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Original Research Article

Mites, monsoon and multisystem mayhem: clinico-demographic profile of scrub typhus at a tertiary care centre in upper Assam

Glady Varsangmawi[1], Rima M. Doley[1]*, Prasanta Dihingia[1], Chimanjita Phukan[2], Pronami Borah[3]

[1]Department of Medicine, Assam Medical College and Hospital, Assam, India
[2]Department of Microbiology, Assam Medical College and Hospital, Assam, India
[3]Department of Radiodiagnosis, Assam Medical College and Hospital, Assam, India

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***Correspondence:**
Dr. Rima M. Doley,
E-mail: drrimamonidoley@gmail.com

ABSTRACT

Background: Scrub typhus, caused by *Orientia tsutsugamushi* and transmitted via larval trombiculid mite bites, is a re-emerging public health threat in Northeast India. Data from upper Assam remain sparse. This study characterises the clinico-demographic profile of confirmed scrub typhus patients at a tertiary hospital in Dibrugarh.
Methods: A hospital-based, cross-sectional observational study was conducted at the Department of Medicine, Assam Medical College and Hospital (AMCH), Dibrugarh over one year (October 2024–September 2025). Eighty patients with confirmed scrub typhus (IgM ELISA and/or quantitative real-time PCR) were enrolled. Demographic, clinical, laboratory, and radiological data were analysed using descriptive statistics and Chi-square tests.
Results: The 31–40-year age group was most affected (33.75%; mean age 40.25±14.74 years). Male predominance was significant (67.5%; M: F=2.08:1; p=0.002). Three-quarters of patients (76.25%) were from rural backgrounds, and farmers comprised the largest occupational group (37.5%). Fever (100%), headache (92.5%), and jaundice (45%) were the commonest symptoms. Eschar was detected in 35% of patients. Near-universal transaminase elevation (100%), thrombocytopenia (96.25%), hypoalbuminaemia (97.5%), and elevated creatinine (87.5%) reflected multi-organ tropism. Peak incidence occurred in March–April (42.5%). Mortality was 8.75%.
Conclusions: Scrub typhus in upper Assam disproportionately affects rural male farmers with a distinctive spring-season peak. Multi-organ involvement is the rule. Early IgM ELISA-based diagnosis and prompt doxycycline initiation remain paramount. Community awareness and vector control are essential to reduce the regional disease burden.

Keywords: Scrub typhus, *Orientia tsutsugamushi*, Northeast India, Eschar, Multi-organ dysfunction, Upper Assam

INTRODUCTION

Scrub typhus is the most prevalent rickettsial disease worldwide, caused by *Orientia tsutsugamushi* — an obligate, gram-negative intracellular bacterium transmitted through the bite of infected larval trombiculid mites (chiggers), principally of the genus Leptotrombidium.[1] It is endemic across the Tsutsugamushi triangle — a vast region encompassing South and Southeast Asia, the Korean Peninsula, Japan, and northern Australia — where over one billion people are at risk.[2] With an estimated annual case burden of one million, the disease carries an untreated case fatality rate of 30–45%.[1]

Systematic reviews of the Indian subcontinent confirm a substantial and likely under-recognised disease burden, and the organism has long been recognised as an important cause of febrile illness among rural and military populations in endemic regions of Asia.[3,4]

Northeast India, with its ecology of slash-and-burn (jhum) cultivation, rich scrub vegetation, and humid subtropical climate, represents a high-risk zone for chigger mite habitation. The interplay between farming practices, animal reservoirs, and human behaviour contributes to seasonal resurgence.[5,6] Outbreaks have also been documented from other parts of India, including Pondicherry and Rajasthan, underscoring the Pan-Indian distribution of this disease.[7,8] Clinically, scrub typhus is characterised by fever, headache, myalgia, rash, eschar at the chigger bite site, and variable involvement of the liver, lungs, kidneys, and central nervous system. Diagnosis is frequently delayed due to overlap with dengue, leptospirosis, typhoid, and malaria, a challenge that remains a major barrier to timely management across Asia.[9] IgM ELISA against *Orientia tsutsugamushi* is the principal serological tool, and doxycycline remains the drug of choice.[10]

Despite a growing recognition of scrub typhus as a re-emerging public health concern in Northeast India, tertiary care data specifically from upper Assam — particularly from Assam Medical College and Hospital (AMCH), Dibrugarh — remain limited.[11]

This study was undertaken to characterise the clinico-demographic profile of confirmed scrub typhus patients attending the Department of Medicine at AMCH, and to identify patterns that may guide early clinical diagnosis and preventive strategies.

METHODS

Study design and setting

A hospital-based, cross-sectional observational study was conducted at the Department of Medicine, AMCH, Dibrugarh, Assam, over a period of one year from October 2024 to September 2025.

Sample size

Based on an assumed scrub typhus prevalence of 22.8% (from published literature), the sample size was calculated to be 80 participants, using a 95% confidence interval and a 10% margin of error.[12]

Inclusion criteria

Patients aged ≥13 years presenting with fever of ≥5 days duration, confirmed by IgM ELISA and/or quantitative real-time PCR targeting the 47-kDa HtrA gene.

Exclusion criteria

Patients with confirmed alternative diagnoses, those aged <13 years, and those unwilling to provide informed consent.

Diagnostic confirmation

Scrub typhus IgM ELISA (JMitra kit, indirect ELISA with recombinant *Orientia tsutsugamushi* antigens; read at 450/630 nm on Thermo Fisher Multiskan GO spectrophotometer) was performed in 65 patients; real-time PCR (HELINI kit, 47-kDa gene target) was used in 15 patients. The choice of test was individualised to the day of illness at presentation and reagent availability, with PCR preferentially employed in patients presenting early (before adequate IgM seroconversion) or with a strong clinical suspicion despite a negative initial serology, and IgM ELISA used as the primary modality in the remaining patients, consistent with standard national testing algorithms.[13]

Data collection

Each consenting patient underwent a structured face-to-face interview. Demographic (age, sex, address, occupation, bin, socioeconomic status by Kuppuswamy scale), clinical (symptoms, signs, complications), laboratory (CBC, LFT, RFT, bilirubin, albumin), and radiological (chest X-ray, ultrasonography, CT scan) data were recorded on a standardised proforma. Blood and urine cultures, dengue NS1/IgM ELISA, leptospira IgM ELISA, malarial peripheral smear, Widal test, and ICT were performed to exclude co-infections.

Statistical analysis

Data were analysed using descriptive statistics (mean, standard deviation, percentages). Chi-square test was used for categorical comparisons. A p value <0.05 was considered statistically significant.

RESULTS

Eighty confirmed scrub typhus patients were enrolled. Key findings are summarised in Tables 1-9.

Chi-square goodness-of-fit test confirmed a statistically significant distribution across age groups ($\chi^2=23.95$, df=5, $p<0.001$), with the highest proportion in the 31–40-year age group. The 31–40-year age group was predominantly affected (33.75%), with a mean age of 40.25±14.74 years. Male predominance (67.5%; M: F=2.08:1) was statistically significant (Table 1).

Male predominance was statistically significant ($\chi^2=9.8$, df=1, p=0.002). The M: F ratio was 2.08:1 (Table 2).

Rural predominance was highly significant ($\chi^2=22.05$, df=1, $p<0.001$) (Table 3).

Farmers formed the largest occupational group (37.5%), followed by homemakers (23.75%), reflecting both outdoor agricultural exposure and peri-domestic contact with mite-infested vegetation as important routes of transmission. Others include gardeners, army personnel, rural school teachers, security staff, community health officers, and monks (χ^2=8.3, df=3, p=0.04) (Table 4).

Table 1: Age distribution of study subjects (n=80).

Age group (years)	Number (N)	Percentage (%)
13–20	5	6.25
21–30	18	22.50
31–40	27	33.75
41–50	12	15.00
51–60	8	10.00
>60	10	12.50
Total	80	100.00
Mean±SD	40.25±14.74 years	
Range	13–75 years	

Table 2: Gender distribution (n=80).

Gender	Number (N)	Percentage (%)
Male	54	67.50
Female	26	32.50
Total	80	100.00
Male: female ratio	2.08:1	

Table 3: Locality distribution (n=80).

Locality	Number (N)	Percentage (%)
Rural	61	76.25
Urban	19	23.75
Total	80	100.00

Table 4: Occupational distribution (n=80).

Occupation	Number (N)	Percentage (%)
Farmers	30	37.50
Homemakers	19	23.75
Students	12	15.00
Others	19	23.75
Total	80	100.00

Table 5: Socioeconomic class (Kuppuswamy scale, n=80).

Class (Kuppus-wamy)	Category	Number (N)	Percentage (%)
I	Upper	0	0.00
II	Upper middle	9	11.25
III	Lower middle	19	23.75
IV	Upper lower	42	52.50
V	Lower	10	12.50
	Total	80	100.00

The upper-lower class (class IV) was the most represented socioeconomic group (52.5%), followed by the lower-middle class (class III; 23.75%), reflecting the socioeconomic vulnerability of this disease and its association with outdoor labour and limited healthcare access (Table 5).

Fever (100%) and headache (92.5%) were near-universal presenting symptoms, while jaundice (45%) pointed to significant hepatic involvement.

Eschar, the pathognomonic sign of scrub typhus, was identified in 35% of patients, and splenomegaly and pneumonia were each noted in 38.75% (Table 6).

Table 6: Symptoms and signs (n=80).

Clinical feature	Number (N)	Percentage (%)
Symptoms		
Fever	80	100.00
Duration <7 days	35	43.75
Duration 7–14 days	41	51.25
Duration >14 days	4	5.00
Headache	74	92.50
Jaundice	36	45.00
Vomiting	21	26.25
Decreased urine output	21	26.25
Myalgia	9	11.25
Altered sensorium	8	10.00
Abdominal pain	11	13.75
Shortness of breath	6	7.50
Cough	6	7.50
Convulsion	6	7.50
Loose stools	4	5.00
Haematemesis	3	3.75
Melena	1	1.25
Signs		
Pallor	35	43.75
Splenomegaly	31	38.75
Pneumonia	31	38.75
Eschar	28	35.00
Hepatosplenomegaly	28	35.00
Hepatomegaly	25	31.25
Lymphadenopathy	23	28.75
Subconjunctival haemorrhage	23	28.75
Facial puffiness	22	27.50
Petechiae	22	27.50
Pedal oedema	21	26.25
Rash	10	12.50
ARDS	9	11.25
Pleural effusion	8	10.00
Meningeal signs	7	8.75
Ascites	5	6.25
Ecchymosis	5	6.25

Transaminase elevation (100%) and leukocytosis (100%) were universal, while thrombocytopenia (96.25%) and hypoalbuminaemia (97.5%) were near-universal, reflecting the multi-organ endothelial and hepatic involvement characteristic of scrub typhus (Table 7).

Table 7: Haematological and biochemical parameters (n=80).

Parameter	Threshold	Number (N)	Percentage (%)
Haemoglobin <12 g%	<12 g%	70	87.50
Haemoglobin ≥12 g%	≥12 g%	10	12.50
Total leukocyte count	>11,000/ cumm	80	100.00
Platelet count	<1.5 lakh	77	96.25
ALT	>50 IU/l	80	100.00
AST	>59 IU/l	80	100.00
ALP	>126 IU/l	80	100.00
Serum albumin	<3.5 g%	78	97.50
Serum creatinine	>1.0 mg/dl	70	87.50
Total bilirubin	>2 mg/dl	15	18.75
Direct bilirubin	>1.1 mg/dl	45	56.25
Blood urea	>43 mg/dl	4	5.00

Significant seasonal variation was confirmed (χ^2=55.3, df=11, p<0.001), with March–April accounting for 42.5% of all cases (Table 8).

Table 8: Seasonal distribution of scrub typhus cases (n=80).

Month	Number (N)	Percentage (%)
January	0	0.00
February	0	0.00
March	19	23.75
April	15	18.75
May	8	10.00
June	9	11.25
July	8	10.00
August	7	8.75
September	6	7.50
October	3	3.75
November	2	2.50
December	3	3.75
Total	80	100.00

USG findings included minimal ascites, hepatomegaly, and splenomegaly.

Chest X-ray showed unilateral/bilateral opacities in a subset of patients (Table 9).

Table 9: Radiological investigations (n=80).

Investigation	Number (N)	Percentage (%)
Chest X-ray (abnormal)	19	23.75
Ultrasonography (abnormal)	29	36.25
CT scan	2	2.50

DISCUSSION

This hospital-based study describes the clinico-demographic profile of 80 confirmed scrub typhus patients at a tertiary care centre in Upper Assam, contributing to the growing literature from Northeast India.

Diagnostic approach

The diagnostic modality used in this study varied between patients according to their day of illness at presentation and kit availability, rather than being applied uniformly. Real-time PCR targeting the 47-kDa HtrA gene was preferentially used in patients presenting early in the febrile illness, typically within the first five to seven days, when circulating IgM antibody titres may not yet have reached a detectable threshold; IgM ELISA, in contrast, served as the primary serological test in patients presenting later, when seroconversion is more reliable and the test performs with higher sensitivity. This individualised, illness-day-based approach reflects the recognised limitation of serology during the early "window period" of infection and mirrors testing algorithms recommended in Indian and regional practice, as well as the broader difficulty in identifying a single universally sensitive diagnostic test for scrub typhus that has been highlighted in the literature.[9,13,14] Combining serological and molecular methods in this manner likely improved overall case ascertainment compared with reliance on either test in isolation.

Age and gender

The 31–40-year age group was predominantly affected (33.75%), with a mean age of 40.25±14.74 years (Table 1). Male predominance (67.5%; M: F=2.08:1) was statistically significant (Table 2). These findings are comparable to studies by Ngulani et al (59.7% male; mean age 41 years) from Manipur, Varghese et al from South India (median age 36.5 years), and Narlawar et al from Central India (54.3% female; notable regional variation).[15-17] The male predominance is attributed to greater occupational outdoor exposure in agricultural settings.

Locality and occupation

A large majority (76.25%) were from rural backgrounds (Table 3), and farmers constituted 37.5% of patients — consistent with scrub typhus being an occupational and environmental hazard of rural communities (Table 4).

Homemakers (23.75%) were also significantly affected, highlighting peri-domestic exposure. This mirrors findings by Pathania et al from the sub-Himalayan region and Van Ramliana et al from Mizoram.[18,19]

Socioeconomic status

The upper-lower class (class IV, Kuppuswamy scale) was most affected (52.5%), followed by the lower-middle class (class III; 23.75%), reflecting the socioeconomic vulnerability of this disease and its association with outdoor labour, poor housing, and limited healthcare access — consistent with published Indian data (Table 5).

Clinical features

Fever (100%) and headache (92.5%) were universal (Table 6). Jaundice was prominent (45%), indicating significant hepatic tropism of *Orientia tsutsugamushi*, consistent with Kamath et al and Varghese et al.[16] Eschar, the pathognomonic finding, was identified in 35% — higher than some Indian series (8–13%) but lower than East Asian studies (~67%), likely reflecting improved clinical awareness at this centre. Splenomegaly and pneumonia were each present in 38.75%, while ARDS was noted in 11.25%. Neurological involvement (altered sensorium, convulsions, meningeal signs) occurred in a significant minority, consistent with neuro-scrub typhus described by Mahajan et al.[1]

Laboratory findings

Thrombocytopenia (96.25%), hypoalbuminaemia (97.5%), universal transaminase elevation (100%), and elevated creatinine (87.5%) reflect the pathophysiology of endothelial injury and vasculitis caused by *Orientia tsutsugamushi* (Table 7). These findings are consistent with Chrispal et al and Varghese et al.[16] Leukocytosis (100%) was a consistent feature, contrasting with the leukopenia reported in dengue, aiding differential diagnosis.

Radiological findings

Abnormal chest radiographs (23.75%) and ultrasonographic findings (36.25%) — predominantly hepatosplenomegaly, minimal ascites, and pleuro-pulmonary opacities — corroborate the multi-organ tropism of *Orientia tsutsugamushi* and are in keeping with previously described radiological patterns in scrub typhus (Table 9).[20] These imaging abnormalities, though non-specific, support clinical suspicion in patients with compatible febrile illness and should prompt early consideration of the diagnosis, particularly in endemic regions such as upper Assam.

Seasonal pattern

Peak incidence during March–April (42.5% of cases) is notable (Table 8) — diverging slightly from the classical post-monsoon clustering described in peninsular India. This spring peak likely reflects the activity pattern of local Leptotrombidium species, coinciding with agricultural activities and increased human-mite contact during this period in upper Assam, and contrasts with the autumn–winter clustering reported from northern China.[21]

Mortality

Mortality in our series was 8.75%, lower than the 21.2% reported by Takhar et al from Rajasthan and 14% by Varghese et al, but higher than Ngulani et al (4.5%), reflecting differences in disease severity, diagnostic delay, and circulating strains.[8,15,16] This underscores the seriously neglected and potentially life-threatening nature of the disease when recognition or treatment is delayed.[14]

Limitations

The sample size was limited to 80 patients from a single tertiary centre, restricting generalisability. The short study duration and hospital-based design may not reflect community prevalence. Strain identification and genotyping of *Orientia tsutsugamushi* was not performed, limiting virulence comparisons.

CONCLUSION

This hospital-based study from upper Assam characterizes scrub typhus as a disease predominantly affecting rural male farmers in the economically active age group, with a distinct spring seasonality. Fever, headache, and jaundice are the cardinal presenting features. Multi-organ involvement — hepatic, haematological, renal, and pulmonary — is the rule rather than the exception, reflected in universal transaminase elevation, near-universal thrombocytopenia, and frequent renal dysfunction. Eschar detection (35%) remains a key diagnostic pointer when present.

Early clinical suspicion during the spring–early monsoon season in patients with rural occupational exposure, supported by timely IgM ELISA testing and prompt initiation of doxycycline, remains the cornerstone of management. Strengthening community awareness, ensuring diagnostic accessibility at primary care level, and implementing vector control measures are vital for reducing the burden of this neglected but treatable tropical disease in Northeast India.

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