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Clinical Profile and Outcomes of Pediatric Scrub Typhus in Manipur: A Hospital-Based Study

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Abstract

Scrub typhus is a significant pediatric health concern in endemic regions such as Manipur. This study analyzed 80 children diagnosed with scrub typhus to determine epidemiological patterns, clinical features, laboratory findings, complications, and outcomes. The majority of affected children were male, school-aged, and from rural or forested regions. Fever, organomegaly, hematological abnormalities, and multi-organ involvement were common. Complications included thrombocytopenia, hepatitis, myocarditis, renal impairment, and neurological manifestations. Early diagnosis and timely antibiotic therapy remain crucial to preventing severe outcomes and reducing morbidity and mortality among pediatric patients.

Keywords: Scrub Typhus, Pediatrics, Epidemiology, Complications, Manipur

Introduction

Scrub typhus is an infectious disease caused by intracellular obligate bacteria Orientia tsutsugamushi. It is a major vector-borne zoonotic disease prevalent in the Asia-Pacific region, including India. It is transmitted by bite of trombiculid mite[1]. The disease is contracted in humans from the bite of an infected chigger. Scrub typhus is often underdiagnosed in our part of the world due to a low index of suspicion among pediatricians. Delay in diagnosis and treatment has been associated with an increase in case fatality[2]. Due to the fact that active rice fields are a significant reservoir for transmission, scrub typhus is frequently contracted

through occupational or agricultural exposures. Children playing barefoot in the foothills and transmission during open defecation are a few risk factors[3]. The incubation period for scrub typhus ranges from 6 to 21 days, with an average of 10 to 12 days. Development of an eschar at the site of the chigger bite is a pathognomic feature, which often appears before systemic symptoms manifest. Common locations for eschar formation include the axillae, under the breast, and the groin, though they can also occur on the abdomen, back, and extremities[4]. The pathogenesis of scrub typhus, caused by Orientia tsutsugamushi, involves complex interactions between the pathogen and host vascular systems. A hallmark of the disease is the widespread infection of vascular endothelial cells, leading to disseminated vasculitic and perivascular inflammatory lesions. This endothelial tropism is associated with vasculitis affecting multiple organs, contributing to severe clinical manifestations[5]. Histopathological examinations from autopsy series have revealed that vascular injury in scrub typhus patients often results in hemorrhage. However, emerging evidence suggests that the initial endothelial damage induced by O. tsutsugamushi infection is exacerbated by immune-mediated inflammation. This synergistic effect leads to significant vascular leakage and contributes to the pathophysiology of the disease[6] most often manifested in the brain and lungs[7]. Scrub typhus, caused by Orientia tsutsugamushi, presents a broad spectrum of clinical manifestations in children, ranging from mild to severe, affecting multiple organ systems. Typically, patients experience fever lasting between 9 to 11 days (range: 1–30 days) before seeking medical attention. Common clinical features include regional or generalized lymphadenopathy, reported in 23–93% of cases, hepatomegaly in approximately two-thirds, and splenomegaly in about one-third of pediatric patients. Approximately 40% of children present with gastrointestinal symptoms such as abdominal pain, vomiting and diarrhea. A single painless eschar with an erythematous rim at the chigger bite site is observed in 7–68% of cases, while a maculopapular rash is present in less than half; notably, both signs can be absent, complicating diagnosis[8]. Hematologic abnormalities are also observed. While leukocyte and platelet count often remain within normal ranges, thrombocytopenia occurs in approximately one-quarter to one-third of children, and leukocytosis is observed in about 40% of cases8. Serious complications include pneumonitis in 20–35% and meningoencephalitis in approximately 10–25% of children. Acute renal failure, myocarditis, disseminated intravascular coagulation and aseptic shock–like syndrome occur much less often[7]. Studies related to the incidence and clinical profile of scrub typhus in children of the Indian subcontinent are limited in number. The published studies are mostly retrospective or sporadic case reports. Globally, approximately one million cases are reported annually, with India bearing a substantial portion of this burden. The prevalence of scrub typhus in India exhibits regional variations: Urban Areas: 30.44% Rural Areas: 27.73% Mixed Urban-Rural Settings: 36.25%[9] In rural India and Southeast Asia, it is observed that there is an increased incidence of cases during the monsoon and post-monsoon seasons, typically from June to November[10]. The case-fatality rate (CFR) of scrub typhus in India remains a significant concern. Over the past decade, the CFR was reported at 6.3%. Notably, in patients who developed multi-organ dysfunction syndrome, the CFR escalated to 38.9%, underscoring the severity of complications associated with delayed diagnosis and treatment[11]. Scrub Typhus is regarded as a re-emerging infectious disease in India. The first Scrub Typhus infection in the country was reported from the

States of Assam and West Bengal during the Second World War. Himachal Pradesh, Sikkim, West Bengal, Puducherry, Uttarakhand and north-western part of the country have also reported several outbreaks of Scrub Typhus. A resurgence of scrub typhus was documented in Assam in 2010–2011, following a 65-year lapse since the initial report. Thereafter, sporadic cases of ST in the State of Assam as well as from its neighbouring States including Manipur have been reported[12]. Since 2001, multiple seasonal outbreaks of febrile illness with eschar have been reported in Bishnupur district of Manipur. The exact cause of these outbreaks is not identified. However, it was found that the prevalence was higher among individuals who defecated or urinated in the jungle or bushy areas in a squatting position. The incidence of pediatric scrub tuphus is quite significant. Since limited study has been done so far in Manipur, this study will help in understanding better about clinical features and therapeutic outcomes of pediatric scrub typhus in Manipur.

Materials and Methods

This hospital-based observational study included 80 pediatric patients diagnosed with scrub typhus. Diagnosis was based on clinical features supported by laboratory testing. Demographic details, clinical presentations, laboratory parameters, complications, and outcomes were recorded and analyzed.

Results

A total of 80 children were included in this study. The mean age was 8.36 years (SD = 3.86), with the highest incidence observed among children aged 6–10 years (39%), followed by 11–14 years (35%) and 1–5 years (26%). There was a male predominance (60%). Most children lived in rural areas (55%), whereas the remaining lived-in towns (22.5%) and forested areas (22.5%).

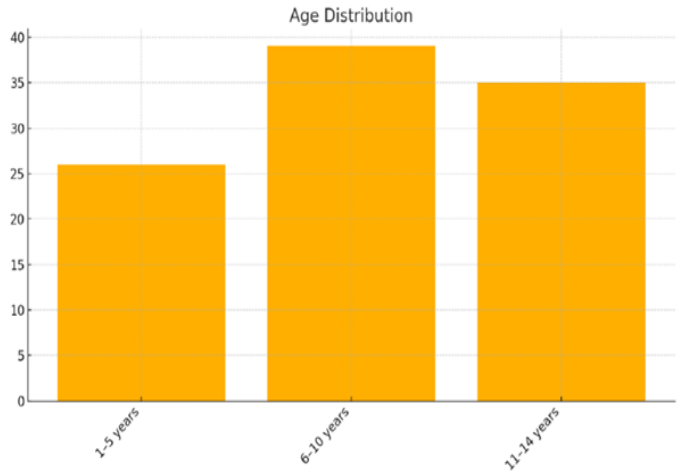

Figure 1: Age distribution among pediatric scrub typhus cases.

Figure 2: Gender distribution of affected children.

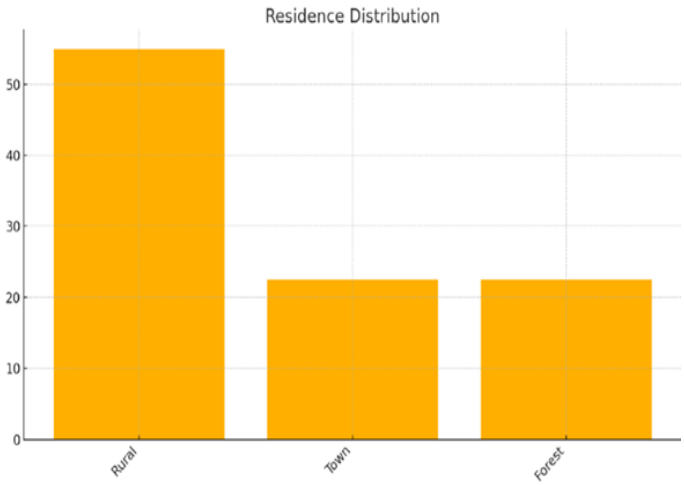

Figure 3: Residence profile of patients (Rural, Town, Forest).

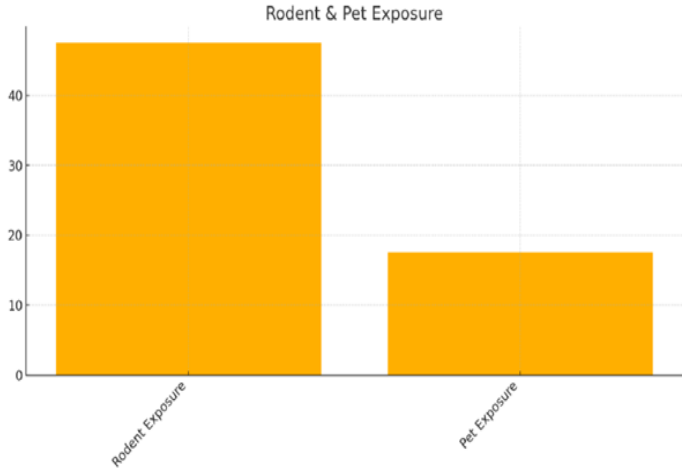

Figure 4: Exposure history involving rodents and pets.

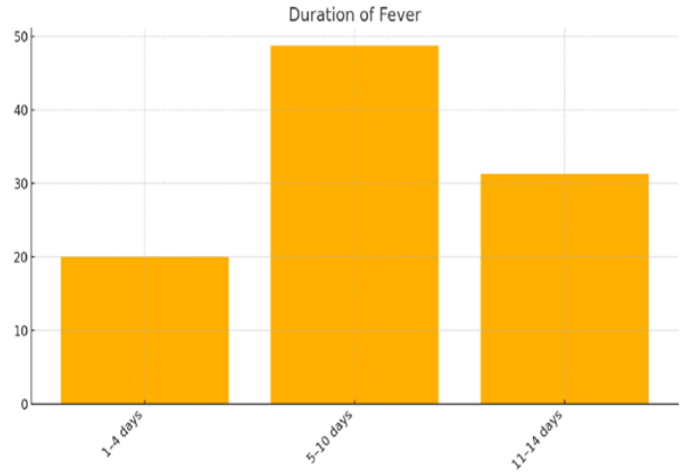

Figure 5: Duration of fever prior to presentation.

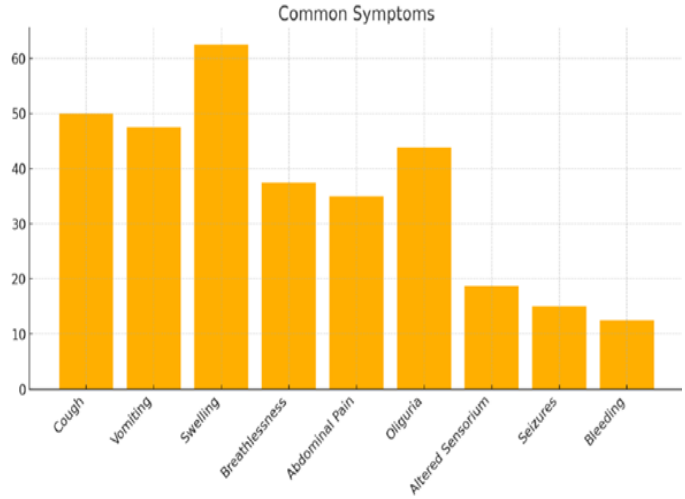

Figure 6: Common symptoms observed in affected children.

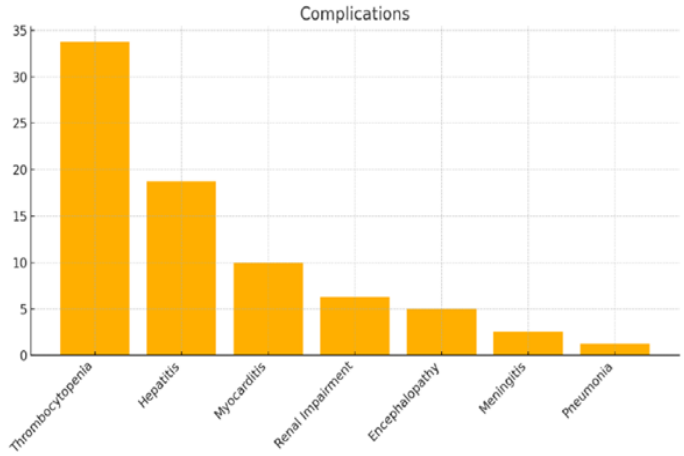

Figure 7: Complications associated with scrub typhus.

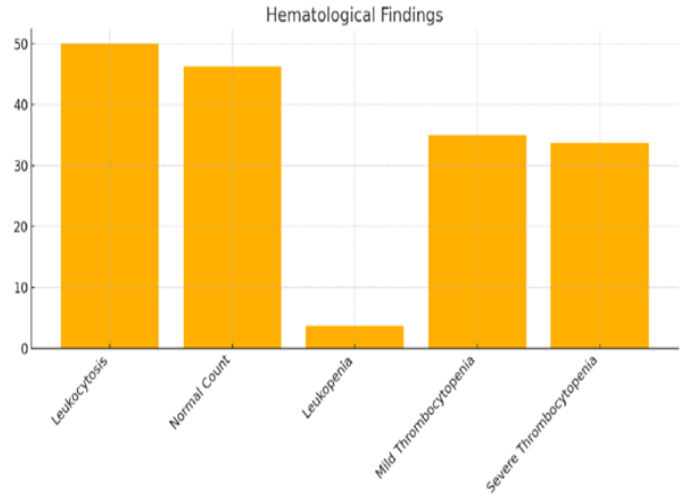

Figure 8: Hematological findings among patients.

Exposure to rodents (47.5%) and pets (17.5%) was identified as a potential risk factor. The duration of fever ranged from 1 to 13 days (mean 7.85 days, SD = 3.77), with 31.25% experiencing fever for 11–14 days. Common symptoms included cough (50%), vomiting (47.5%), swelling (62.5%), breathlessness (37.5%), abdominal pain (35%), oliguria (43.8%), altered sensorium (18.8%), seizures (15%), and bleeding manifestations (12.5%).

Clinical examination revealed high-grade fever (>101°F) in 87.5% of children, hepatomegaly in 90%, splenomegaly in 62.5%, lymphadenopathy in 50%, edema in 60%, tachypnea in 25%, hypotension in 31.3%,

pleural effusion in 15%, pericardial effusion in 10%, pulmonary signs in 18.8%, and eschar in 15%.

Complications included thrombocytopenia (33.75%), hepatitis (18.75%), myocarditis (10%), renal impairment (6.25%), encephalopathy (5%), meningitis (2.5%), pneumonia (1.25%), and rare instances of peripheral gangrene.

Hematological analysis showed leukocytosis (>11,000/mm³) in 50%, normal leukocyte counts in 46.25%, leukopenia in 3.75%, mild thrombocytopenia (100,000–150,000/mm³) in 35%, and severe thrombocytopenia (<100,000/mm³) in 33.75%.

Overall outcomes were favorable with timely diagnosis and treatment, emphasizing the importance of early clinical intervention to reduce severe morbidity and mortality.

Discussion

Orientia tsutsugamushi is the causative agent of scrub typhus, an acute febrile disease that is common throughout India and other parts of the world and is spread by chigger bites. Studies from Eastern and Northern India offer important insights into its effects on children, despite the paucity of specific data on the paediatric population in Manipur. Since postponed treatment can result in serious complications, such as multiple organ dysfunction and even death, early diagnosis and management are essential. Positive results have been linked to the timely administration of antibiotics such as azithromycin or doxycycline, highlighting the significance of early identification and treatment of afflicted children[13]. Our study showed a male predominance (60%), potentially due to increased outdoor exposure to mite-infested areas. This aligned with findings from other regions, such as North India, where males were more commonly affected (61%)[14]. In this study with 80 pediatric patients in Manipur, the mean age was 8.36 years (SD = 3.86), with the majority of cases occurring in children aged 6–10 years (39%), followed by 11–14 years (35%) and 1–5 years (26%). It suggests that school-aged children are more susceptible to scrub typhus, possibly due to increased outdoor exposure to infected mites and an immature immune response in younger children. This age distribution is consistent with research from other areas. For example, a study conducted in North India found that the most frequently affected children were between the ages of 5 and 10 (53.1%)[14], while research in Odisha found a higher incidence in the 2-5 years age group13. Regional differences in exposure patterns and immune development may influence the age distribution. Younger children may have immature immune responses, making them more susceptible to infection. In this study, a significant proportion lived in rural villages (55%), with the remainder living in towns (22.5%) and forested areas (22.5%), reflecting the typical epidemiology of scrub typhus, as mite vectors thrived in grassy, scrubby, and forested environments. This distribution is consistent with global patterns in which scrub typhus primarily affects rural populations due to environmental exposure to infected chiggers[15]. In this study, exposure to rodents (47.5%) and pets (17.5%) was identified as a potential risk factor for scrub typhus, emphasizing the importance of environmental reservoirs in disease spread. Rodents are the primary reservoirs for Orientia tsutsugamushi, and infected mites (chiggers) act as vectors[16]. Poor sanitation and increased rodent-human contact in rural and peri-urban areas contribute to higher transmission risks[17]. Even though it is still unclear how domestic animals spread scrub typhus, it is possible that they do so indirectly by spreading infected mites, which highlights the need for more research[18]. Another study conducted in South India found that environmental factors like being

close to bodies of water, having bushes close to homes, and owning pets as significant risk factors for acquiring scrub typhus[19]. Reducing the burden of disease requires early exposure risk identification combined with preventive strategies like better sanitation, vector control, and public education. The study population's duration of fever, which is the main clinical feature of paediatric scrub typhus, ranged from 1 to 13 days (mean 7.85 days, SD = 3.77); noteworthy, 31.25% of them had fever for 11–14 days. Prolonged fever is frequently associated with increased disease severity and systemic complications[17]. In a study conducted in North India, all 66 pediatric patients presented with fever, with durations ranging from 2 to 25 days (median 8 days). Prolonged fever was associated with severe complications such as meningoencephalitis (30.3%), shock (25.8%) and acute kidney injury (16.7%)[17]. Similarly, a study from Eastern India reported that 64.2% of children had been febrile for 7–14 days, with complications including thrombocytopenia (40.3%) and meningoencephalitis (29.9%)[20]. Common clinical symptoms of paediatric scrub typhus in Manipur include cough (50%), vomiting (47.5%), swelling (62.5%), breathlessness (37.5%), abdominal pain (35%), oliguria (43.8%), altered sensorium (18.8%), seizures (15%), and bleeding manifestations (12.5%), indicating systemic inflammatory responses and multi-organ involvement. These findings align with existing literature on pediatric scrub typhus. A study in Nepal reported that all cases presented with fever, accompanied by symptoms such as headache (75%), myalgia (68.4%), vomiting (64.5%), nausea (59.2%), abdominal pain (57.9%), cough (35.5%), shortness of breath (22.4%), altered sensorium (14.5%), rashes (13.2%), and seizures (11.8%). Notably, lymphadenopathy (60.5%), hepatomegaly (47.4%), edema (26.3%), jaundice (26.3%), and splenomegaly (15.8%) were significant clinical signs observed.[4] Neurological symptoms like seizures and altered sensorium point to involvement of the central nervous system, which could be caused by encephalitis or severe systemic inflammation. According to the CDC, scrub typhus can cause an acute febrile illness ranging from mild to severe or fatal, with typical signs and symptoms including fever and chills, headache, myalgia, eschar, altered mental status, lymphadenopathy and rash[4]. The occurrence of bleeding manifestations highlights the risk of vascular damage, thrombocytopenia, and potential coagulopathies in severe cases. In paediatric scrub typhus cases in Manipur, high-grade fever (>101°F) was observed in 87.5% of children, with significant organ involvement including hepatomegaly (90%) and splenomegaly (62.5%), alongside lymphadenopathy (50%), oedema (60%), cardiopulmonary manifestations such as tachypnea (25%), hypotension (31.3%), pleural effusion (15%), pericardial effusion (10%), pulmonary signs like crackles or wheezing (18.8%), and the presence of eschar in 15% of cases, indicating systemic inflammation and multi-organ involvement. The findings align with existing literature on pediatric scrub typhus. A study in Nepal reported that all cases presented with fever, accompanied by symptoms such as headache (75%), myalgia (68.4%), vomiting (64.5%), nausea (59.2%), abdominal pain (57.9%), cough (35.5%), shortness of breath (22.4%), altered sensorium (14.5%), rashes (13.2%) and seizures (11.8%). Notably, lymphadenopathy (60.5%), hepatomegaly (47.4%), edema (26.3%), jaundice (26.3%) and splenomegaly (15.8%) were significant clinical signs observed[4]. The presence of neurological symptoms such as altered sensorium and seizures suggests central nervous system involvement, which may result from encephalitis or severe systemic inflammation. A study on 4.5-year boy

showed signs such as fever, vomiting, diarrhea, lymphadenopathy, hepatosplenomegaly, lymphocytosis, anemia, thrombocytopenia, and increased liver enzymes[22]. In paediatric scrub typhus cases in Manipur, complications included thrombocytopenia (33.75%), hepatitis (18.75%), cardiac dysfunction such as myocarditis (10%), renal impairment (6.25%), encephalopathy (5%), meningitis (2.5%), pneumonia (1.25%), and rare instances of peripheral gangrene, indicating the disease's potential for multi-organ involvement and severe outcomes. The above findings are consistent with existing literature on scrub typhus complications. A comprehensive review reported that common complications include hepatitis (40.5%), thrombocytopenia (28.4%), acute respiratory distress syndrome (20.5%), acute kidney injury (19.2%), meningitis (16.4%), shock (16.2%) and myocarditis (15.5%)[23]. Another study analyzing 262 children with scrub typhus infection noted that complications such as acute respiratory distress syndrome, acute kidney injury, myocarditis, and meningoencephalitis are organ-specific and contribute to the disease's severity8. Notably, a case series highlighted severe manifestations like extensive gangrene and necrosis in pediatric patients, underscoring the potential for vascular complications[24]. In paediatric scrub typhus cases in Manipur, haematological analysis revealed leukocytosis (>11,000/mm³) in 50% of children, normal leukocyte counts in 46.25%, leukopenia (<4,000/mm³) in 3.75%, mild thrombocytopenia (100,000–150,000/mm³) in 35%, and severe thrombocytopenia (<100,000/mm³) in 33.75%, indicating significant alterations in white blood cell and platelet counts. These findings align with existing literature on haematological abnormalities in paediatric scrub typhus. A study from Odisha, India, reported anemia in 54.2% and thrombocytopenia in 43.9% of cases[25]. Another study observed anemia in 81.55% and thrombocytopenia in 49.51% of patients, with leukocytosis in 20.39% and leukopenia in 6.8%[26]. These haematological abnormalities, particularly thrombocytopenia, are concerning due to the increased risk of haemorrhagic complications and morbidity. Leukocytosis suggests a robust immune response, whereas leukopenia may indicate immune suppression or bone marrow involvement in severe disease. Recognizing these haematological changes is crucial for early diagnosis and management of scrub typhus, aiming to reduce complications and improve outcomes in affected children.

Conclusion

Scrub typhus remains a significant pediatric health concern, particularly in endemic regions like Manipur. The study identifies key epidemiological patterns, such as male predominance, school-aged children being the most affected, and a higher incidence in rural and forest areas. In order to avoid serious complications, clinical manifestations like a prolonged fever, systemic inflammatory responses, and multi-organ involvement highlight the importance of early diagnosis and timely antibiotic treatment. The findings also emphasize the role of environmental factors and exposure to rodents in disease transmission, underscoring the importance of preventive measures like improved sanitation and public awareness. Haematological abnormalities, including thrombocytopenia and leukocytosis, serve as valuable indicators of disease severity. Given the potential for severe outcomes, timely recognition, intervention and further research are essential to mitigate the burden of paediatric scrub typhus in endemic regions.

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