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Seroprevalence of scrub typhus at tertiary care hospital in Nagpur

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Summary

Background: scrub typhus, an acute febrile illness caused by *Orientia tsutsugamushi*, poses a diagnostic challenge in endemic regions due to its diverse clinical presentations and similarity to other infections. Regional epidemiologic data are vital for improving clinical suspicion and prompt management of scrub typhus.
Materials and Methods: a retrospective observational study was conducted in the Department of Microbiology at Indira Gandhi Government Medical College, Nagpur, Maharashtra, between December 2021 and June 2025. A total of 5,262 suspected cases were screened using Immunochromatographic Tests (ICT) for Immunoglobulin M (IgM) and Immunoglobulin G (IgG), with IgM positive results confirmed by IgM Enzyme-Linked Immunosorbent Assay (ELISA). Data on demographics, clinical features, and laboratory results were analyzed using chi-square statistics.
Results: out of 5,262 patients, 96 (1.82%) were confirmed as seropositive for scrub typhus. The highest annual positivity was in 2022. Most cases were from males aged 20-50 years, and 72% resided in rural areas. Seasonal peaks were observed in July and August. Fever, myalgia, and rash were common symptoms, while eschar was found in 28% of cases. Complications included pneumonitis, renal failure, and Acute Respiratory Distress Syndrome (ARDS), with no reported mortality.
Conclusions: scrub typhus prevalence was lower than in prior Indian studies, likely due to regional distribution and increased post-COVID testing. The combination of rapid ICT and ELISA enhanced diagnostic accuracy. Early suspicion, timely doxycycline therapy, and improved diagnostics are essential for reducing morbidity. Continued research and expanded surveillance are needed for robust disease control.

Key words: scrub typhus, *Orientia tsutsugamushi*, IgM, IgG, ELISA.

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Introduction

Scrub typhus is a Rickettsial infection transmitted to humans through the bite of infected larvae of trombiculid mites, commonly known as "chiggers," belonging to the genus and subgenus *Leptotrombidium*. The etiological agent, *Orientia tsutsugamushi* is an obligate intracellular bacterium, widely prevalent across Asia, including India [18]. Although endemic mainly within the Asia-Pacific region known as the "Tsutsugamushi Triangle," the disease has also been reported from tropical and subtropical areas of Africa and South America [6]. Transmission occurs through exposure to infected chiggers, which are often reddish in colour and more abundant in dense vegetation during the monsoon and post-monsoon seasons. As mites lay eggs between July and December, human cases are more frequently observed in this period. Since chigger habitats are commonly found in scrub vegetation, the disease became known as "scrub typhus," although its occurrence is not limited to such areas [16]. In India, scrub typhus has been recognized for decades and is widely reported from multiple states, including Haryana, Jammu & Kashmir, Himachal Pradesh, Uttarakhand, West Bengal, Assam, Maharashtra, Kerala, and Tamil Nadu [10]. Historical outbreaks have been documented among troops during World War II in Assam and West Bengal, during the Indo-Pak war of 1965 in the Jammu-Sialkot sector, and during the 1971 conflict along the northwestern border. A resurgence of the disease was again noted in the 1990s in scrub-type terrains of northwestern India [17]. Recognizing regional incidence is crucial for guiding diagnosis and treatment, given the nonspecific presentation of scrub typhus and its potential for misdiagnosis with other acute febrile illnesses. Against this backdrop, the present study aims to determine the seroprevalence of scrub typhus in a tertiary care hospital in Maharashtra and to explore associations with demographic factors.

Materials and Methods

A retrospective observational study was conducted at Indira Gandhi Government Medical college, in the Department of Microbiology Nagpur between December 2021 and June 2025. During this period, 5262 patients suspected of scrub typhus were screened using the J. Mitra Immunochromatographic Test (ICT) assay, which detects Immunoglobulin M (IgM) and Immunoglobulin G (IgG) antibodies specific to scrub typhus.

Patients who tested positive for IgM antibodies with the rapid test were further evaluated using the J. Mitra Scrub Typhus IgM Microlisa Enzyme-Linked Immunosorbent Assay (ELISA) kit, considering those with an Optical Density (OD) above 0.5 as positive. Clinical records of patients who were positive by IgM ELISA were analysed for their presenting symptoms, laboratory profiles, and clinical outcomes. The data were analysed to determine statistical significance using the chi-square test.

Results

The results are included in Tables 1-6 and Figure 1.

Discussion

The prevalence of scrub typhus varies from 0-8% to 60% in different countries [20]. The prevalence of scrub typhus in the present study was 1.82%, lesser compared to other Indian studies which range from 13 to 63% [2,15,19]. The low prevalence of scrub typhus in this study can be attributed to the limited geographical distribution of the disease in the area. The number of positive scrub typhus cases was highest in 2022, likely due to the increased testing for acute febrile illnesses in the post-COVID period.

There was significant gender difference in the distribution of scrub typhus cases with male predominance and 47/96 (48.9%) of them were in the age group of 20-50 years, similar to observations made by Sivarajan *et al.* [19] while a slight male preponderance was also reported by two studies from South India. [15] A higher prevalence among males may reflect the greater proportion of men engaged in outdoor work. In the present study, 24% of total positive cases were reported from urban areas and 72% of total positive cases were reported from rural areas and this was found to be statistically significant ($p<0.05$) [4]. In the present study, peak incidence of scrub typhus was observed in August and decreased thereafter. This is statistically significant ($p<0.05$), indicating that the distribution of cases across months is not uniform with a clear seasonal variation showing peak occurrences in July and August. In south India, scrub-typhus cases occur mostly in the cooler months (August-January), while in Southeast Asia, scrub-typhus cases are highest in July-November [3].

Twenty of the 96 patients (20.8%) were either agricultural workers or had history of exposure to vegetation. Fever was the most common clinical presentation and 58.3% of patients presented with 1-2 weeks of fever as observed in several studies [2,4,8,11,15,20]. As complications are more likely to occur after the first week of illness, a high index of suspicion for scrub typhus is needed for prompt diagnosis, treatment and subsequent reduction in mortality in such patients. The presence of diagnostic eschar in scrub typhus is variable; it is more easily found on Caucasian and East Asian patients than on dark skinned South Asian patients [7].

Clinical records of the ninety-six scrub typhus patients were

Table 1. Distribution of scrub typhus cases in each year during study period.

	2021	2022	2023	2024	2025
Total	700	1466	1050	1450	595
Positive	10	59	17	09	01
Negative	690	1407	1033	1441	594
Percentage of positivity	1.42%	4.02%	1.61%	0.62%	0.16%

Table 2. Distribution of scrub typhus cases according to gender.

Gender	Total (n=5262)	Positive	Negative
Male	3344 (63.5%)	60 (1.7%)	3284 (98.20%)
Female	1918 (36.4%)	36 (1.8%)	1882 (98.12%)

Table 3. Distribution of scrub typhus cases according to age.

Age group (years)	Total (n=5262)	Positive	Negative
0-10	245	06 (2.4%)	239
10-20	1023	08 (0.78%)	1015
20-30	1328	14 (1.05%)	1314
30-40	1440	33 (2.29%)	1407
40-50	921	21 (2.28%)	900
50-60	305	12 (3.93%)	293

p-value=0.00054; this indicates that there is a statistically significant difference in the distribution of positive cases across age groups ($p<0.05$).

Table 4. Distribution of scrub typhus cases according to geographical location.

	Total (n=5262)	Positive
Urban	1006 (19.1%)	24 (0.45%)
Rural	4256 (80.8%)	72 (1.36%)

available for analysis. Average duration of fever was 8 days. Majority of the patients (56/96; 58.3%) presented with 7-14 days of fever and 8.3% (08/96) of them had prolonged pyrexia beyond 2 weeks. Eschar was documented in 28% patients in our study compared 7% to 97% in various studies [12].

A prospective study on 161 patients in Northern Thailand to find the true accuracy of diagnostic tests for scrub typhus concluded that a combination of ICT and presence of eschars has good specificity and can be used in resource poor situations as point-of-care diagnostic test [9].

Scrub typhus was clinically suspected in 5262 of patients with acute pyrexia and 1.82% (96/5262) of them were positive by both scrub typhus rapid test and IgM ELISA. The Indirect Immunofluorescence Assay (IFA) is considered the gold standard for diagnosing scrub typhus but is limited by the need for standard slides, paired sera, and subjective interpretation. The Weil-Felix test is widely used but lacks sensitivity and specificity [14]. IgM ELISA offers good sensitivity and specificity but is time-consuming, requiring 3 to 4 hours for completion [13]. Rapid Immunochromatographic Tests (ICTs), such as J. Mitra, have demonstrated sensitivity as high as 89.6% and specificity up to 84% [1]. In comparison, SD Bioline ICT shows even greater sensitivity up to 99% and specificity between 96% and 98.4%, with excellent agreement when compared to established methods like IFA and IgM ELISA [5]. These rapid diagnostics are especially useful for point-of-care testing after the first week of illness. Early diagnosis and prompt treatment using ICTs play a pivotal role in decreasing mortality and morbidity among scrub typhus patients [21-23].

Complications were seen in 7 patients, pneumonitis in 2 patients; shock, renal failure, Acute Respiratory Distress Syndrome (ARDS) and myocarditis in one patient each. One patient had both pneumonitis and shock.

There was no mortality in the present study. This could be attributed to the increased awareness of the diverse clinical presentation of scrub typhus among the clinicians, early diagnosis and treatment. Delayed treatment in patients with scrub typhus increases morbidity and mortality [16,22,23]. A study evaluating risk factors for ARDS in scrub typhus patients established that prolonged untreated fever was significantly associated with ARDS [16].

Doxycycline and tetracycline are the primary treatment options for scrub typhus. Azithromycin, rifampicin and ciprofloxacin are the alternatives. Azithromycin is preferred for pregnant women and for children less than 8 years of age [8]. A single dose of tetracycline, doxycycline or chloramphenicol every 5 days for a period of 35 days can be used for prophylaxis against Orientia infection [7].

To prevent high risk complications and to reduce morbidity and mortality rate, high index suspicion, timely diagnosis and proper treatment with antibiotics are necessary [9,12].

Conclusions

Scrub typhus persists as a significant public health challenge in India and other endemic regions, primarily due to its diverse clinical

Table 5. Month-wise distribution of scrub typhus cases.

Month	Cases (n=96)
January	2 (2.08%)
February	3 (3.12%)
March	2 (2.08%)
April	3 (3.12%)
May	4 (4.16%)
June	8 (8.3%)
July	18 (18.75%)
August	28 (29.16%)
September	12 (12.5%)
October	8 (8.33%)
November	4 (4.16%)
December	4 (4.16%)

p-value=0.0009; this is statistically significant ($p<0.05$), indicating that the distribution of cases across months is not uniform with a clear seasonal variation showing peak occurrences in July and August.

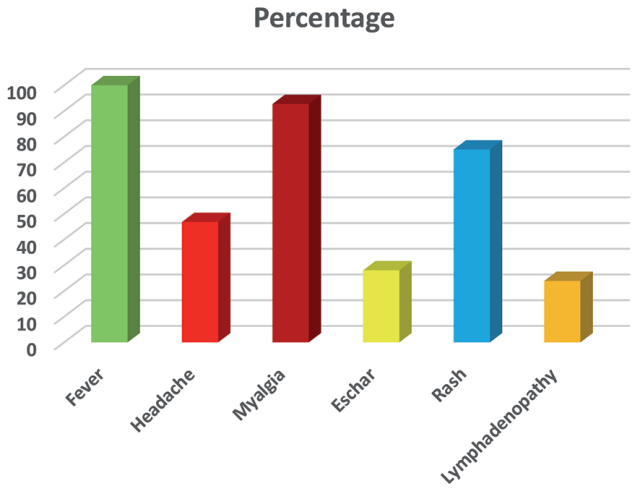

Figure 1. Clinical presentations of scrub typhus cases.

Table 6. Clinical presentations of scrub typhus cases.

Symptoms	Positive cases	Negative cases	Percentage of positive cases
Fever	96	00	100%
Headache	45	51	46.8%
Myalgia	89	07	92.7%
Eschar	27	69	28%
Rash	72	24	75%
Lymphadenopathy	23	73	23.9%

presentation and limitations of current diagnostic tools. For routine investigation of febrile illness, the scrub typhus diagnostic test can be utilized if there is a strong clinical suspicion of the disease. While traditional serological methods like the Weil-Felix test continue to be used for their affordability, their poor sensitivity and specificity compromise accurate diagnosis and timely treatment initiation. Advances such as IgM capture ELISA and rapid ICT tests have improved early case recognition, but variable performance in local settings underscores the urgent need for extensive field validation. Ultimately, enhancing clinical awareness, prioritizing timely initiation of doxycycline, and strengthening diagnostic infrastructure are vital strategies for reducing morbidity and mortality associated with scrub typhus. Future research must focus on validation of diagnostic modalities and integration of surveillance data to develop robust control strategies for this neglected disease.

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