

SEROLOGICAL EVIDENCE OF SCRUB TYPHUS IN A HILLY REGION OF NORTH INDIA: A RETROSPECTIVE OBSERVATIONAL STUDY

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ABSTRACT

Background: Scrub typhus is an underdiagnosed zoonotic disease caused by *Orientia tsutsugamushi*, transmitted through chigger mite bites. It presents with nonspecific symptoms, often mimicking other tropical febrile illnesses, leading to delayed diagnosis. This study was undertaken to evaluate the seroprevalence and demographic distribution of scrub typhus cases using IgM ELISA at Zonal Hospital Mandi in Himachal Pradesh.

Methods: A retrospective study was conducted in the Department of Microbiology from January to December 2024. A total of 590 patients with clinically suspected scrub typhus were tested using IgM ELISA. Data on age, sex, month of testing, and ELISA results were collected and analyzed using descriptive statistics.

Results: Out of 590 samples tested, 118 (20%) were positive for scrub typhus IgM antibodies. Females constituted 70.3% of positive cases, showing a clear female predominance. The majority of cases were reported in the 21–50 year age group. A distinct seasonal trend was observed, with all positive cases occurring between September and November, peaking in October (63.6%).

Conclusion: Scrub typhus continues to be a significant cause of acute febrile illness in the sub-Himalayan region, especially during the post-monsoon months. IgM ELISA serves as a reliable diagnostic tool. Awareness among clinicians, early diagnosis, and timely treatment are essential to prevent complications and improve patient outcomes in endemic areas.

Keywords: Scrub typhus, IgM ELISA, *Orientia tsutsugamushi*, Himachal Pradesh, seasonal trend, acute febrile illness, post-monsoon.

INTRODUCTION

Scrub typhus is an acute, febrile zoonotic illness caused by *Orientia tsutsugamushi*, an obligate intracellular Gram-negative bacterium. The disease is transmitted to humans through the bite of infected chigger mites, the larval form of trombiculid mites. Once considered a disease of the Asia-Pacific “tsutsugamushi triangle,” scrub typhus has now emerged as a

significant public health concern in several parts of India, particularly in rural and hilly regions such as Himachal Pradesh, Uttarakhand, and Northeast India.^{1,2}

The clinical presentation of scrub typhus is nonspecific, with symptoms such as fever, headache, rash, lymphadenopathy, and in some cases, the presence of a characteristic eschar. Due to its resemblance to other tropical febrile illnesses like malaria, dengue, leptospirosis, and typhoid fever, diagnosis is often delayed or missed.³ If not treated promptly, scrub typhus can lead to severe complications such as acute respiratory distress syndrome (ARDS), myocarditis, meningoencephalitis, renal failure, and multi-organ dysfunction syndrome (MODS).⁴

Serological tests, especially IgM enzyme-linked immunosorbent assay (ELISA), are the mainstay of diagnosis in endemic areas due to their sensitivity, specificity, and feasibility.⁵ Seasonality plays a critical role in the epidemiology of scrub typhus, with most cases reported during the monsoon and post-monsoon periods (July to November) when conditions are favorable for the proliferation of the mite vector.^{6,7}

Himachal Pradesh, a hilly state in northern India, provides an ideal ecological niche for the vector, and several outbreaks have been reported from this region in the last decade.⁸ However, region-specific data on demographic and seasonal trends are still limited. Therefore, this study was undertaken to assess the seroprevalence, age and gender distribution, and seasonal trends of scrub typhus among suspected cases tested by ELISA over a one-year period at a tertiary care hospital in Himachal Pradesh.

MATERIALS AND METHODS

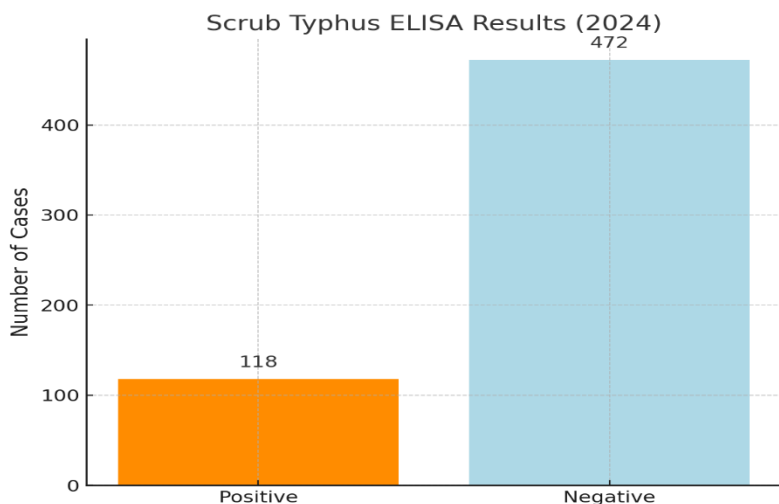
This was a retrospective study conducted in the Department of Microbiology at Zonal Hospital Mandi (H.P.) located in District Mandi, Himachal Pradesh. The study was conducted using data from January 1, 2024, to December 31, 2024, to assess the demographic and seasonal distribution of scrub typhus cases.

All patients with clinical suspicion of scrub typhus who were tested using IgM ELISA for *Orientia tsutsugamushi* during the study period were included. Clinical suspicion was based on the presence of acute febrile illness (≥ 5 days), often associated with symptoms such as headache, myalgia, rash, and lymphadenopathy, with or without the presence of eschar. Inclusion Criteria: Patients of all ages and both sexes, Patients tested for scrub typhus IgM ELISA between Jan–Dec 2024. Exclusion Criteria: Repeat samples from the same patient, incomplete or missing data.

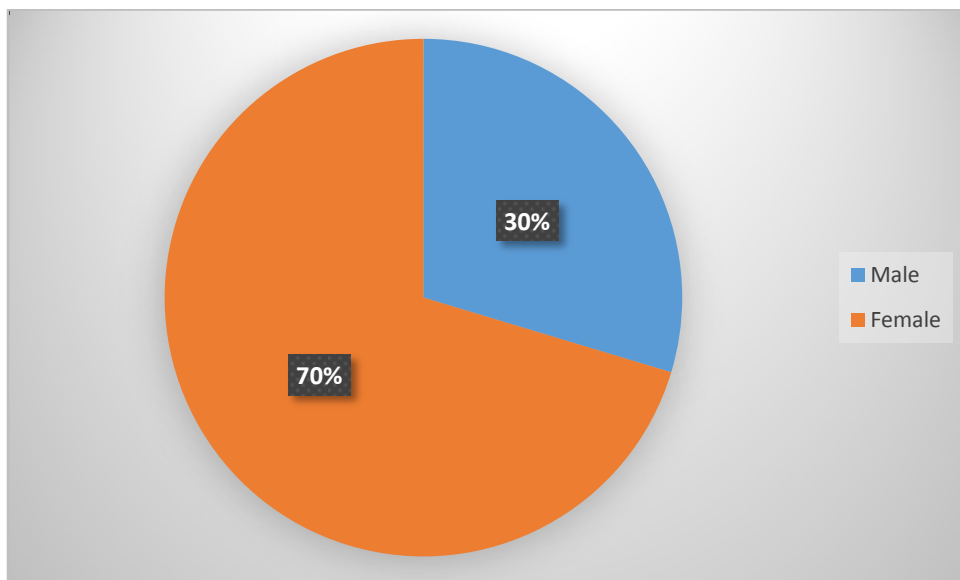
Sample Collection and Testing: Venous blood samples were collected from patients under aseptic precautions, and serum was separated and stored at 2–8°C until testing. The IgM ELISA test for scrub typhus was performed using a commercially available kit, following the manufacturer's protocol. The optical density (OD) was measured using an ELISA reader at 450 nm, and results were interpreted according to the kit's reference cut-off.

RESULT

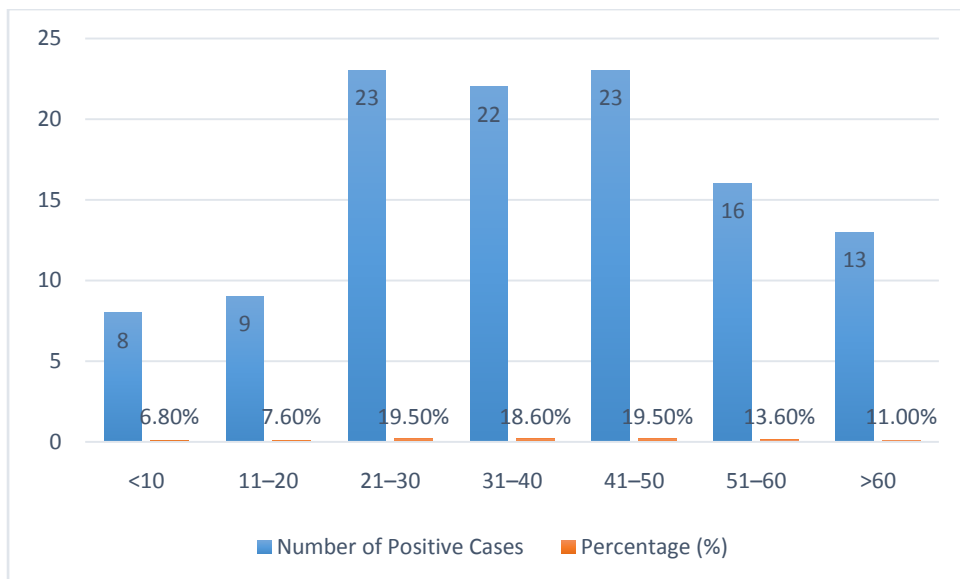
A total of 590 patients with clinically suspected scrub typhus were tested for IgM antibodies using ELISA between January and December 2024. Out of these, 118 patients (20%) were found to be positive, and 472 (80%) tested negative.



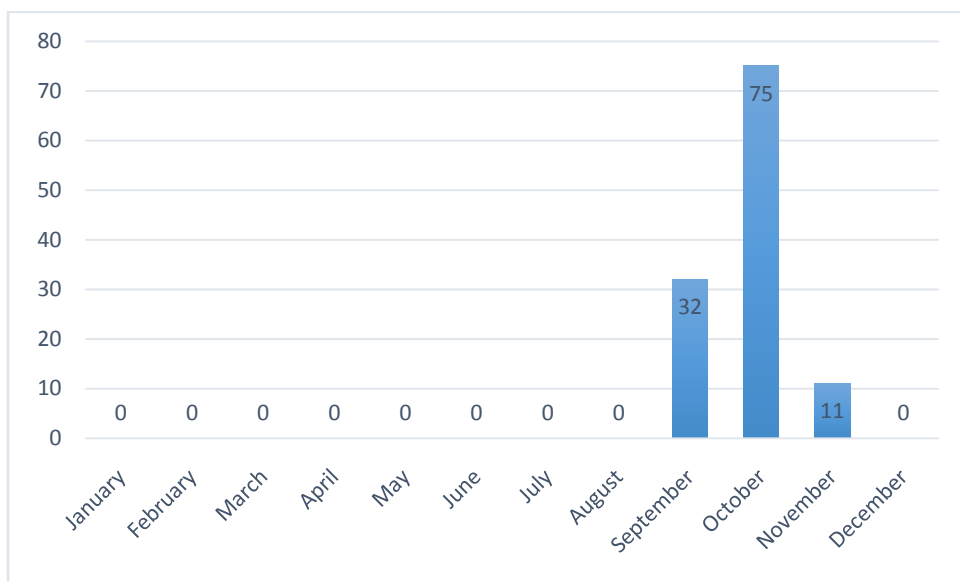
Among the 118 ELISA-positive patients, 83 (70.3%) were females and 35 (29.7%) were males, showing a female predominance.



The age of positive cases ranged from below 10 years to above 60 years. The maximum number of positive cases was reported in the 21–30 years (19.5%) and 41–50 years (19.5%) age groups, followed by 31–40 years (18.6%). Children below 10 years constituted 6.8% of the positive cases.



No positive cases were reported from January to August. A sharp rise in scrub typhus cases was observed in the post-monsoon months, with a peak in October (75 cases) followed by September (32 cases) and November (11 cases).



DISCUSSION

This study was conducted to evaluate the demographic and seasonal distribution of scrub typhus cases using ELISA-based serodiagnosis over a period of one year at zonal hospital Mandi in Himachal Pradesh. Of the 590 clinically suspected cases tested during 2024, 118 (20%) were found positive, indicating a significant burden of scrub typhus in the region.

A notable female predominance (70.3%) was observed among the ELISA-positive cases. This finding is consistent with earlier studies conducted in northern India, including Sharma

et al.¹(2017) and Pathak et al.²(2022), which reported higher incidence among females. This could be attributed to their greater involvement in outdoor agricultural and domestic activities in rural areas, increasing exposure to the vector mite.

The majority of positive cases were seen in the 21–50 year age group, with the highest number in the 21–30 years and 41–50 years brackets (each contributing 19.5% of total positives). This trend aligns with findings from Vivekanandan et al.⁶(2010) and Sinha et al.⁴(2018), which suggest that the working-age population is at greater risk due to increased outdoor occupational exposure, particularly in forested and farming regions.

CONCLUSION

A distinct seasonal pattern was observed, with all positive cases reported during the post-monsoon months of September (27.1%), October (63.6%), and November (9.3%). No positive cases were reported from January to August. This pattern corresponds with the typical activity period of the chigger mites, which thrive in the humid, vegetated environment following monsoon rains. Similar seasonal peaks have been documented in studies from Himachal Pradesh and other hilly regions (Mahajan et al.⁷, 2005; Sharma et al.⁸ 2016), reinforcing the role of environmental factors in disease transmission. This study highlights that scrub typhus remains a significant cause of acute febrile illness in Himachal Pradesh, with a seropositivity rate of 20% among suspected cases. The disease showed a distinct seasonal pattern, with all positive cases occurring in the post-monsoon months of September to November, peaking in October.

A female predominance and a higher incidence in the 21–50 years age group were observed, reflecting increased exposure due to occupational and environmental factors. These findings underscore the need for heightened clinical suspicion during the endemic season and early testing using IgM ELISA for prompt diagnosis and treatment.

Strengthening surveillance, public awareness, and training of healthcare providers in endemic regions is essential for reducing morbidity and preventing complications from delayed diagnosis.

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