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Original Research Article

INCIDENCE AND PATTERN OF NEUROLOGICAL MANIFESTATIONS OF SCRUB TYPHUS IN A TERTIARY CARE CENTRE- ORIGINAL ARTICLE

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ABSTRACT

Background: Scrub typhus is an important cause of acute febrile illness in India. Central nervous system (CNS) involvement is a known complication of scrub typhus, which ranges from aseptic meningitis to frank meningoencephalitis. Objective is to estimate the incidence and describe the pattern of neurological involvement among patients with scrub typhus in a tertiary care hospital. **Materials and Methods:** This study was done as a Prospective observational study at Critical care unit and medical wards of Government Medical College and Hospital Thiruvananthapuram for a period of 1 year from August 2024 to July 2025 in 118patients diagnosed with scrub typhus. Clinical examination, blood samples for routine blood investigations, fever profile, Neuro imaging- CT or MRI, CSF examination was done in all patients. All patients in our study presented with fever and myalgia, among neurological presenting complaints in particular. **Results:** A total of 37 patients (31.4%) exhibited neurological manifestations. Meningoencephalitis accounted for 43% of neurological manifestations, while encephalopathy accounted for 24%. Unusual cases of cranial nerve palsy, parkinsonism, opsoclonus myoclonus were also seen. CSF analysis revealed mild pleocytosis and elevated protein, with generally preserved glucose and normal ADA levels, suggesting inflammatory involvement of the central nervous system. **Conclusion:** Neurological manifestations are very common in scrub typhus. Scrub typhus can present with various neurological features of varying severity. Knowledge of these manifestations will enable clinicians to consider scrub typhus as one of the differential diagnoses of acute febrile illness with neurological involvement. The neurological complications in scrub typhus have better prognosis if diagnosed and treated early.

INTRODUCTION

Scrub Typhus is a zoonotic infection caused by Orientia Tsutsugamushi and is transmitted to humans by the bite of chigger larva of Lepto trombidium mites.[1] The eschar at the site of the chiggers bite is a distinctive clinical feature and is considered as a hallmark of the disease.[2]

Infection is commonly associated with agricultural exposure and recreational activities in forested and mountainous regions.[2] Disease manifestations range from an acute febrile illness to severe multi organ failure. An estimated 1 million cases occur annually within the Tsutsugamushi Triangle, which includes East Asia, South Asia and the Southwest Pacific region.[3] Recent studies in epidemiology have described Scrub Typhus as an important cause of central nervous system infections in endemic areas.[3] The World Health Organization recognizes Scrub typhus as a major public health concern, with nearly 1 billion people at risk and new cases of 1 million reported annually.[4] In endemic regions, the disease accounts for a substantial proportion of hospital admissions due to acute febrile illness. Scrub typhus can cause multiorgan dysfunction and has high mortality if it is not recognized early and treated appropriately.[5]

Diagnosis is often difficult because its clinical features overlaps with other infections like leptospirosis and dengue Fever, particularly in rural settings where diagnostic facilities and timely treatment are limited.[6]

Neurological involvement in Scrubtyphus has been reported in approximately 25–46% of cases.[7] Common neurological pattern includes meningitis and meningoencephalitis.[1] Various other rare neurological patterns are transverse myelitis, cranial nerve palsies, opsoclonus-myoclonus syndrome, acute disseminated encephalomyelitis, GuillainBarré Syndrome, polyneuropathy, parkinsonism and acute

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psychosis.[8] Disseminated vasculitis is believed to be the main pathology responsible for multisystem and neurological involvement in scrub typhus.[7] Orientia tsutsugamushi mainly targets macrophages and endothelial cells through its unique 56-kDa type specific antigen, this can leads to vasculitis and endothelial dysfunction.[9] Despite the wide range of neurological patterns reported in Scrub typhus, studies from our region are scarce.

In the present study ,we describe the incidence and the pattern of neurological manifestations among patients with scrub typhus admitted to a tertiary care centre.

MATERIALS AND METHODS

The main objective of our study was to determine the incidence and the pattern of neurological manifestations among patients with Scrub typhus admitted to a tertiary care centre. This prospective observational study was conducted in the intensive care units and medicine wards of Government Medical College Thiruvananthapuram Kerala over a one-year period from July 2024 to July 2025. The study- was approved by the Institutional Review Board and the Ethics Committee before commencement (No: 11/12/2024/MCT dated 05.07.2024).

A total of 118 patients, with confirmed Scrub typhus were included. Patients underwent detailed clinical examination; routine blood tests, fever profile assessment, neuroimaging (CT or MRI), and cerebrospinal fluid (CSF) analysis. Fever was observed in all patients, while neurological symptoms constituted a significant component of the clinical presentation.

After obtaining informed consent, patients with acute febrile illness who were confirmed to have scrub typhus on testing with IgM enzyme-linked immunosorbent assay or polymerase chain reaction for O. tsutsugamushi were included. We excluded patients with confirmed malignancy, immunocompromised state, and concurrent autoimmune disease, as these diseases can influence neurological manifestations.

Detailed medical history was collected, and physical examination was performed on each patient. All patients received a detailed neurological assessment at admission and again at 48 hours to assess new findings. Neuroimaging and cerebrospinalfluid (CSF) analysis were done. Magnetic resonance imaging (MRI) of the brain was performed among patients with rare neurological presentations. Neurological manifestations were identified based on the presence of one or more abnormal neurological examination findings or discrete neurological presentations within one month of the onset of illness. Meningitis or meningoencephalitis was diagnosed as fever or headache with signs of meningeal irritation, seizures, or altered sensorium (Glasgow Coma Scale score ≤14/15); isolated headache was not considered. We excluded cases without objective clinical findings or where the neurological abnormality reportedly preceded the acute infection. The other neurological manifestations were identified based on the presence of one or more findings related to a neurological system such as the extrapyramidal system, cerebellum, or peripheral nerves. Patients were followed up until the resolution of neurological complaints or until 30 days following discharge. The cumulative incidence of neurological manifestations and various neurological pattern were recorded.

Statistical Analysis

Data were entered into a Microsoft Excel spreadsheet and analyzed using SPSS version 27. Categorical variables were expressed as frequencies and proportions, while quantitative variables were presented as mean ± standard deviation (SD). The association between categorical variables was assessed using the Chi-square test, and quantitative variables were compared using the Student's t-test. A p-value < 0.05 was considered statistically significant.

RESULTS

A total of 118 patients with Scrub typhus positive test were taken in the present study. The median age of the study population was 54 years, with an age range of 18–80 years. The mean age was 50.89 ± 15.27 years. The study showed a male predominance; with 86 males (72.9%) and 32 females (27.1%), yielding a male-to-female ratio of 2.7:1. Age-stratified analysis demonstrated that neurological involvement was most common among patients aged 41–60 years (37.3%), followed by those aged 61–80 years (25.9%) and 21–40 years (25.0%).

Most patients belonged to rural areas of nearby districts, and the majority were involved in agricultural work or manual labour. Approximately 47.5% of the participants had one or more comorbidities. Diabetes mellitus (22%) and systemic hypertension (21.2%) were the predominant comorbid conditions, while coronary artery disease (5.9%) and other comorbidities (10.2%) were less commonly observed.

All patients presented with acute febrile illness, with a mean fever duration of 5.28 ± 1.26 days (range: 3–10 days). The most common presenting symptoms were myalgia (66.9%), headache (66.1%), cough (64.4%), vomiting (55.9%), breathlessness (55.1%), and altered sensorium (27.1%). Neurological symptoms were observed with varying frequencies among the 118 patients with scrub typhus. Altered sensorium was the most common symptom, occurring in 32 patients (27.1%), followed by seizures in 15 patients (12.7%). Limb weakness was noted in 8 patients (6.8%), while sensory symptoms were present in 3 patients (2.5%). Dysarthria and cranial nerve palsies were each observed in 2 patients (1.7%). Ataxia and psychosis were rare manifestations, occurring in one patient each (0.8%).

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[Table-2showing frequency of neurological symptoms]

Meningeal signs, particularly neck stiffness, were observed in 24 patients (20.3%), suggesting meningeal irritation or meningoencephalitis. Motor abnormalities were identified in 8 patients (6.8%), whereas sensory deficits (2.5%), cranial nerve involvement (1.7%), and abnormal reflexes (3.4%) were infrequent. Extrapyramidal rigidity and cerebellar signs were rare, each noted in only one patient (0.8%).

Jaundice was present in 21 patients (17.9%), respiratory symptoms in 22 patients, and abdominal pain in 12 patients. Clinical examination revealed hepatomegaly in 42 patients (35.6%), splenomegaly in 28 patients (23.7%), pallor in 34 patients (28.8%), lymphadenopathy in 9 patients (7.6%), and eschar in 26 patients (22.0%). [figure2]

Neurological manifestations were observed in 37 of 118 patients, representing 31.4% of the study population.

Among neurological manifestations, meningoencephalitis was the predominant presentation occurring in 16 patients (43.2%) followed by encephalopathy in 9 patients (24.3%). Meningitis was noted in 5.4% of patients. Movement disorders such as transient parkinsonism were seen in 3 patients (8.1%). Rare neurological manifestations each occurring in one patient (2.7%) included, acute disseminated encephalomyelitis (ADEM), peripheral neuropathy, psychosis, opsoclonus-myoclonus syndrome and hydrocephalus with meningo encephalitis. [Table-5 showing various neurological patterns]

Laboratory investigations demonstrated thrombocytopenia and elevated liver enzymes in a substantial proportion of patients.

Thrombocytopenia was the predominant laboratory abnormality, observed in 93 patients (78.8%), while anaemia (haemoglobin <10 g/dl) was present in 18 patients (15.3%). Concurrent anaemia and thrombocytopenia were noted in 14 patients (11.9%). Severe thrombocytopenia, defined as platelet count below 50,000/mm³, was identified in 15 patients (12.7%). Elevated SGOT and SGPT levels were observed in 104 (88.1%) patients each, while hyperbilirubinemia (total bilirubin >1.2 mg/dL) was present in 71 (60.2%) patients.

Diagnostic evaluation revealed that IgM ELISA demonstrated higher positivity compared to PCR testing. IgM ELISA was positive in 89 patients (75.4%), whereas scrub typhus PCR positivity was observed in 63 patients (53.4%). A substantial proportion of patients (46.6%) did not undergo PCR testing, limiting direct comparison between the two modalities.

CSF analysis was performed in all 37 patients with neurological manifestations. CSF findings demonstrated a characteristic pattern of lymphocytic pleocytosis with increased protein levels and relatively preserved glucose concentrations. The mean CSF cell count was 52.35 ± 43.12 cells/µL. Higher than normal CSF protein levels were observed in 81.1% of patients, with a mean protein concentration of 76.83 ± 32.39 mg/dl. CSF glucose remained within normal limits in most patients (67.6%), while reduced glucose levels were observed in 27.0% of cases. Lymphocytic predominance was identified in 70.3% of samples. CSF ADA level averaged 4.02 ± 0.77 U/L, effectively excluding tuberculous meningitis in the majority of patients.

Systemic involvement was frequently observed. Gastrointestinal manifestations were present in 55.9% of patients, with hepatic dysfunction being the predominant abnormality. Transaminitis was observed in 41.5% of cases, while liver failure occurred in 9.3%. Severe gastrointestinal complications such as pancreatitis, cholecystitis, and gallbladder perforation were rare (<1%). Respiratory involvement was noted in 33.1% of patients, with pneumonia (15.3%) and acute respiratory distress syndrome (ARDS) (13.6%) being the predominant respiratory complications. Renal dysfunction, predominantly acute kidney injury, was identified in nearly 10% of patients. Cardiovascular manifestations were observed in 9.3%, with myocarditis being the predominant abnormality.

Among patients with neurological manifestations, significant overlap with other systemic complications was observed. Gastrointestinal involvement coexisted in 20 of 37 patients (54.1%), while respiratory manifestations were present in 15 patients (40.5%). Only one patient (2.7%) demonstrated concurrent cardiovascular involvement, reflecting the rarity of neuro –cardiac overlap.

Neuroimaging findings were predominantly normal. CT brain imaging was normal in 34 patients whereas abnormalities were detected in 3 patients. Abnormal CT findings included cerebral infarct, cerebral atrophy and hydrocephalus. MRI brain imaging was predominantly normal; abnormal findings observed in only a few patients. MRI abnormalities included T2 FLAIR Hyper intensities in basal ganglia,temporallobe, brainstem, cerebellum (5.4%),leptomeningeal enhancement(2.7%)infarct with meningoencephalitis changes (2.7%), demyelinating changes (2.7%), and combined findings of hydrocephalus with meningoencephalitis (2.7%). [Figure2,3,4_ showing MRI images]

Clinical outcome was favourable in the majority of patients. Overall, 112 patients (94.9%) recovered, while 6 patients (5.1%) died, resulting in a mortality rate of 5.1%. Oxygen supplementation was required in 61 patients (51.7%), whereas mechanical ventilation was necessary in 36 patients (30.5%). Notably, all patients who died required ventilator support, compared to only 26.8% of survivors. A statistically significant association was observed between mechanical ventilation and mortality ($\chi^2 = 14.4$, df = 1, $p < 0.001$).

Patients with central nervous system involvement exhibited a higher mortality rate than those without neurological involvement. Patients with neurological manifestations had a mortality rate of 11.4%,

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compared to 2.38% among patients without neurological involvement. Two-thirds of all deaths (66.7%) occurred in patients with neurological complications. Statistical analysis demonstrated a significant association between neurological involvement and mortality ($\chi^2 = 4.22$, $p = 0.04$), indicating CNS involvements are associated with poorer clinical outcomes in scrub typhus infection.

Most patients in this study were treated with doxycycline injection and showed favourable clinical outcomes. A smaller proportion of patients received azithromycin either as monotherapy or in combination with doxycycline.

The summary of patient details is given in Table 1.

Patients blood results and CSF analysis findings shown in table3

Table 1: Description of baseline patient characteristics

VARIABLES			TOTAL(n=118)
Age (years)±SD			50.89± 15.27
SEX			
TOTAL	NEUROLOGICAL MANIFESTATIONS	NON NEUROLOGICAL MANIFESTATIONS	
MALES-86(72.9%)	28(32.6%)	58(67.4%)	
FEMALES-32(27.1%)	9(28.1%)	23(71.9%)	
COMORBIDITY			
Diabetes		26(22%)	
Hypertension		25(21.2%)	
Coronary artery disease		7(5.9%)	
Other comorbidities Eg-copd,CLD		12(10.2%)	
Fever duration in days± SD(RANGE)			5.28±1.26(3 -10 DAYS)
Fever (%)			118(100%)
Myalgia(%)			79(66.9%)
Breathlessness(%)			65(55.1%)
Headache(%)			78(66.1%)
Vomiting(%)			66(55.9%)
Pallor(%)			34(28.8%)
Jaundice(%)			21(17.9)
Lymphadenopathy(%)			9(7.6%)
Hepatomegaly(%)			42(35.6%)
Splenomegaly (%)			28(23.7%)
Eschar(%)			26(22.03%)
Neck stiffness(%)			24(20.3%)
Systemic manifestations Acute respiratory distress syndrome			16(13.6%)
Transaminitis			49(41.5%)
Acute kidney injury			11(9.2%)

Table 2: Frequency and percentage distribution of neurological symptoms in patients with scrub typhus(n=118)

Symptoms	Frequency (Number of Cases)	percentage
Altered sensorium	32	27.1%
Seizures	15	12.7%
Speech abnormalities	2	1.7%
Limb weakness	8	6.8%
Sensory symptoms	3	2.5%
Cranial nerve palsy	2	1.7%
Ataxia	1	0.8%
Psychosis	1	0.8%

Table 3: Patients Baseline Laboratory Parameters

Patient laboratory parameters	Mean ± SD
Haemoglobin(g/dl)	11.4 ± 1.63
Total Leukocyte Count (/mm³)	11,126 ± 6,651
Platelet Count (/µl of blood	99,301 ± 62,768
Random Blood Sugar (mg/dL)	144.42 ± 49.8
SGOT (U/L)	188.0 ± 255.82
SGPT (U/L)	162.4 ± 288.2
Total bilirubin(mg/dl)	2.77±2.86
Direct bilirubin(mg/dl)	1.73±2.09
Total protein(g/dl)	6.10±0.87
S albumin(g/dl)	3.18±0.71
B urea(mg/dl)	81.57± 61.21
S creatinine(mg/dl)	2.34±2.00
CSF ANALYSIS-TOTAL CSF CELL COUNT	52.35 ± 43.12
CSF PROTEIN(mg/dl)	76.83 ± 32.39
CSF sugar(mg/dl)	52.21± 22.4
CSF ADA(U/L)	4.02±0.77

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Normal laboratory values: Hb 13-17 g/dL , TC: 4000-10,000 cells/mm3 , Platelets: 1.5-4.0 L cells/mm3 ,RBS-<140 mg/dl TB: 0.1-1.2 mg/dL, SGOT: 5-40 U/L, SGPT: 5-40 U/L, Serum creatinine: 0.8-1.3 mg/dL, BLOOD urea: 5-20 mg/dl .total protein-6-8.3 gm/dl.albumin-3.5-5.5 gm/dl.
Normal values of CSF -protein15-45mg/dl, glucose-50-80 mg/dl WBC count-<8 cell/micro litres

Table 4: Comparison of other studies showing neurological manifestation of Scrub Typhus

Study	Number of scrub typhus patients included in studies	Findings
R Poongodi et al.[27]	50 total scrub patients	Meningoencephalitis 26(52%) Meningitis 6(12%) Transverse Myelitis1(2%) Encephalopathy 4(8%) Cranial nerve palsy2(4%)
UK Misra et al[15]	37 total scrub patients	13 meningoencephalitis 6 encephalitis 9 encephalopathy
Majumdar s et al[7]	198 total scrub patients	Meningoencephalitis-62(26.3%) meninigitis -26(13.1%) Movement disorder- 19(9.6%)
Ghosh R et al[28]	50 cases with neurological manifestations	10 rare manifestations (PRES, Opalski syndrome, parkinsonism, cerebellitis, isolated opsoclonus, transverse myelitis, poly radiculo neuropathy, myositis, transient behaviour change, fibromyalgia)
Jamil MD, Hussain M et al[12]	113 total scrub typhus patients	15 meningoencephalitis

Various neurological pattern	Frequency(number of cases)	Percent%
Meningoencephalitis	16	43.2%
Encephalopathy	9	24.3%
Transient parkinsonism	3	8.1%
meningitis	2	5.4%
Cranial nerve palsies	2	5.4%
Acute disseminated encephalomyelitis (ADEM	1	2.7%
Opsoclonus-myoclonus syndrome	1	2.7%
Peripheral neuropathy	1	2.7%
Acute psychosis	1	2.7%
Hydrocephalus with meningo encephalitis	1	2.7%

Table5-A chart showing distribution of various pattern among scrub typhus patients with neurological involvement (n=37)

DISCUSSION

This prospective study highlighted the incidence and extent of various neurological manifestations seen with scrub typhus. Nearly one-third of the patients (31.3%) had neurological involvement, of whom the majority (43.2%) had meningoencephalitis.
Consistent with our findings, P. Jain et al. reported that around one-quarter of acute encephalitis syndrome cases were attributable to scrub typhus,[10] Central nervous system involvement in rickettsial diseases has long been recognized, and early diagnosis is crucial because untreated scrub typhus may carry a mortality rate of 30–35%.[10] The neurological involvement in scrub typhus infection cases includes aseptic meningitis, meningoencephalitis, isolated cranial nerve palsies, acute disseminated encephalomyelitis, transverse myelitis, stroke, opsoclonus, Guillain Barrésyndrome, and psychiatric features.[11] Our findings of a male-to-female ratio of 2.7:1 are comparable to those of various studies that have documented male predominance.[12]
Similarly a study by Jamil et al reported male to female ratio was 2.25:1.[12] The average age of patients in this study was 50 years, closely matching the observations of Hamaguchi et al., who reported a mean age of 46.6 years.[13]
All patients were presented with an acute febrile illness with mean duration of five days, which was comparable to study Brummaier et al.[14] Fever was the predominant presenting symptom, occurring in all cases, in concordance with other Indian studies.[15] Altered sensorium was observed in 27% of patients in the present study, which is consistent with the findings of Rana et al., who reported a frequency ranging from 10% to 40%.[16]
Seizures were present in 12.7% of cases, which is comparable to the 2–22% reported in previous studies.[14,15] Eschar was identified in 22% of cases, similar to rates reported in other studies ranging from 12–32%.[13,15] In a study by Jamil et al., eschar was found in 30.7% of patients with meningoencephalitis.[7] Therefore, lack of eschar does not exclude the diagnosis of scrub typhus. Neck stiffness was noted in up to 20.3% of patients, similar to the findings reported by Majumdar et al.[7]

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Serological assays, either by enzyme-linked immunosorbent assay (ELISA) or indirect immunofluorescence assay, remain the mainstay for the diagnosis of scrub typhus.[11] Meningoencephalitis occurred in 43% of the study population, which is consistent with findings from other Indian studies, including the 40% reported by Rana et al,[16] and up to 52% reported by Misra et al.[15] Previous reports have described varying rates of neurological involvement ranging from 25% to 46%, likely reflecting variations in the definitions of neurological involvement used across studies.[15,17] A study published by Mishra et al. reported neurological pattern in nearly 2/3 of cases, presenting as meningoencephalitis, encephalitis, or encephalopathy but cerebrospinal fluid findings can mimic viral meningoencephalitis and tuberculosis meningitis.[15] Cerebrospinal fluid analysis in scrub typhus generally lacks any distinctive pattern characteristic of other acute encephalitis. There is a lymphocytic pleocytosis, mild to moderate elevation of CSF protein with low to normal CSF glucose.[17] Similar findings were noted in our study, with cerebrospinal fluid analysis demonstrating raised protein levels in 81% of patients and lymphocytic pleocytosis in 72%.CSF glucose remained within normal limits in the majority (67.6%), with reduced levels observed in 27.0% of patients.

Consistent with our findings, cerebrospinal fluid studies in scrub typhus patients conducted by Rehani et al. demonstrated mild-to-moderate mononuclear pleocytosis in 52% of cases, normal glucose levels, and mildly increased protein concentrations in 57% of patients.[18] Similar CSF patterns have been documented in previous studies, including those by Rana et al. Cerebrospinal fluid (CSF) analysis was abnormal in 23 patients (raised lymphocytes in 68%, raised protein in 80%.[16] The neurological manifestations of scrub typhus are thought to occur mainly due to small vessel vasculitis causing disruption of the blood brain barrier, micro infarctions and cerebral edema.[11] Direct central nervous system invasion by organism has also been reported, with the organism isolated from cerebro spinalfluid.[19] Endothelial invasion and cytokine mediated vascular injury play an important role in the development of neurological complications.[11,20]

Transient parkinsonism is an uncommon neurological complication of scrub typhus. A similar presentation (8.1%) was observed among our patients and has also been described by Chiou et al and Premaratnaet al.[20,21]

All these cases demonstrated features of rigidity, tremor, and symmetrical bradykinesia. Opsoclonus myoclonus syndrome in scrub typhus is rare and usually manifests during the second week of illness.[22] The underlying mechanism is postulated to involve a rapid antibody class switch from IgM to IgG, leading to elevated anti-O. tsutsugamushi IgG titers.One case of opsoclonus was observed in the present study.

Peripheral nervous system involvement in scrub typhus includes cranial neuropathies, mono neuropathies, mono neuritis multiplex, plexopathies, and radiculopathies, including Guillain–Barré syndrome. Among the cranial neuropathies, isolated acute sensorineural hearing loss, either unilateral or bilateral, has been frequently reported.[23] Cochlear damage secondary to vasculitis or immune-mediated mechanisms has been postulated. Abducens nerve palsy and bilateral facial palsies have been reported in scrubtyphus.[24] In this study, one case of unilateral abducens nerve palsy and one case of sensorineural hearing loss were noted. Post-infectious Acute Disseminated Encephalomyelitis (ADEM) presenting with altered sensorium, seizures, meningeal signs, and multifocal white matter lesions has been reported previously and was also identified in the present study.[25] One patient had ADEM with seizures, altered sensorium, meningeal signs, and multifocal extensive periventricular white matter hyper intensities on T2-weighted MRI images.ne case with hydrocephalus was observed in this study. A similar case study was reported by Maheswara et al.[26]

CSF reverse transcriptase (RTPCR) can be tested to diagnose scrub meningoencephalitis.[10] There are no specific or characteristic radiological findings in scrub meningoencephalitis.[11] CT brain was normal majority of patients in our study. In the present study, MRIbrain abnormalities were observed in a subset of patients, including leptomeningeal enhancement, abnormal T2 FLAIR hyperintense signals involving the brainstem cerebellum and temporal lobe and cerebral infarction.

In a study by UK Misra et al,[15] MRI was performed in 25 of 31 patients with scrub typhus meningoencephalitis, and all scans were normal except for one patient who showed meningeal enhancement .Multi organ dysfunction occurred in 26% patients. Systemic involvement occurs in more than 50% patients. Overall mortality was 6% in our study. A recent study by Meena et al. reported a mortality rate of 14%.[9] Doxycycline served as the treatment mainstay, either as monotherapy or combined with azithromycin demonstrating favourable clinical outcomes in survivors. Doxycycline have good CNS penetration and is effective in the treatment of severe scrub typhus with neurological involvement. [1] Early initiation of antibiotic therapy is crucial for achieving better outcomes in scrub typhus.[1]

CONCLUSION

Clinicians should maintain a strong clinical suspicion for scrub typhus in patients presenting with AES in endemic regions and consider initiating empiric treatment while awaiting investigation results, despite the absence of classical signs such as eschar or lymphadenopathy.

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Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient (s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Author contributions-SNR: conceptualisation, data curation, formal analysis, investigation, methodology, validation, writing original draft (lead).

SST: Formal analysis, Visualisation; formal analysis writing –review and editing. (supporting)

DK: Formal analysis, Visualisation writing –review and editing. (supporting

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Data availability statement-the data that support the findings of this study are available from corresponding author upon reasonable interest.

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