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Original Research Article

Burden and clinical characteristics of Scrub typhus in Deoghar: analysis of a hospital-based cohort

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ABSTRACT

Background: Scrub typhus remains a significant cause of acute undifferentiated febrile illness in endemic regions, and transmission is modulated by ecological and seasonal forces. This study was done to characterise the epidemiological features, sex and age distribution, seasonal patterns, and clinical manifestations of suspected and laboratory-diagnosed Scrub typhus cases reported in 2025.
Methods: This was a cross-sectional observational study in 204 clinically suspected patients of Scrub typhus who were tested for the disease. Laboratory confirmation was done through serological testing. Demographic data, month-wise trends, clinical symptoms were obtained and evaluated to determine positivity rates and predictive clinical features.
Results: Of the 204 suspected cases, laboratory tests confirmed 47 (23% positivity). Men had a 24.37% positive rate, compared to 21.18% for women. Cases were seen at all ages, peaked at >15 years and were predominantly male in the ≥50s. From January to March, data were mostly monthly, indicating robust seasonality and a few positives. The monsoon (August) and post-monsoon (November) seasons in India had the largest number of positive incidences, with positivity rates being 41.0% and 34.1%, respectively, followed by a decline in December. The most frequent symptom in suspected and confirmed cases was fever with chills. Patients had increasing abdominal pain and vomiting, headaches and rarely myalgia or cough.
Conclusions: This study confirmed the seasonality, sex predilection of scrub typhus and clinical spectrum. Ongoing daily surveillance in high-hazard months may allow endemic residents to detect and treat epidemic disease sooner.

Keywords: Clinical manifestations, Epidemiological analysis, Scrub typhus, Seasonal trend, Spotted fever group

INTRODUCTION

Scrub typhus is an acute, undifferentiated pyrexic condition that has spread extensively throughout South and Southeast Asia, the Asian Pacific Rim, and Northern Australia, a geographical region known as the "Tsutsugamushi Triangle". Several areas in India fall under this region, where the thick growth of scrub vegetation and favourable climatic conditions favour the persistence of infected chigger mites.[1] The principal vectors are trombiculid mites, especially *Leptotrombidium deliense* and *Leptotrombidium pallidum*. It accidentally infects humans who are bitten by the larval stage of these mites. A characteristic eschar may appear at the inoculation site, and if found, it is strongly suggestive. New infection with a spotted fever group (SFG) Rickettsia (*Orientia tsutsugamushi*).[2,3] Most patients who have an acute SFG rickettsiosis develop fever, with chills, malaise, headache, myalgia, cough, and lymphadenopathy, plus any number of gastrointestinal symptoms such as nausea, vomiting, or abdominal pain.[4,5]

Deoghar district and other parts of Jharkhand are endemic for Scrub typhus because several environmental and occupational conditions favour the natural cycle of *Orientia tsutsugamushi*.[6] The larger portions of this belt

are predominantly filled with arid scrubs, forest fringes, paddy lands, and agro-mixed zones, which can be the best microhabitats for trombiculids. They also happen to support high numbers of rodents- reservoirs for the infection that maintain it through the year.[7,8] Long monsoon and post-monsoon seasons are warm and humid, conditions favourable for the breeding of chiggers, which contribute to the seasonal peak (from July to November) in the number of incident cases.[9] Numerous populations in Jharkhand are involved with farming, woodland-based occupations, and outdoor work, leading to greater direct exposure to mite-infested vegetation. Despite endemicity, shortages of surveillance systems and low clinical suspicion in primary care that may underreport Scrub typhus are likely to explain why the disease persists among hill tribes in the region.[10]

Early detection is critical, as Scrub typhus can transform from a relatively innocuous febrile illness to an acute, multi-organ, life-threatening disorder if not promptly treated.[11] IgM enzyme-linked immunosorbent assay (ELISA) is a useful diagnostic test in routine use, which has higher sensitivity for the detection of early infection and good specificity to diagnose cases of recent infections. As IgM antibodies are present in the first week of illness, early detection and treatment can be achieved. This hospital-based cohort study characterized the demographic profile, clinical features, and laboratory findings of Scrub typhus in Deoghar by IgM ELISA. Through analysis of seasonal trend, exposure pattern, age distribution, and patient outcome, the study contributes to current knowledge on regional disease burden and can guide improved management of prolonged febrile illness.

METHODS

Study design and period

This is a prospective observational cohort study at a tertiary care hospital, All India Institute of Medical Sciences, Deoghar, India. The patients suspected of suffering from prolonged febrile illness were included in the study during a year-long (January 2025-December 2025) period from Deoghar and its neighbouring districts. The main purpose was to study the seasonality and clinical manifestations of cases. The catchment area of the hospital is rural and is mainly agricultural, with villages around forest fringes and thick scrub vegetation. These natural and working patterns should be beneficial in vector-borne disease (VBD) (such as Scrub typhus) studies, as they permit long-lasting human contact with infected chigger mites.

Eligibility criteria

Inclusion criteria

Patients >1 year of age with fever for ≥5 days were eligible. Patients were recruited when clinical signs suggested Scrub typhus, and their consent was obtained for themselves or for a parent.

Exclusion criteria

Patients with laboratory-diagnosed alternative illnesses (such as malaria, diagnosed based on rapid diagnostic test or peripheral smear, and dengue, determined by NS1 antigen positivity or IgM positivity) were excluded. Patients with proven bacterial or microbial infections such as enteric fever, urinary tract infection (UTI), and meningitis were also excluded. Patients who were taking doxycycline before presentation and those withholding consent were also excluded from the study.

Sample collection and serological testing

A total of 204 blood samples were obtained from clinically suspected cases of Scrub typhus presenting to the outpatient department (OPD) and inpatient department (IPD) of the hospital. Samples were obtained from the central clinical laboratory in sterile conditions. Trained laboratory personnel obtained venous blood samples aseptically and stored these in plain vacutainers. All samples were appropriately labelled with patient identity and transported for processing. The blood was clotted at room temperature and centrifuged, and serum was collected as a sample and used for performing serological tests. All samples were collected and processed according to standard biosafety and quality control protocols.

The viral serological diagnosis was performed in the State-Virus Research and Diagnostic Laboratory (VRDL), Department of Microbiology, AIIMS Deoghar, using a validated commercial Scrub typhus IgM Microlisa ELISA kit (J. Mitra and Co. Pvt. Ltd.), strictly following the manufacturer's instructions. Plain vacutainers were used to extract venous blood samples, and serum was then isolated for testing.[12] The method uses an indirect enzyme-linked immunosorbent method, where the microtiter wells are initially coated with the recombinant antigens, which embody the immunodominant epitopes of *Orientia tsutsugamushi*. Then the patient sera and controls are added and incubated so that the specific IgM antibodies, if any, bind to the coated antigens.[13] After that, a washing step is performed to remove any unbound material, then horseradish peroxidase–conjugated anti-human IgM is added, followed by the chromogenic substrate. The colour intensity produced, which is directly proportional to the amount of IgM antibodies, was then spectrophotometrically measured at 450 nm with a reference wavelength of 630 nm.[14]

RESULTS

The combined effect of sex- and age-based distribution presents the true profile of Scrub typhus burden in the study area. Males were in the majority (119 suspected among suspects), and only 29 positive cases were reported (Figure 1), with a confirmation rate of 24.37% (Table 1). There were 85 suspected cases in females, of whom 18 were positive, showing a slightly lower positivity rate (21.18%). This suggests a modestly higher risk in males,

possibly related to higher occupational exposure to open environments, including agricultural fields, scrub forest and forest edges that are typical for Deoghar and nearby districts.

Table 1: Clinical manifestations of suspected and positive cases of Scrub typhus.

Clinical manifestation	Suspected individual (%) (n=204)	Positive cases (%) (p=47)
Fever and chill	190 (93.14)	42 (89.36)
Headache	138 (67.65)	33 (70.21)
Abdominal pain	147 (72.06)	42 (89.36)
Vomiting	110 (53.92)	33 (70.21)
Myalgia	27 (13.24)	7 (14.89)
Cough	18 (8.82)	2 (4.26)

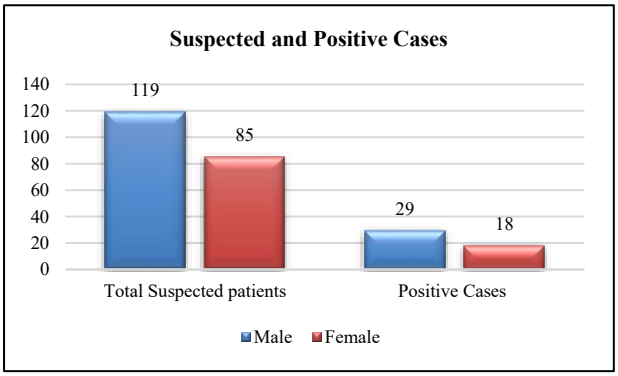

Figure 1: Gender-wise distribution of suspected and confirmed Scrub typhus cases.

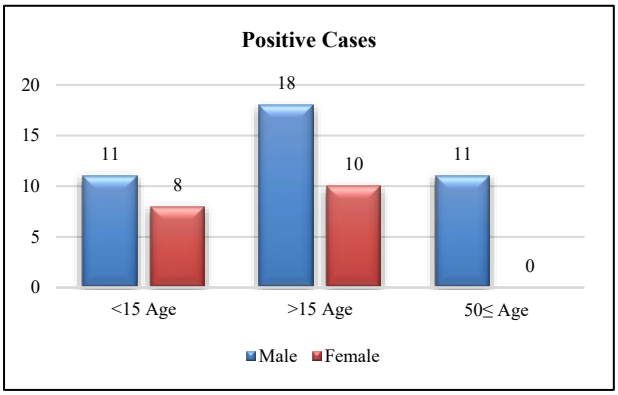

Figure 2: Age-wise and gender-wise distribution of positive Scrub typhus cases.

This observation is further refined when examining the age-wise analysis of cases (Figure 2). Among males, the maximum number of positives was observed in those above 15 years (n=18), followed by both 50-year-old adults, who possessed equivalent numbers (n=11 each). Among females, cases were predominantly distributed between ages above 15 years (n=10) and those under 15 years (n=8), with no confirmed cases in the ≥50-year age group. These combined patterns also suggest that children and working-age adults may be the most affected group in general, indicative of movement and environmental exposure, while paediatric cases indicate exposure at an earlier stage and at the household level. Taken together, this series of cases highlights the fact that Scrub typhus is not sex- and age-group-restrictive, and there should be community-wide surveillance, early diagnosis, and preventive strategies in place.

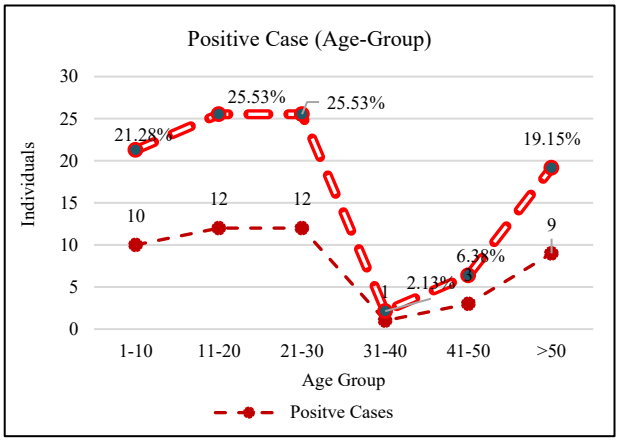

Figure 3: Age-wise distribution and positivity trends of Scrub typhus cases.

Figure 3 depicts the age-stratified distribution of confirmed Scrub typhus cases and their respective positivity rates, showing a specific pattern in different age groups. The greatest burden is present in the younger age groups. Persons of the age groups 11-20 years and 21-30 years equally contributed to the number of confirmed cases, with the maximum percent positive rate being 25.53% among both groups. Such a pattern possibly indicates more exposure to chiggers in these age groups due to frequent outdoor activity, schooling, working outside, and contact with environments where mites infest.

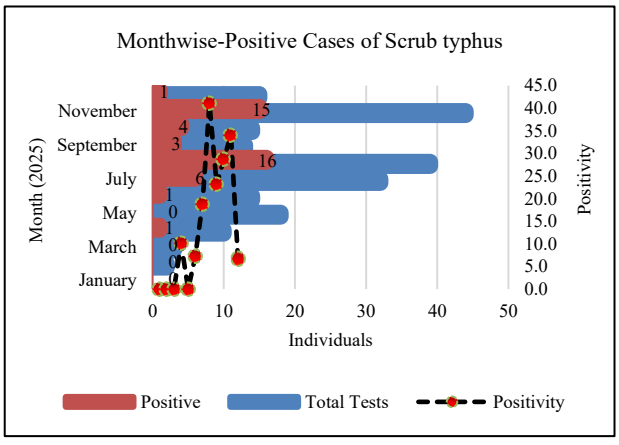

Figure 4: Month-wise distribution of Scrub typhus testing and positivity trends.

It has also been observed that the age group of 1-10 years of individuals has a high burden of disease; they were among 10 confirmed cases with an overall positivity rate

of about 21.28%, showing evidence for early exposure in their house or contact as long as residents are in-house in endemic areas, irrespective of those age brackets. Conversely, a significant difference was seen in the daily numbers and positivity for those aged 31 to 40 years. There is only 1 case reported in this census data of those amidst; again, the % here falls to 2.13%. Changes in exposure patterns, waning immunity, or health-seeking behaviour might explain this decline. There is, once again, a steady increase in positivity, also for the elderly. Three positive cases were in the age group of 41-50 years, with a positivity rate of 6.38% and above 50 years, there was a significant increase, showing nine positive samples with a positivity rate of 19.15%. This revival in the elderly may be attributable to aging, co-morbid conditions, or a history of environmental exposure. On the whole, our figure confirms that Scrub typhus affects persons of all ages, with an over-representation in those who are younger and more active compared to older age groups, indicating the importance of age-specific surveillance and prevention programs.

The Figure 4 reveals with great clarity a monthly approval pattern of Scrub typhus testing and positivity during 2025, seasonally displayed throughout the year. The first quarter, January-March, registered very low testing numbers and zero positivity, indicating that the infection was either not transmitted or indeed came a little forward in the winter. One case was tested in April with a positivity detection of 10%, while May and June showed no detections and 7.1% positivity testing, suggesting the beginning of an anticipated seasonal trend by emergence. Those figures have spiked since July. In July, there were 32 tests and six positives for 18.8% positivity; in August, the transmission peaked at a 41% positivity rate in the tested individuals, with cases of 39 tested and 16 positives. Environmental factors facilitated the multiplication of chigger mites post-monsoon. While September, October, and November did have high positivity rates of 23.1%, 28.6% and 34.1% respectively, these early months had substantial transmission after the rainy season had peaked. The month of November had the highest number of tests. By December, in consequence, the testing and detection had fallen off. Only one case was detected with the assay, translating to a positivity of 6.7%. In general, it is obvious that the monsoon months are periodic, from July to November, and become marginal between December and June.

The table presents the clinical profiles of all suspected Scrub typhus patients (n=204) against the IgM-positive ones (n=47) and emphasizes symptom combinations suggestive of a diagnosis. Fever with chills was the symptom most commonly reported by suspected patients (93.14%) and confirmed individuals (89.36%). This demonstrates that fever is the most relevant symptom of Scrub typhus. Abdominal pain appeared as a major symptom in 72.06% of suspect patients and was slightly more frequent among infected (89.36%) than uninfected resultant positives, indicating gastrointestinal involvement as an important clinical presentation in confirmed infection.

Headache was the most common reported symptom in both groups, being present in 67.65% and 70.21% of suspects and positive cases, respectively, reflecting systemic inflammatory attack. Vomiting manifested an obvious increase in confirmed patients (70.21%) compared to suspected cases (53.92%), also indicating a relation between Gastrointestinal (GI) symptoms and Scrub typhus. Overall, myalgia was reported less frequently and in similar proportions of suspected (13.24%) and confirmed cases (14.89%), suggesting that muscle pain, although typical, may not be a predominant symptom for every patient (Table 1).

There were fewer respiratory symptoms, including cough, particularly for confirmed cases (4.26%), and this may be indicative of marginal pulmonary involvement by the time of presentation in the majority of patients. Collectively, the table shows that fever is a ubiquitous symptom, but abdominal symptoms and vomiting are more characteristic of IgM-confirmed Scrub typhus; this could be an aid to the clinician in high-endemicity areas.

DISCUSSION

The research demonstrates distinct seasonal and demographic patterns, revealing clinical and epidemiological details of suspected and confirmed Scrub typhus cases that occurred in 2025. The region experiences a severe outbreak of Scrub typhus which accounts for 23.0% of all acute febrile infections based on the positivity rate from clinically suspected cases. The higher male positivity rate than female positivity rate indicates that men face greater risks of working in outdoor settings, which include agricultural fields and forest edges and Scrub vegetation areas that harbours infected chigger mites. The study confirmed cases in both genders, demonstrating that the infection affects a wide section of the population. Kaur et al and Mohapatra et al have conducted studies on the epidemiology of Scrub typhus. Their findings depend on weather conditions and the distribution of various infectious agents and their disease-carrying insect vectors. The incidence of Scrub typhus begins to rise during the monsoon season and continues through the post-monsoon period, which extends from June to November in rural areas of India and Southeast Asia. The results show that men have higher chances of coming into contact with outdoor spaces, including farms, forest edges, and scrub vegetation areas, where infected chigger mites are typically found.[15,16]

Age stratification study indicated risk was most frequent among males: confirmed cases of 15 years and older, possibly associated with increased movement, more involvement in vocational activities and higher exposure to vectors/reservoirs. Disease transmission risk could be higher in this age group through farming, exposure to field activities, and contact with scrub vegetation. But

arguments from child cases suggest that environmental exposure to domestic and ecological niches also elevates infection risk. In endemic areas, humans can be exposed to hantaviruses present in plants and soil or contaminated areas surrounding homes. Scrub typhus has also been more closely associated with acute encephalitis syndrome (AES), particularly in children. Other viral pathogens that may cause similar neurological symptoms in children with AES include Japanese encephalitis virus, Herpes simplex virus, Chandipura virus and varicella-zoster virus (VZV).[17-19] *Leptospira interrogans* is also known to cause similar manifestations.[20]

The research established initial findings about Scrub typhus epidemiology and clinical presentation in Deoghar, which subsequent research should develop further. The hospital study involved patients who needed medical treatment; thus, the research demonstrates how healthcare facilities can track disease development through their records. Researchers used a small group of suspected and confirmed cases to study patient attributes, demonstrating how larger population studies could better validate and extend their findings. IgM ELISA-Diagnosis enabled clinicians to detect cases during regular hospital operations, but future research should include additional diagnostic tests to improve detection of disease and enhance understanding of its infection patterns. The study found that IgM ELISA-Diagnosis enables efficient and rapid case discovery in clinical settings, yet future research should use additional diagnostic techniques to enhance early detection and understanding of infection development. The field currently lacks molecular diagnostic techniques such as polymerase chain reaction (PCR), which scientists can use to enhance pathogen identification and study strain differences. Research should examine both clinical and epidemiological issues as biological vector distribution patterns and rodent reservoir presence together with environmental factors need to be studied further. The research study established a one-year period which successfully identified seasonal trends yet continuous research over multiple years will provide deeper insights into permanent disease pattern shifts.

CONCLUSION

The present investigation describes the time trend and clinical characteristics of suspected and confirmed cases throughout 2025, which are important regarding diagnostics and epidemiology. Low volume and zero positivity from January are seen in the monthly testing data, with an increase in April. Testing as well as positivity increased in the monsoon and post-monsoon months, primarily from July to November, with maximum positive rates reported for August and November. Seasonal clustering would indicate strong effects of environmental and climatic variables, which will be enhanced by the disease transmission, and the importance of active surveillance programmes at these times was emphasised. The clinical examination also supports this observation, with fever and chills being the most common feature in both suspect and confirmed cases; it is the key clinical sign. Abdominal pain and vomiting were substantially more prevalent among laboratory-confirmed cases and were deemed as possible factors to predict real infection. Headache was the common systemic symptom, and myalgia and respiratory symptoms were less common, especially in cases confirmed.

Collectively, the results underscore that a combination of seasonal knowledge and symptom-based screening can enhance early case detection. Enhancing diagnostics during this season and focusing on patients with fever combined with abdominal symptoms in the early stage is helpful for timely diagnosis and management. Finally, use of this comprehensive strategy may contribute to the reduction of diagnostic delay and help manage clinical decisions at the point-of-care, leading to good clinical outcomes in the endemic area.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Kamath SD, Kumari S, Sunder A, Kamath SD, Sunder A. A study of the profile of scrub typhus in a tertiary care hospital in Jharkhand: an underestimated problem. Cureus. 2022;14(7).
2. Ma T, Hao M, Chen S, Ding F. The current and future risk of spread of *Leptotrombidium deliense* and *Leptotrombidium scutellare* in mainland China. Sci Total Environ. 2022;843:156986.
3. Jain HK, Das A, Dixit S, Kaur H, Pati S, Ranjit M, et al. Development and implementation of a strategy for early diagnosis and management of scrub typhus: an emerging public health threat. Front Public Health. 2024;12:1347183.
4. Saluja M, Vimlani H, Chittora S, Sen P, Suman C, Galav V, et al. Scrub typhus: Epidemiology, clinical presentation, diagnostic approach, and outcomes. J Indian Acad Clin Med. 2019;20(1):15-21.
5. Stose LL. Rocky mountain spotted fever (*Rickettsia rickettsi*). In: Samples OM, McCommon GW, Terrill TH, Stose LL, eds. The One Health Model as Applied to Zoonotic Diseases. Wiley Online Library; 2025:103-105.
6. Ravishankar V, Narayanan S, Shandil RK. Rickettsial infections: prevalence and diagnosis of scrub typhus in India. Front Trop Dis. 2024;5:1433013.

7. Aggarwal HK, Jain D, Kaverappa V, Mittal A, Yadav S, Gupta A. Emergence of scrub typhus in northern India: experience from tertiary care hospital. Klimik J. 2014;27(1).
8. Kumar M, Sahoo GC, Das VN, Singh K, Pandey K. A review of miRNA regulation in Japanese encephalitis (JEV) virus infection. Curr Pharm Biotech. 2024;25(5):521-33.
9. Mohapatra RK, Al-Haideri M, Mishra S, Mahal A, Sarangi AK, Khatib MN, et al. Linking the increasing epidemiology of scrub typhus transmission in India and south Asia: are the varying environment and the reservoir animals the factors behind? Front Trop Dis. 2024;5:1371905.
10. Rai RK, Scarborough H. Understanding the effects of the invasive plants on rural forest-dependent communities. Small-Scale forest. 2015;14(1):59-72.
11. Kumar VS, Kumar KH, Priya RV, Mounika K, Sabeeha M. Clinical assessment on acute febrile illness- a comprehensive review. Int J Enhanced Res Med Dent Care. 2024;11(5):41-8.
12. Jayagandan S, Ratchagadasse VR, Philomenadin FS, Dhodapkar R. Evaluation of diagnostic accuracy of the novel Scrub typhus IgM ELISA Kit. Diagn Microbiol Infect Dis. 2025:117025.
13. Venkatesan R, Gani T, Seepoo AM, Paulraj PS, Renu G, Subbiah GS, et al. Development of molecular and immunological based diagnostic tools to detect *Orientia tsutsugamushi* (scrub typhus) infection in human. J Microbiol Methods. 2025;232:107124.
14. Aydin S, Emre E, Ugur K, Aydin MA, Sahin İ, Cinar V, et al. An overview of ELISA: A review and update on best laboratory practices for quantifying peptides and proteins in biological fluids. J Int Med Res. 2025;53(2):03000605251315913.
15. Kaur J, Sharma N, Kanaujia R, Bisht K, Goel S, Biswal M, et al. Molecular characterization of Orientia tsutsugamushi causing fatal scrub typhus in a young male affected by so-called “mystery fever” in North India. Indian J Med Microbiol. 2023;46:100418.
16. Mohapatra RK, Al-Haideri M, Mishra S, Mahal A, Sarangi AK, Khatib MN, et al. Linking the increasing epidemiology of scrub typhus transmission in India and South Asia: are the varying environment and the reservoir animals the factors behind? Front Trop Dis. 2024;5:1371905.
17. Kumar M, Singh K, Topno RK, Madhukar M, Siddiqui NA, Sinha SK, et al. Prevalence of Japanese encephalitis infection in children below 15 years’ age, Bihar. Diagn Microbiol Infect Dis. 2025;111(2):116579.
18. Kumar P, Mishra R, Topno RK, Kumar M, Dinesh DS, Singh DK. Seasonal prevalence of Japanese encephalitis (JE) in Patna district of Bihar, India J Commun Dis. 2019;51(4):58-61.
19. Misra UK, Kalita J. Changing spectrum of acute encephalitis syndrome in India and a syndromic approach. Ann Indian Acad Neurol. 2022;25(3):354-66.
20. Yadav KL, Choudhury KA, Siddiqui H, Verma SK. Distinguishing leptospirosis from other causes of acute encephalitis syndrome: clinical insights. Ann Afr Med. 2026;10:4103..

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