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Research Article

Clinico-Epidemiological Profile, Complications and Outcome of Scrub Typhus Among Hospitalised Paediatric Patients": A Retrospective Study from a Tertiary Care Hospital in Nuh, Haryana

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A B S T R A C T

To assess the clinico-epidemiological profile, complications, and outcomes of scrub typhus among hospitalized paediatric patients in a tertiary care hospital in Nuh, Haryana.

Background: Scrub typhus, caused by Orientia tsutsugamushi and transmitted by chigger mites, is an emerging but underdiagnosed cause of acute febrile illness in children, especially in rural and resource-poor regions. The disease often mimics other infections and can lead to severe complications if not identified early. Nuh (formerly Mewat) in Haryana is a predominantly rural district with limited healthcare infrastructure, poor sanitation, and environmental conditions favorable for mite proliferation, increasing the disease burden in children. Despite this, local data on its clinical presentation and outcomes remain scarce, necessitating region-specific studies.

Methods: This retrospective study reviewed records of 32 paediatric patients (1 month to 14 years) admitted with confirmed scrub typhus between September and December 2024. Diagnosis was based on clinical signs and positive IgM ELISA for O. tsutsugamushi. Data on demographics, clinical features, lab findings, complications, co-infections, treatment, hospital stay, and outcomes were analyzed using descriptive statistics. Results: Of the 32 children, 59% were male, with most aged 1–5 years. All presented with fever; respiratory distress (44%), seizures (40%), and altered sensorium (40%) were common. Eschar was found in 12.5%. Anaemia was universal, and 43.7% had thrombocytopenia. Common complications included hepatitis (47%), encephalopathy (41%), and pneumonitis (34%). Co-infections occurred in 40%. While 87.5% recovered, four patients (12.5%) died due to delayed presentation and multi-organ dysfunction.

Conclusion: Scrub typhus poses a significant threat in endemic rural areas like Nuh. Early diagnosis and prompt treatment are crucial to reducing associated morbidity and mortality.

Keywords: IgM ELISA ,Eschar ,Rash, Complications, Pneumonia, Hepatitis, Scrub Typhus

Introduction

Scrub typhus, a mite-borne rickettsial infection caused by Orientia tsutsugamushi[1,2], spread by the bite of trombiculid mites that resides in moist soil is an important cause of acute febrile illness in children, particularly in rural and semi-urban areas of South and Southeast Asia, including India. Scrub typhus is usually underdiagnosed in our country due to varied presentation, limited knowledge about the disease, low index of suspicion among physicians and nonavailability of diagnostic facilities in community [3] The greatest challenge to a paediatrician is difficulty in the diagnosis since it has non-specific clinical presentation resembling many common diseases like dengue, malaria, enteric fever, leptospirosis. Clinical manifestations can vary from mild to severe. It can affect almost all organ systems and can be fatal. Common features include fever, rash, lymphadenopathy, hepatosplenomegaly, and, in some cases, the presence of an eschar. Severe complications such as acute respiratory distress syndrome (ARDS),meningoencephalitis, hepatitis, and renal involvement may occur, contributing to significant morbidity and mortality if left untreated. Untreated cases can have mortality as high as 30-35%. Due to the high risk of dangerous complications and prompt response to doxycycline, timely diagnosis and treatment are important. Most of the studies of rickettsial infections in India and worldwide are on adult populations.[1,4] In the Indian subcontinent, there are scarce studies available regarding incidence and clinical profile in paediatric scrub typhus. Most of the reports from India are from southern states or the Himalayan belt. Reports from northern states, especially from underserved districts such as Nuh (formerly Mewat) in Haryana, are scarce. This region is characterised by poor healthcare access, low literacy rates, and limited public health infrastructure, which collectively contribute to delayed diagnosis and adverse outcomes. Different studies from North India reported an incidence of 28% in the age group of 0-60 years[5], while different studies from Rajasthan reported an incidence of 23%-25%.[6] Hence, this retrospective observational study was undertaken to describe the clinico-epidemiological profile, complications, and outcomes of pediatric scrub typhus cases admitted to a tertiary care hospital in Nuh, Haryana.The findings aim to enhance awareness and guide early access diagnosis and management strategies, especially in resource-limited settings.

Methods

This was a retrospective observational study conducted at a tertiary care hospital in Nuh (Mewat), Haryana after approval from the institutional ethics committee. The study included paediatric patients aged 1 month to 14 years who were hospitalised with a diagnosis of scrub typhus between (September, 2024 to December, 2024).Children presenting with acute febrile illness of > 5 days and testing positive for scrub typhus IgM antibody by ELISA were included. Cases with incomplete records or alternative confirmed diagnoses unrelated to scrub typhus were excluded. The diagnosis of scrub typhus was confirmed by IgM MICROLISA by J;. MITRA & co. Pvt. Ltd. testing done in the microbiology department at our institute. The sensitivity & specificity of this test is very high (100%).A cut- off value of >11 is used for case positivity.

Medical records of all eligible patients were reviewed. Data were extracted and collected in a predesigned proforma that included demographic details (age, sex, address), clinical features (symptoms and signs), laboratory parameters (haematological and biochemical findings),complications, co-infections, treatment received, and outcomes. The duration of hospital stay and final outcome (recovery or death) were also noted.

Epidemiological features of all patients were recorded. Residence location, exposure to animals, farming and proximity to forest areas which may be the source of ticks were also recorded.

Laboratory tests like complete blood count(CBC), C-reactive protein (CRP),liver function test (LFT), blood urea, creatinine (Cr), serum electrolytes, and coagulation profile (PT, APTT, INR) as per clinical indications. Other relevant investigations such as cerebrospinal fluid, chest radiography, and neuroimaging, were performed where necessary. Serological tests for dengue, enteric fever, leptospirosis, and viral hepatitis were done to identify co-infections.

The Weil-Felix test which is a screening test for rickettsial infection, was done. The presence of co-infection, data pertaining to complications, need for oxygen support or mechanical ventilation, and final outcomes were also recorded .

A favourable clinical response to doxycycline (defervescence within 48 h) was considered additional evidence of the disease.

Definition of complication of scrub typhus

- Hepatic dysfunction was defined as serum bilirubin >1 mg/dL, serum aspartate aminotransferase (AST) >120 U/L, serum alanine aminotransferase (ALT) >120 U/L, serum albumin <3.5 g/dL ,PT ≥15 sec, and INR >1.5.
- Acute kidney injury (AKI) was considered as per kidney disease: improving global outcomes (KDIGO) definition and classification.
- Meningoencephalitis was considered with the presence of altered sensorium along with meningeal signs and/ or seizures along with positive CSF findings.
- ARDS was defined as the acute onset of respiratory failure, bilateral infiltrates on chest radiograph,

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hypoxaemia as defined by a PaO2/FiO2 ratio ≤ 200 mmHg, and no evidence of left atrial hypertension in the absence of heart failure.[7]

- Multiple organ dysfunction syndrome (MODS) is defined as the concurrent dysfunction of two or more organs or systems, including respiratory, cardiovascular, haematological, neurological, gastrointestinal, hepatic, and renal.[8]
- **Myocarditis was diagnosed when the following conditions were observed:** clinical findings consistent with left ventricular dysfunction, echo–presence of global left ventricular wall motion abnormality, and elevated CPK-MB levels in the blood, with or without ECG abnormalities.

Statistical analysis

All the data were collected and entered in a Microsoft Excel master chart and analysed using descriptive statistics. Results were expressed in terms of absolute numbers and percentages. No comparative or inferential statistical analysis was performed due to the small sample size and retrospective nature of the study.

Ethics clearance: Institutional Ethical Committee, SHKM GMC; No. SHKM/IEC/2025/05,dated May 27, 2025.

Results

During the study period, a total of 32 cases were diagnosed as scrub typhus by the IgM ELISA method. The majority of cases,27 (84.4%) cases were from the Nuh district of Haryana, while the other 5 (15.6%) cases from neighbouring district, of Nuh, in which 3(9.4%) cases from Alwar (Rajasthan) and 2 (6.3%) cases were from Bharatpur (Rajasthan). All cases are from rural areas of Southern Haryana and Rajasthan. Males were more affected than females, 19 (59.4%) and 13 (40.6%), respectively, with a male-to- female ratio of 1.5:1. The maximum number of cases wasseen in the age group of 1 to 5 years, with 16 cases (50.0%), and the age and gender distribution is given in .[Table 1]. A majority of cases (78%) occurred between the months of September and December, following the post-monsoon season.

Fever was the most consistent symptom, present in all 32 cases. 22 (69%) cases presented with a fever of more than 7 days' duration. Other common presenting symptoms included respiratory distress 14 (43.7%), altered sensorium 13 (40%), seizures 13 (40%), vomiting 12 (37.5%), rash 10 (31.2%), abdominal pain 10 (31.2%). Additional symptoms noted were generalised swelling 8 (25%), diarrheoa 2 (6.3%), yellowish discolouration 2 (6.3%), abdominal distension 2 (6.3%) , myalgia 2 (6.3%), and headache 4 (12.5%. On examination all patients were febrile. Tachypnea was observed in 22 (68.7%) patients, oedema in 8 (25%), and hypotension in 2 (6.2%). Eschar was found in 4 (12.5%) cases, which is pathognomonic of scrub typhus. [Figure 1(a,b,c)] 1(a)-Eschar present over face,1(b)- Eschar over the left anterior part of chest ,1(c)-Eschar over left hand.

Other signs included lymphadenopathy 2 (6.2%). [Figure 2(a,b)] 2(a)-Figure showing axillary lymphadenopathy, 2(b)-Figure showing cervical lymphadenopathy, icterus 3 (9.4%), shock 5 (15.6%), hepatomegaly 16 (50%), splenomegaly 11 (34.4%), and ascites 1 (3.1%) cases. Symptoms and signs were depicted in [Table 2].

In our study the Weil-Felix test was done on 20 patients. Only 2 patients were positive for scrub typhus (OX-Ktitre), 4 patients were positive for spotted fever group rickettsia (OX19,OX2+) and 1 patient was positive for typhus group rickettsia (OX19+).This indicates that the sensitivity of Weil-Felix is very low. Sensitivity of the Weil -Felix test is 33%, and specificity is 46%.

There were few cases of scrub typhus which had associated coinfection. Enteric fever was the commonest coinfection, which was found in 5 cases (15.6%) confirmed by the Widal test in all 5 patients ,The other coinfection was dengue, found in 4 (12.5%) cases confirmed by the NS1 antigen in 2 cases & in 2 cases by the IgM antibody method ;leptospirosis found in 2 (6.2%) cases confirmed by IgM ELISA, and Hepatitis B in 1 (3.1%) case confirmed by the IgM ELISA method. One patient was positive for both Hepatitis A and C 1 (3.1%) by the IgM ELISA method.

Anaemia (Hb<11g/dl) was observed in all patients. Total leukocyte counts ranged from 4,000 to >11,000/mm^3, with leukocytosis (>11,000) in 22 (68.7%) patients and normal counts in 10 (31.2%) patients. Thrombocytopenia (<1 lakh) was found in 14 (43.7%) patients, while 10 (31.2%) patients had counts between 100,000 and 150,000/mm^3, and 8 (25%) patients had normal counts. Biochemical abnormalities included hypoalbuminemia in 24 (75%) patients, elevated AST in 12 (37.5%) and elevated ALT in 6 (18.7%), and elevated alkaline phosphatase in 16 (50.%). Raised total bilirubin (>1.2 mg/dl) was seen in 5 (15.6%) cases. Other abnormalities included hyponatraemia 8 (25%), raised creatinine 2 (6.2%), albuminuria 1 (3.1%) ,raised C-reactive protein 17 (53.1%),prolonged prothrombin time 1 (3.1%),and prolonged APTT 4 (12.5%) cases. Laboratory abnormalities are depicted in Table.[3]

Complications were seen in 26 (81.3%) cases of scrub typhus. The most common complications were hepatitis, seen in 15 (46.9%);thrombocytopenia 14 (43.8%), encephalopathy 13 (40.6%); meningoencephalitis 9 (28.1%), raised intracranial pressure, 9 (28.1%); pneumonitis 11 (34.4%); acute respiratory distress syndrome (ARDS), 4 (12.5%). (Figure 3) - Chest x-ray showing ARDS. Other complications included meningitis 4 (12.5%), pleural effusion 3 (9.4%), pulmonary haemorrhage 2 (6.3%), multiorgan dysfunction

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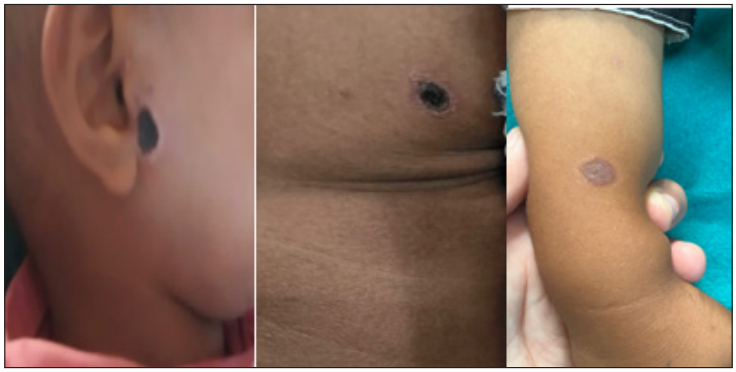
syndrome 6 (19%), suspected cardiac dysfunction based on cardiomegaly on chest x-ray 4 (12.5%), acute kidney injury (AKI) 2 (6.3%) and subdural haemorrhage 1 (3.1%). Scrub meningoencephalitis was diagnosed in 9 (28.1%) cases by CSF study. All cases showed a lymphocytic predominance, protein was moderately elevated, and glucose was almost normal in CSF analysis.

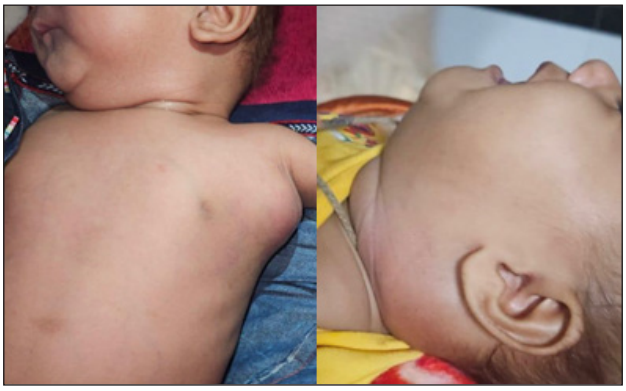
All patients were treated with doxycycline, and 11 (34.3%) were treated with azithromycin. Doxycycline is the drug of choice (oral or intravenous). The Dose is 2.2 mg/kg twice daily [<40 kg] and 100 mg twice daily [>40 kg] can be given for a total of 7 days or 3 days after fever subsides or 10 days in complicated or severe cases.

The duration of hospital stay ranged from 4 to 15 days. Out of 32 cases (87.5%), 28 cases recovered and were discharged, while 4 (12.5%),expired as, depicted in Table 4. The most common causes of mortality in our patients were acute respiratory distress syndrome (ARDS), pulmonary haemorrhage, septic shock and disseminated intravascular coagulation (DIC).



(a) (b) (c)

Figure 1(a).Eschar present over face (b) Eschar over the left anterior part of chest (c) Eschar over left hand



(a) (b)

Figure 2(a).Figure showing axillary lymphadenopathy, (b) Figure showing cervical lymphadenopathy, icterus 3 (9.4%), shock 5 (15.6%), hepatomegaly 16 (50%), splenomegaly 11 (34.4%), and ascites 1 (3.1%) cases

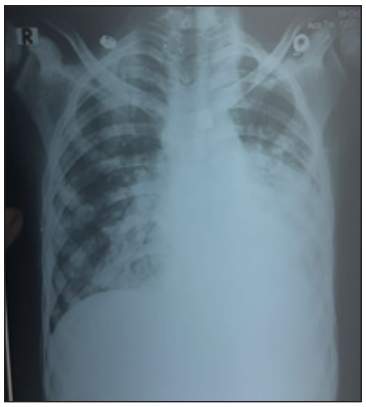


Figure 3.Chest x-ray showing ARDS

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Table 1.Demographic Profile of Patients

Parameters	Number of children (n=32)	Percent (%)
Male	19	59.4%
Female	13	40.6%
Age(y)		
<1	3	9.4%
1-5	16	50%
>5-10	8	25%
>10	5	15.6%

Table 2.Clinical features at Presentation

Parameters	Number of children (n=32)	Percent(%)
Presenting symptoms		
Fever	32	100%
Respiratory distress	14	43.7%
Seizures	13	40%
Altered sensorium	13	40%
Vomiting	12	37.5%
Rash(Maculopapular)	10	31.2%
Abdominal Pain	10	31.2%
Generalised swelling	8	25%
Headache	4	12.5%
Diarrhea	2	6.3%
Yellowish discolouration	2	6.3%
Abdominal distension	2	6.3%
Myalgia	2	6.3%
Physical examination		
Pedal edema	8	25%
Hypotension	2	6.2%
Eschar	4	12.5%
Lymphadenopathy	2	6.2%
Icterus	3	9.4%
Shock	5	15.6%
Hepatomegaly	16	50%
Splenomegaly	11	34.4%
Ascites	1	3.1%

Table 3.Laboratory Abnormalities

Variables	Number of children (n=32)	Percent(%)
Hematologic parameters		
Hb <11 g /dl	32	100%

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TLC(per mm³)		
<4000	0	0%
4000-11000	10	31.2%
>11000	22	68.7%
Platelets (per mm³)		
>150,000	8	25%
100,000-150,000	10	31.2%
<100,000	14	43.7%
Biochemical parameters		
Raised creatinine	2	6.2%
Hypoalbuminemia	24	75%
Raised AST	12	37.5%
Raised ALT	6	18.7%
Raised alkaline phosphatase	16	50%
Total bilirubin >1.2 mg/dl	5	15.6%
Hyponatremia	8	25%
Albuminuria	1	3.1%
Raised CRP	17	53.1%
PT prolongation	1	3.1%
APTT prolongation	4	12.5%

Hb: Hemoglobin,TLC: Total Leukocyte Count
AST: Aspartate Aminotransferase,ALT:Alanine Aminotransferase
CRP:C-Reactive Protein,PT:Prothrombin Time
APTT:Activated Partial Thromboplastin Tim

Table 4.Complications,Treatment and Outcome were seen in patients

Parameters	Number of children (n=32)	Percent(%)
Complications		
Hepatitis	15	46.9%
Platelet count <1 lakh	14	43.8%
Encephalopathy	13	40.6%
Meningoencephalitis	9	28.1%
Raised ICT	9	28.1%
Meningitis	4	12.5%
Pneumonitis	11	34.4%
ARDS	4	12.5%
Pleural effusion	3	9.4%
Pulmonary haemorrhage	2	6.2%
MODS	6	19%
Cardiac dysfunction	4	12.5%
AKI	2	6.2%
Subdural haemorrhage	1	3.1%

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Treatment		
Doxycycline (intravenous or oral use)	32	100%
Azithromycin	11	34.3%
Outcome		
Duration of hospital stay	4-15 days(9)	
Recovery	28	87.5%
Mortality	4	12.5%

ICT:Intracranial Tension,ARDS:Acute Respiratory Distress Syndrome
MODS:Multiple Organ Dysfunction Syndrome,AKI: Acute Kidney Injury

Discussion

This retrospective study highlights the clinic epidemiological profile, complications, and outcomes of scrub typhus among hospitalised paediatric patients in Nuh (Mewat), Haryana - a region with poor healthcare access and limited disease surveillance. Scrub typhus emerged as an important differential diagnosis in children presenting with prolonged febrile illness, especially during the post-monsoon months.

Nuh is the southern part of Haryana, which is bordered by the Bharatpur and Alwar districts of Rajasthan. The majority of cases, 27 (84.4%) cases, were from the Nuh district of Haryana, while the other 5 (15.6%) cases were from neighbouring districts of Nuh, in which 3 (9.4%) cases were from Alwar (Rajasthan) and 2 (6.3%) cases were from Bharatpur (Rajasthan). All cases are from rural areas of Southern Haryana and Rajasthan.

Scrub typhus is an important public health concern in endemic region, with outbreaks affecting vulnerable populations.

Infections are most common during the rainy season, usually June to November, which favours mite activity. In our center, the number of cases was high in the month of September to December month.

In some areas, outbreaks occurred during harvest season when people are exposed to mite-infested vegetation.

In our study the main sources of transmission of larval mites were farming areas and poorly maintained kitchens which were inhabited by rodents and chiggers. In recent years, there has been a resurgence of scrub typhus cases in the predominantly rural tribal population of Northeast India, a mountainous region. Its prevalence is influenced by a range of ecological factors such as rodent populations, habitat characteristics and climatic conditions.[9]

The age group commonly affected was between 1 and 5 years, which is similar to an earlier study from India.[10]

Our study showed male children outnumbering females with ratio of 1.5:1;similar observations were found by previous studies[10,11], probably due to more outdoor activities leading to higher exposure to infected mites. Fever was the universal symptom in all the cases, similar to earlier studies.[10,11] Other presenting symptoms were vomiting, seizure, respiratory distress, altered sensorium, abdominal pain, headache, maculopapular rash, yellowish discoloration of eyes etc. Common examination findings were hepatomegaly (50%) and splenomegaly (34.4%), similar to another study.[10]

Eschar, the most pathognomonic sign of scrub typhus, was found in 12.5% of case in our study. However, eschar was found in 11.8% of cases in Pathak et al.[11] So we can suggest that though eschar is characteristic of scrub typhus, it may not be found in most cases, and strong clinical suspicion is crucial in endemic areas after monsoon season. Maculopapular rash was present in our study in 31.2% of cases. In our study, less common signs were icterus and lymphadenopathy.

On investigation, anaemia was seen in 100% of cases leucocytosis was seen in (68.8%) of cases and thrombocytopenia was present in 75% of cases. Hyponatraemia was present in 25% of cases in our study; Pathak et al.[11] reported hyponatraemia in 48.7% of cases. CRP was elevated in (53.1%) of cases. A similar result of elevated CRP was reported by earlier studies.[13]

The most common LFT abnormality was AST elevation, seen in 37.5% of cases. ALT elevation was seen in 18.7% of cases. Similar elevations of transaminases (ALT and AST) were also reported by earlier studies.[7,10,11] We found hypoalbuminaemia in 75% of cases. However, Sarangi et al.[14] Dass etal.[12] and Kumar et al.[14] reported hypoalbuminaemia in 38.4%, 52.2% and 54% of respectively. We found hyperbilirubinaeamia in 15.6%, similar to earlier studies.[10,12,14] In our study, coagulopathy was seen in 15.6% cases. Another study in Taiwan reported no coagulopathy .[15]

The most common complication observed in our study was hepatitis (46.9%), followed by lung involvement pneumonitis (34.4%) and meningoencephalitis (28.1%). Similar other studies in Odisha and in Thailand have reported pneumonitis as the most common complication.[10,13] Many studies have found similar incidence of meningoencephalitis.[10,11,13] In

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our study, septic shock was seen in 15.6% of cases. This is comparatively less to study by Bhat etal.[16] 25.8%. This difference may be due to early diagnosis and management. ARDS was found in 12.5 % cases similar to earlier studies.[10,19] AKI was detected in 6.2% of cases, similar result was reported in a study from the northeast.[12]

In our study, CSF analysis was done in 17 cases, and 9 cases were diagnosed as scrub meningoencephalitis, CSF analysis showed lymphocytic predominance, moderate elevation of protein and normal glucose, similar to a few Indian studies.[17,18] In our study, the average hospital stay was 9 days. The mortality rate in our study was 12.5% which is less than the 15% reported by Kamarasu etal.[19]Palanivel etal.[20] and Muthukrishan etal.[21] reported 12% and 9% respectively. This may be attributed to early referral to our centre, early diagnosis and treatment.

The most common causes of mortality in our patients were acute respiratory distress syndrome (ARDS),pulmonary haemorrhage, Septic shock and disseminated intravascular coagulation (DIC),which may be due to delays in presentation, diagnosis and treatment.

Scrub typhus is a neglected rickettsial disease prevalent in our country and is reemerging.[22] For timely diagnosis and favourable outcome, a high degree of suspicion and knowledge about geographical distribution and clinical manifestations is important. Our case study provides clues for primary care physicians to diagnose and treat scrub typhus early. In our cases, all the patients were screened for sensorineural hearing loss before discharge.[23]

Early diagnosis and prompt treatment with antibiotics (eg.,doxycycline or azithromycin) are critical to reducing mortality. Improved surveillance, awareness, and vector control measures are essential to mitigate its impact.

All over patients were treated with doxycycline, and 11 (34.3%) were treated with azithromycin.

Treatment should be started without waiting for laboratory confirmation. Doxycycline is the drug of choice (Oral or intravenous), Dose is 2.2 mg/kg twice daily [<40kg] and 100 mg twice daily [>40kg] can be given for total of 7 days or 3 days after fever subsides or 10 days in complicated or severe cases.[23]

Our study had certain limitations; the small sample size and retrospective nature of the study, complications like myocarditis could not be assessed due to the non - availability of two-dimensional echocardiography in our centre. The study was performed in a tertiary referral hospital; therefore, the present data do not represent the entire community, and the actual incidence of rickettsiosis may be higher.

In conclusion, with India being part of the famous Tsutsugamushi Triangle, the entirety of India is endemic for scrub typhus. The presenting features are non -specific. Hence, diagnosis is based on a high index of clinical suspicion. Children presenting with fever of no focus, rashes, or eschar should be suspected scrub typhus. The presence of eschar, though pathognomonic, is not mandatory, and its absence should not be a criterion for not testing. Scrub typhus is easily treatable when diagnosed early and helps in reducing patient morbidity and mortality.

Ethics clearance: Approval was obtained from the Institutional Ethical Committee, SHKM GMC; No. SHKM/IEC/2025/05, dated May 27, 2025.

Data Availability Statement

The data that support the findings of this retrospective study are available from the corresponding author upon reasonable request.

Conflict of Interest: None

Source of Funding: None

Declaration of Generative AI and AI-Assisted Technologies in the Writing Process: None

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