mortality if untreated.

The occupational and clinical patterns observed in our study are aligned with the epidemiological trends reported by Gautam et al. in Nepal[29] and Saha et al.[17] in eastern India, reinforcing scrub typhus as a significant cause of acute fever in this region. The ICMR guidelines[26] emphasize the need for heightened clinical suspicion, particularly in endemic areas, even in the absence of eschar.

No mortality occurred in our study, contrasting with Indian reports showing 10–30% fatality. Narvencar et al.[8] noted approximately 8% mortality, while Varghese et al.[2] and Mahajan et al.[14] reported higher mortality with delayed diagnosis and multi-organ failure. Overall, our results align with existing literature, with variations attributable to population differences, diagnostic delay, and healthcare access.

## Strengths

- Provides region-specific data on scrub typhus from eastern India, where published evidence is limited.
- Includes serologically confirmed cases, reducing diagnostic misclassification.
- Comprehensive assessment of clinical features, laboratory abnormalities, and complications.
- Use of standardized definitions for complications allows reliable comparison with other studies.
- Reflects real-world clinical practice in a tertiary care setting.

## Limitations

- Retrospective, single-center design limits generalizability and causal inference.

- Reliance on medical records may have resulted in incomplete or missing data.
- Small sample size limits detailed subgroup and statistical analyses.
- Diagnosis based on IgM ELISA alone, without molecular confirmation or strain typing.
- Lack of long-term follow-up data and detailed outcome measures such as duration of hospitalization and seasonal variations.

## Conclusion

Scrub typhus remains a less-recognized cause of acute febrile illness in India due to its variable presentation and severity. In view of limited regional data from eastern India, this study aimed to define the clinical and laboratory profile of scrub typhus and its complications. This retrospective cross-sectional study included serologically confirmed cases. Clinical features, laboratory parameters, and complications were systematically analyzed.

Fever was the most significant symptom, with frequent hematological and hepatic abnormalities. Eschar was infrequently detected. Significant complications included acute kidney injury and meningoencephalitis, while severe respiratory involvement was uncommon. No mortality was observed, likely reflecting timely diagnosis and appropriate antimicrobial therapy.

Overall, the findings align with international studies and underscore the need to suspect scrub typhus in cases of acute febrile illness, thrombocytopenia, and hepatic dysfunction, especially during the monsoon season. Early recognition and prompt treatment remain crucial in reducing complications and improving outcomes.

## Recommendation

- Scrub typhus should be suspected in acute febrile illness in endemic areas, especially during the monsoon, and promptly evaluated in patients with thrombocytopenia or hepatic dysfunction.
- Early serological testing (IgM ELISA) should be strengthened at secondary and tertiary care levels to enable prompt diagnosis.
- Thorough physical examination, including hidden body sites, should be performed to detect eschar despite its low prevalence.
- Early initiation of appropriate antibiotics (doxycycline or azithromycin) should be emphasized to prevent complications and reduce morbidity.
- Larger multicentric prospective studies are needed to better define regional patterns.

## Ethical Approval

The ethical approval was obtained from the Institutional Ethics Committee, All India Institute of Medical Sciences, Patna.

## Author Contributions

Dr Jyoti Prakash (JP): Main idea of the project, research design, protocol making, and supervision.
Dr Anjani Kumar (AK): Data collection and segregation.
Dr Janmeshwar Prasad (JsP): Data collection, literature review, and logistics.
Dr Pratibha Modi (PM): Data analysis, manuscript making, editing, and submission.

## Ethical Compliance

Ethical clearance was obtained from the Institutional Ethics Committee of AIIMS Patna. As this was a retrospective record-based study, informed consent was waived.

## Acknowledgments

I would like to extend my heartfelt gratitude to my fellow colleagues, students, and Department of General Medicine for their participation and help in conducting this study.

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