

Original Research Article

Epidemiological insights into scrub typhus in Goa

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ABSTRACT

Background: Scrub typhus is an acute, mite-borne, febrile illness, caused by *Orientia tsutsugamushi* ("noxious" or "dangerous mite"). It is an under-recognized rickettsial re-emerging infection with increasing public health relevance in India. Despite advances in diagnostics, regional epidemiological data remain sparse. Emerging epidemiological evidence indicates its occurrence in Goa, and potential to be a major challenge to public health owing to less developed preparedness.

Methods: Hospital-based retrospective observational descriptive analysis of line-listed data of confirmed scrub typhus cases reported from Goa Medical college and hospital (tertiary care hospital), between 1st April 2024 and 31st March 2025. Temporal, spatial, and demographic analyses were performed using descriptive epidemiology and geospatial mapping

Results: A total of 827 confirmed cases were documented with positivity of 29.38%. Males (65.6%) were disproportionately affected compared to females (34.4%). The highest burden occurred among adults aged 18-60 years. Seasonal peaks were observed during the monsoon months (July–September). Geospatial mapping revealed clusters in Tiswadi and Marmugao block.

Conclusions: Scrub typhus is a re-emerging vector-borne infection in Goa, India with distinct seasonal and demographic patterns. Strengthened surveillance, clinician awareness, and integration of scrub typhus diagnostics into routine fever panel is warranted.

Keywords: Scrub typhus, *Orientia tsutsugamushi*, Epidemiology, Geospatial distribution

INTRODUCTION

Scrub typhus, caused by the obligate intracellular bacterium *Orientia tsutsugamushi*, is transmitted through the bite of larval trombiculid mites ("chiggers").

Mites act as both the principal vector and the reservoir of the pathogen, as transovarial transmission plays a critical role in the natural maintenance of the infection.¹ Initially, only three prototype strains-Karp, Gilliam, and Kato-were identified; however, more than 20 antigenically distinct strains have since been discovered.²

The disease is endemic across the "*tsutsugamushi* triangle," encompassing large parts of Asia-Pacific rim including India, extending from Afghanistan to China, Korea, the islands of the southwestern Pacific, and northern Australia.^{3,4} In recent decades, India has witnessed increasing reports of scrub typhus outbreaks, particularly in southern and northeastern states.^{5,6} Goa is located adjacent to the Western Ghats, a region with documented presence of trombiculid mites, the known vectors of scrub typhus, and previous studies have also reported cases from this area.⁷

Clinically, scrub typhus presents as an acute undifferentiated febrile illness or presenting with circulatory collapse accompanied by haemorrhagic manifestations. Often mimicking malaria, dengue, or leptospirosis, thereby posing diagnostic challenges.⁸ Untreated cases can progress to severe complications, including meningoencephalitis, myocarditis, multi-organ dysfunction.

Pregnancy complicated by scrub typhus is associated with adverse maternal and fetal outcomes, including a high risk of miscarriage.⁶ Delayed diagnosis & initiation of treatment may result in complications, thereby increasing the risk of mortality. Reported mortality associated with Scrub Typhus shows considerable variation, with median case fatality rates estimated at approximately 6.0% in untreated patients and 1.4% among those receiving appropriate treatment.⁴

Serology remains the primary diagnostic modality for scrub typhus. Owing to financial constraints, patients in the present study were initially screened using the Weil-Felix test, and positive samples were subsequently confirmed by IgM ELISA for antibodies against *Orientia tsutsugamushi*.

Despite Goa's ecological suitability for vector proliferation, systematic epidemiological data on scrub typhus remain limited. This study provides an overview of the epidemiological profile of scrub typhus in Goa using line-listing data, highlighting demographic, spatial, and temporal trends.

METHODS

Study design and setting

A hospital-based retrospective observational descriptive study was conducted using line-listed data of laboratory-confirmed scrub typhus cases reported from Goa Medical College and Hospital, a tertiary care hospital in Goa, India.

Inclusion criteria

The study included line-listed data of laboratory-confirmed scrub typhus cases reported between 1st April 2024 and 31st March 2025

Exclusion criteria

A small number (256) of sample were excluded from the study because incomplete address details prevented accurate tracing and geographical classification

Data collection and statistical analysis

Data on confirmed scrub typhus cases were extracted from Integrated Health Information Platform (IHIP) portal line lists (April 2024–March 2025). Case

confirmation was based on serological detection of *O. tsutsugamushi* IgM antibodies. Secondary data analysis was performed using variables including age, sex, place of residence, laboratory test results, and sample collection dates. Geospatial mapping was performed using case coordinates, while temporal analysis assessed monthly trends. Statistical analysis was done using SPSS software (Version 31.x).

Ethics approval

Institutional Ethics Committee (IEC) approval was obtained before commencement of the study. Ethical clearance certificate was received from the Institutional Ethics Committee of Directorate of health services, Goa under approval number DHS/Sp.Cell/24-166(Ethics)/2026-27/807 dated 02/07/2026.

RESULTS

Demographic Profile of scrub typhus seropositivity

A total of 3,071 samples were tested for scrub typhus during the study period; however, only 2,815 samples were included in the analysis after exclusion of incomplete or untraceable records. Of these, 827 samples tested positive, resulting in an overall seropositivity rate of 29.38%. North Goa accounted for 1,768 samples tested, with 513 positive cases and a positivity rate of 29.02 %. In South Goa, 1,047 samples were tested, of which 314 were positive, giving a positivity rate of 29.99% (Figure 1).

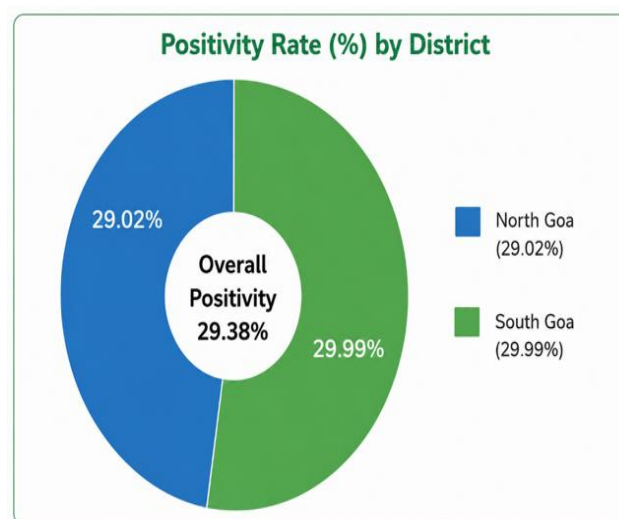


Figure 1: Demographic profile of scrub typhus seropositivity.

Spatial distribution

Hotspots were seen in Tiswadi (Panaji) and Mormugao (Vasco). Fewer cases from interior and forested talukas (e.g., Dharbandora, Quepem). Geospatial clustering indicates peri-urban transmission zones (Figure 2 and 3).

Block	Total Tested	Positive Cases	Positivity (%)
Tiswadi	667	222	33.28%
Mormugao	303	100	33.00%
Ponda	311	96	30.87%
Sanguem	36	11	30.56%
Salcete	255	74	29.02%
Canacona	38	11	28.95%
Satari	209	58	27.75%
Bardez	569	152	26.71%
Pernem	125	32	25.60%
Bicholim	197	49	24.87%
Quepem	61	15	24.59%
Dharbandora	43	7	16.28%
TOTAL	2,814	827	29.38%

Figure 2: Spatial variation in scrub typhus positivity rates.

Scrub Typhus Positivity (%) by Block, Goa

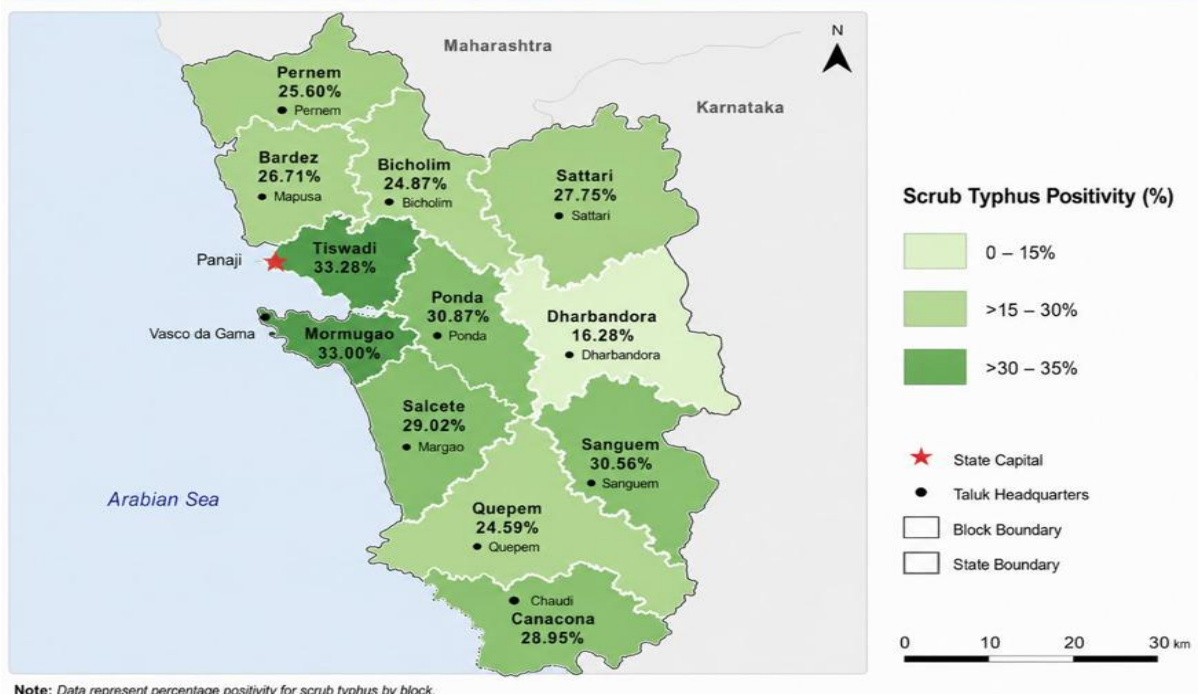


Figure 3: Map showing block-wise geospatial distribution of scrub typhus cases in Goa.

A total of 827 confirmed scrub typhus cases were analyzed. Males (533, 64.45%) outnumbered females (294, 35.55%). The difference was statistically significant ($\chi^2 = 69.07$, $p < 0.0001$). Age distribution was skewed toward adults, with the 18–60 years age group accounting

for the majority of cases (663, 80.17%). Only 4.59% of cases were reported among children aged <18 years, while 15.24% of cases occurred in individuals aged >60 years. The age distribution was statistically significant ($\chi^2 = 830.40$, $p < 0.0001$) (Figure 4).

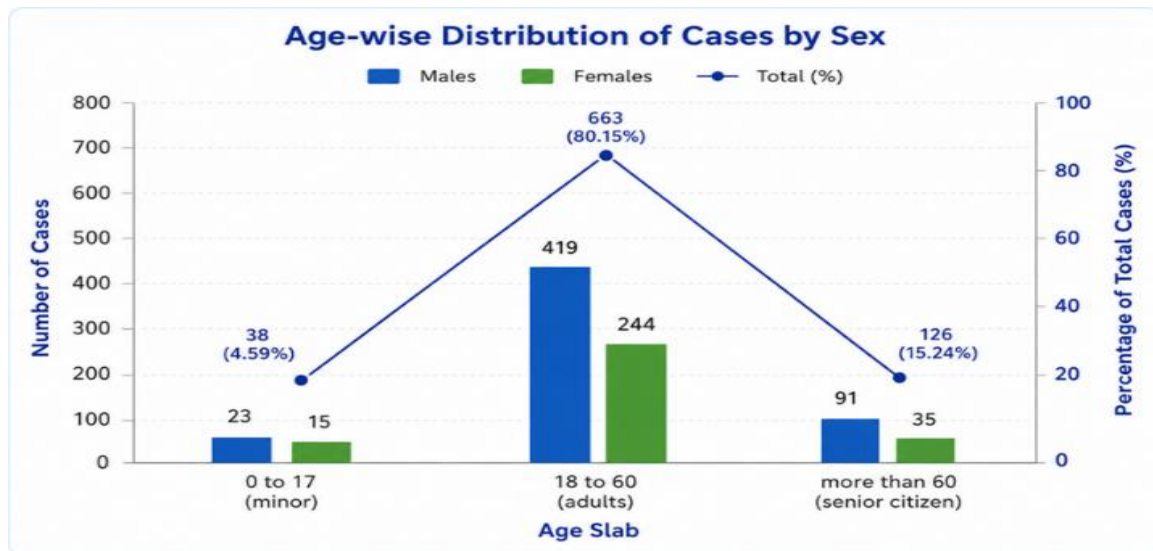


Figure 4: Demographic distribution of cases by age and sex.

Temporal trends

Peak transmission was observed between July and September, with the highest positive cases recorded in September. Decline observed from late 2024 to early

2025, with sporadic cases thereafter. Positivity correlated strongly with monsoon rainfall (Figure 5).

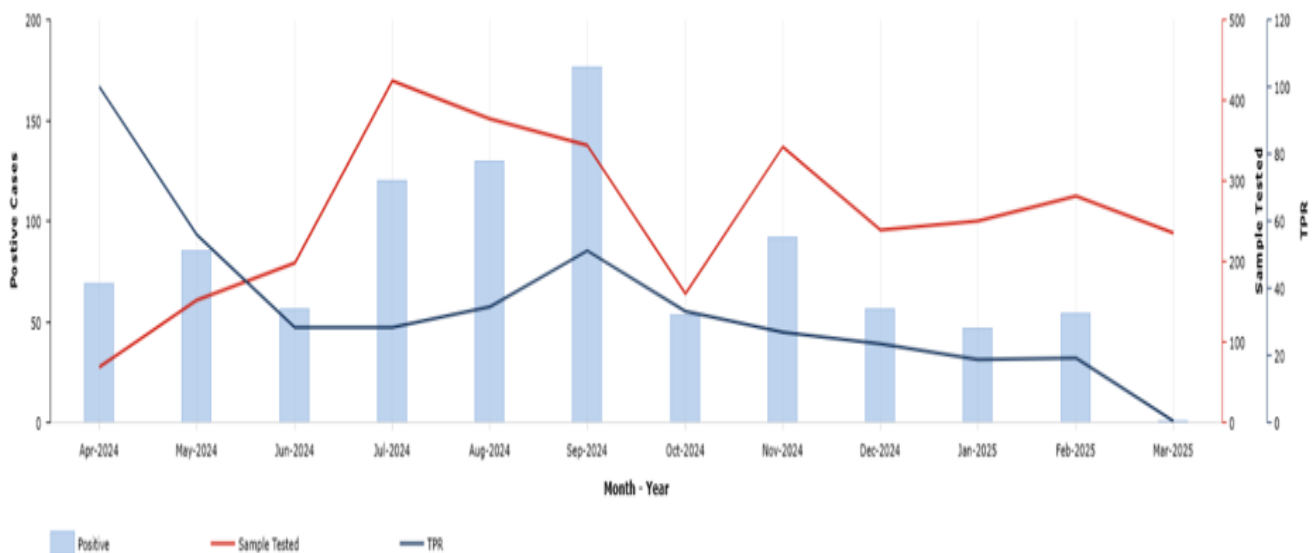


Figure 5: Monthly trends in positive cases, samples tested and test positivity rate (TPR) from April 2024 to March 2025.

DISCUSSION

Accumulating evidence indicates that climate change and progressive human encroachment into previously uninhabited ecosystems may be important drivers in the re-emergence and increasing epidemiological burden of scrub typhus.⁴ Our findings highlight the seasonal and demographic predilection of scrub typhus in Goa. Sero-epidemiological studies indicate that infection with Scrub Typhus is widely prevalent across Asia, with reported

seroprevalence rates ranging from 9.3% to 27.9%.⁴ Seropositivity rates reported from neighboring countries have also been substantial, with Bangladesh reporting a seroprevalence of 23.7% and Sri Lanka 26.3%.^{9,10} In our study, a total of 2,814 serum samples were screened for scrub typhus, of which 827 samples tested positive, resulting in an overall seroprevalence rate of 29.38%. District-wise analysis demonstrated comparable positivity rates between the two districts, with North Goa showing a slightly lower seroprevalence of 29.02% compared to

29.99% in South Goa. Although a higher number of samples were received from North Goa, the positivity rates remained consistently high across both districts, indicating widespread circulation of *Orientia tsutsugamushi* infection throughout Goa.

Data from China, Japan, South Korea, and Taiwan indicate that individuals aged 60-69 years constitute the highest-risk group for scrub typhus infection, whereas in Thailand, the highest burden has been reported among those aged 45-54 years. Epidemiological data indicate a male predominance of scrub typhus cases in Japan and Thailand, whereas studies from most other endemic countries have reported a higher risk among females.⁴ In current study, age- and sex-wise analysis of scrub typhus seropositive cases revealed a marked predominance among males and adults in the productive age group. Out of the 827 positive cases identified in the study, (64.45%) were males, while (35.5%) were females, indicating that nearly two-thirds of the cases occurred in males.

The majority of seropositive cases were observed in the 18-60 years age group, which accounted for 663 cases (80.15%) of the total positivity. In this adult category, males constituted 63.20% of the cases, whereas females accounted for 36.80%. The geriatric population aged more than 60 years contributed 126 cases (15.24%), with a more pronounced male predominance (72.22% males vs. 27.78% females). Children and adolescents aged 0-17 years represented the smallest proportion, with only 38 cases (4.59%), among whom 60.53% were males and 39.47% were females.

Overall, the findings demonstrate predominance of cases among working-age males may reflect occupational exposure in agriculture, construction, and outdoor labor.^{11,12}

Seasonal peaks align with monsoon scrub vegetation growth (mite islands), favoring chigger mite activity, consistent with reports from Karnataka, Tamil Nadu, and Northeast India.^{13,14} A study conducted in Goa in 2012 included 44 patients, of whom 15 tested positive for scrub typhus, yielding a positivity rate of 34%. A marked seasonal variation was observed, with the majority of cases occurring between July and November.⁷ In current study, seasonal analysis demonstrated a marked increase in scrub typhus positivity during the monsoon aligned with previous studies. Increased test positivity rates were observed predominantly between July and September, corresponding to the peak transmission season. These findings indicate a clear seasonal trend, with higher scrub typhus transmission occurring during periods of increased rainfall and vegetation growth.

This study also shows, block-wise analysis demonstrated variation in scrub typhus seropositivity across Goa. Among the 12 blocks included in the study, the highest positivity rates were observed in Tiswadi (33.28%), followed by Mormugao (33.00%), all exceeding the

overall study positivity rate of 30.58%. Lower seropositivity was observed in Quepem (24.59%) and Dharbandora recorded the lowest positivity rate at 16.28%. The findings indicate the geospatial clustering in coastal peri-urban zones suggests environmental modification, urban expansion, and increased human-vector interface as potential drivers.

Currently, no licensed vaccines or established vector control measures are available. Hence, strengthening diagnostic capacity, incorporating testing into routine fever surveillance, and developing effective vector control strategies are essential. More community-based studies on scrub typhus are needed, as the actual disease burden in the community is likely to be substantially higher than reported cases, since the present study was limited to hospital-based data.

Limitation

A key limitation of this study is that a higher proportion of samples were received from North Goa, likely due to the proximity and referral patterns of the Goa medical college and Hospital, which may have influenced sample testing distribution and affected the representativeness of cases across all regions of Goa. Only one year of surveillance data was available, limiting assessment of long-term epidemiological trends and temporal variations in scrub typhus transmission. Due to the retrospective nature of the study, travel and occupational histories were not available, limiting assessment of transmission sources and exposure risk factors.

CONCLUSION

Scrub typhus is an emerging infectious disease in Goa, with seasonal surges during monsoon, adult male predominance, and clustering in peri-urban areas. These insights are critical for guiding surveillance, case management, and vector-control strategies.

Recommendation

It is recommended to strengthen surveillance and expand routine diagnostic testing for scrub typhus in South Goa to ensure more uniform state-wide case detection. Inclusion of scrub typhus testing in routine febrile illness surveillance, especially during monsoon and post-monsoon seasons, may help in early outbreak identification.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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