

Original Article

A Comparative Study of Clinical Presentation of Scrub Typhus Patients between Pre and Post Monsoon Clusters in a Tertiary Care Hospital in Kolkata

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Background : Scrub typhus is an endemic zoonoses, caused by *Orientia* (formerly *Rickettsia*) *tsutsugamushi* and transmitted through the chiggers of the genus *Leptotrombidium*. Humans are accidental hosts and are infected through the vector mites during a blood meal. Scrub typhus is a reemerging cause of Acute Undifferentiated Fever in India as well as Worldwide. Previously considered a seasonal disease with distribution mainly in the rural areas, cases are being increasingly recognized in the Metropolitan Cities and beyond the Monsoon months.

Objective : In this study, we present a comparative clinical data of Scrub Typhus cases presenting during the wet Postmonsoon months (August to November) with those presenting during the dry summer months (April-May) in a Tertiary Care Teaching Hospital in Kolkata.

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Key words : Scrub typhus, Urban versus Rural, Pre-monsoon versus Postmonsoon, Acute undifferentiated fever.

Scrub typhus is an endemic zoonoses caused by *Orientia* (formerly *Rickettsia*) *tsutsugamushi*. The disease is transmitted through Chigger mites of genus *Leptotrombidium* (family *Trombiculidae*). The Trombiculid mites serve as vector for the infectious agent. Rodents are the natural hosts as well as reservoir for infection. Humans are the accidental hosts. The disease is transmitted to humans when an infected mite deposits the bacteria into host body during a blood meal¹.

Orientia tsutsugamushi is an obligate intracellular gram-negative bacterium. It is maintained by Transovarial Transmission in the Trombiculid Mites. After hatching, infected larval mites known as Chiggers (the only stage that feeds on a host) inoculate the organisms into the Skin².

Scrub typhus was first described by the Chinese in the third century, however in Modern Medical Literature, it was reported from Japan only in 1899. Occurring in periodic outbreaks in the early 1900s, Scrub typhus was classified as a typhus-like Fever in 1917³.

Scrub typhus Epidemiology :

Scrub typhus prevails in the East and South Asia,

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Editor's Comment :

- Scrub typhus infection must always be considered as differential diagnosis of any Acute Febrile Illness
- This disease occurs in dry as well as wet Monsoon months
- This disease occurs in Urban and Semiurban areas as well, in contrary to the previous concept that it occurs mainly in village and forest areas
- Eschar is the specific manifestation but not always present.
- Like Dengue, Scrub typhus is also a common cause of Fever with Thrombocytopenia.
- Our study found a higher incidence of abdominal pain and vomiting in Postmonsoon cluster of patients.
- Our study has detected a greater severity of Thrombocytopenia, Hyponatremia, ALT elevation, Creatinine elevation in Postmonsoon cluster of patients in comparison to Pre-monsoon cluster of patients.
- Incidence of complication like AKI, ARDS, shock, myocarditis, ICU admission, need of mechanical ventilation was higher in Postmonsoon cluster of patients
- More chiggers remain attached to rodents in Monsoon months may have some bearing with greater incidence and severity of infection in Postmonsoon months
- A greater degree of inflammation as evidenced by significantly higher extent of CRP level in Postmonsoon cluster may explain the higher incidence of severity and complication in Postmonsoon cluster

Western Pacific Islands, and northern Australia. The enclosed area is often known as the "*Tsutsugamushi Triangle*"⁴.

In India, the infection was first documented among the field troops in Assam and West Bengal during WWII. Since then, a Pan-India presence of Scrub typhus has been documented including Jammu and Kashmir, Himachal Pradesh, Uttaranchal (now known as Uttarakhand), Bihar, West Bengal, Meghalaya, Rajasthan, Maharashtra, Karnataka, Tamil Nadu and Kerala⁵.

Incidence of Scrub typhus is common among Rural

population because they are more likely to have exposure to rodents at home or at work or to the chiggers sitting on grass blades or bushes during occupational or recreational activities⁶. The disease is seasonal in many parts of India. Outbreaks generally occur after the Monsoons, because occurrence of Trombiculid mites is influenced by rainfall, with more Chiggers attached to the rodents during the wetter months⁷.

After 1970s, the Scrub typhus saw a decline in prevalence probably due to wide-spread use of pesticides and use of Tetracycline and Chloramphenicol in treating acute febrile episodes. Unfortunately, this disease has shown resurgence in the recent years, with many changes in its epidemiologic patterns. Previously confined to the Himalayan region and Southern States of Tamil Nadu and Kerala, the disease is now reported from majority of States in India. Scrub typhus has also spread from its classical forest and Rural location to the Urban sector. There have been outbreaks of the disease in the Metropolitan cities like Delhi and Kolkata in the recent years. Once thought to be a Seasonal disease, Scrub typhus cases are now being recognized round the year. In the present study we have diagnosed cases both from the Hot and Dry months of April and May and during the Postmonsoon months, August to November.

Clinical Features :

The incubation period of Scrub typhus ranges from 6-21 days (average 10-12 days)⁹. Common symptoms are Fever, Chills, Headache, Myalgia, Enlarged lymph nodes with or without Nausea, Vomiting, Pain abdomen, Cough, Rash and Mental confusion. Clinical diagnosis is often made by the presence of an Eschar, at the site of the Chigger bite. Identification of eschars in Indian population is difficult due to dark skin with incidence ranging from 4%-46%⁵.

Patients with severe illness may develop complications like Septic or Hypovolemic Shock, ARDS and Respiratory failure, Myocarditis, Encephalitis, Hepatitis, Acute kidney injury, Rhabdomyolysis, DIC, Haemophagocytic syndrome, Transient adrenal insufficiency and Subacute painful thyroiditis, Multiorgan failure, and Death¹⁰.

Laboratory findings such as Anaemia, Thrombocytopenia, normal or low WBC counts with Predominant lymphocytosis, Electrolyte abnormalities, Mild to moderate elevations in Serum transaminases, and raised inflammation markers (C-reactive Protein and ESR) were frequently seen.

Establishing the etiologic diagnosis of rickettsioses is very difficult during the acute stage of illness and definitive diagnosis usually requires the examination of Serum samples for IgM antibody or *O.*

tsutsugamushi DNA PCR during the acute and convalescent phases of illness¹¹.

Doxycycline is the drug of choice in Scrub typhus infection. A good treatment response was defined as recovery of scrub typhus without complications. The case-fatality rate for untreated classic cases is 16% but would probably be lower if all mild cases were diagnosed and treated on time¹¹.

AIMS AND OBJECTIVES

- To compare the clinical features, laboratory characteristics and complication of the scrub typhus cases admitted during the Postmonsoon months (Aug-Nov) with those presenting in the Pre-monsoon (April-May) months, in our Tertiary Care facility.

Study Design :

Cross-sectional, Observational study.

MATERIALS AND METHODS

All serologically proven Scrub typhus cases, aged above 16 years, who were admitted in our hospital during the period April to November in the year, 2018 were included in the study and divided into two groups. The Pre-monsoon group included cases diagnosed during April to May, while the Postmonsoon group included cases presenting between August and November.

The diagnosis of Scrub typhus was established by detection of the scrub typhus IgM antibody through Indirect Immunofluorescence Assay.

Any other cause of acute undifferentiated fever was excluded by following the institutional protocol. [Blood for Malarial Parasite, MPDA, Dengue NS1 Ag and IgM, S typhi IgM, and Viral Serology (HIV I, II, HBsAg, Anti HCV, IgM Anti HAV and IgM Anti HEV as and when required)].

Following laboratory parameters were checked in all the patients:

- (1) Complete haemogram including haematocrit.
- (2) Total Leucocyte count, Differential count and Platelet counts.
- (3) CRP level
- (4) Sodium, Potassium, Urea, Creatinine.
- (5) Liver Function Test
- (6) Chest X-ray
- (7) Ultrasound whole abdomen

Special tests such as Arterial Blood Gas analysis, Neuroimaging, CSF analysis, EMG were done as and when required.

Inclusion criteria :

- Age group : 16 years and above.
- Positive Scrub typhus IgM serology.
- Absence of other causes of Acute Undifferentiated Fever.

Exclusion criteria :

- Age below 16 years.

• Laboratory evidence of any other cause of Acute Undifferentiated Fever.

All patients satisfying the above-mentioned criteria during the time period April to November, 2018 were included in the study.

A predesigned questionnaire was used for systematic data collection.

Statistical Analysis :

Categorical variables were presented as percentage and continuous variables were presented as mean \pm standard deviation and IQR. Categorical variables were analysed using Chi-squared test or Fisher's Exact test, whichever applicable.

For all tests, a two-sided P value of 0.05 or less was considered statistically significant.

All statistical analyses were performed using SPSS software.

RESULTS

Demographic Characteristics :

A total number of 32 cases of Serologically proven Scrub typhus are documented. Among them 12 cases are diagnosed during the Pre-monsoon months, April to May, whereas 20 cases are detected during the Postmonsoon months (August to November).

The oldest patient is 50 years while youngest is of 16 years. The mean age at presentation is 31.67 in the Pre-monsoon group versus 38.25 in the post monsoon group.

The Gender distribution in both the groups were almost similar [Males 58% versus 55%; females 42% versus 45%]. The M to F ratios is almost similar in both the groups (1.4 versus 1.2).

Majority of the patients are from Urban and semiurban region around Kolkata (60%). The Geographic distribution in both groups was not much different (Table 1 and Figs 1&2).

Clinical Characteristics :

Fever was the most common presenting feature and was present in all the cases. The average duration of fever was 9.16 days. There was no significant difference in fever duration between the Postmonsoon and Pre-monsoon disease clusters (9.93d versus 9.02d).

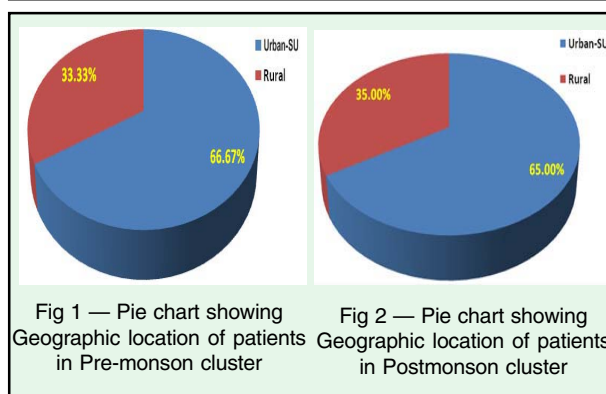
Constitutional symptoms like headache, myalgia, Malaise was present in all the cases.

Lower respiratory symptoms like Cough, Chest pain and Shortness of breath were present in 27 (84.3%), 23(71.88%), 26(81.25%) of total 32 patients respectively and these symptoms were almost equally represented in both the clusters.

Upper respiratory Symptoms like Nasal stuffiness, Sore throat was present in total 17 out of 32 patients (53%).

Table 1 — Demographic characteristics of Scrub typhus patients in the Pre monsoon and Postmonsoon clusters

Demographic characteristics	April-May (n=12)	August-November (n=20)
Age	31.67 (15-48)	38.25 (24-50)
Gender :		
Males	7 (58%)	11 (55%)
Females	5 (42%)	9 (45%)
M : F ratio	1.4	1.2
Locality :		
Urban and Semiurban	8(66.67%)	13(65%)
Rural	4 (33.33%)	7 (35%)



GI Symptoms like Nausea, Vomiting Diarrhea were reported in total 46% patients mostly in Postmonsoon cluster of patients which is comparable to data from South Indian study (28-40%) but lower than North Indian reports (57-60%)^{8,12}. GI Symptoms like Vomiting and abdominal pain were statistically significantly higher in Postmonsoon cluster. Only 4 patients in the Pre-monsoon cluster reported nausea and none had vomiting or pain abdomen. This difference was statistically significant.

Nearly half of the patient presented with Cognitive impairment which is higher than figures reported in the previous studies (20-30%)¹¹⁻¹⁵. 50% patients in the Pre-monsoon and 55% patients in the Postmonsoon cluster had altered sensorium.

Tachycardia, Tachypnea and Hypotension were the most common signs on physical examination. Tachycardia was present in all the patients. Tachypnoea was present in 83.3% and 80% patients respectively. Hypotension was present in 66.7% and 80% patients respectively, most of them improved with fluid resuscitation, few patients required inotropic support.

Presence of Eschar was documented in 4 patients in the Pre-monsoon cluster and 10 patients in the Postmonsoon cluster (33% and 50% respectively) and the difference was not statistically significant. Total 43.8% of patients had Eschar which is comparable to the reports from South India(43.5%)but much higher than those reported from North India (9.5-14%)⁸⁻¹⁵.

Maculopapular rash with sparing of face, palms and

soles was present in only 2 patients in the Pre-monsoon group as compared to 4 patients in the Postmonsoon group. (16.7% *versus* 20% respectively). This data was comparable to the data in studies from Vellore and the Himalayan region (20-22%)^{8,11}.

Spleen was palpable in 59% patients, whereas Liver was palpable in 25% patients and the Incidence of Organomegaly was not much different between two clusters of patients. Incidence of splenomegaly is higher to study from PGI, Chandigarh (45%)¹⁵. Though another study from North India reported a similar incidence of splenomegaly (60%)¹⁶. Lymph nodes were palpable in 6 patients (18.75%).

None of the clinical characteristics was different in between two clusters except the incidence of GI manifestation in the form of abdominal pain and vomiting which was significantly higher in Postmonsoon cluster of patients.

Laboratory Characteristics :

The most common laboratory finding on Routine blood Tests are Raised Serum Creatinine and Thrombocytopenia. Serum Creatinine was raised in 5(41.7%) patients and 13(65%) patients in Pre and Postmonsoon cluster respectively. Though the difference of incidence of AKI was not statistically significant in between both the clusters, renal impairment was more severe in Postmonsoon cluster.

Anemia was present in 53% of patients in the study. Incidence of anemia as 33.3% in the Pre-monsoon cluster as compared to 65% in the Postmonsoon group. The difference was almost close to statistical significance.

Leucopenia was present in 33.33% of patients in Pre-monsoon cluster and in 20% in the Postmonsoon cluster.

Leukocytosis was present in 16.7% of patients in the Pre-monsoon cluster as compared to 20% patients in the Postmonsoon cluster. Neither of the difference was statistically significant.

The most common electrolyte abnormality was Hyponatremia. The incidence of Hyponatremia in Pre-monsoon group was 41.7% as compared to 40% in the Postmonsoon group. Though the difference in incidence of Hyponatremia was not of any statistical significance in between two clusters, hyponatremia was much more severe in Postmonsoon cluster of patients. Mean sodium value in Pre-monsoon cluster of patients was 130±6 mEq/L and Postmonsoon cluster was 122±5 mEq/L and the p value was <0.001.

Incidence of hypokalemia is 33.3% in the Pre-monsoon group as compared to 25% in the Postmonsoon group.

In the Pre-monsoon cluster 33.3% of patient had

Hyperkalemia as compared to 45% in the Postmonsoon group. Difference in incidence as well as Mean Potassium value was not significantly different in between the groups.

Deranged Liver Function Tests (LFT) were found in many of the patients. The most common abnormality in LFT was elevation in AST and ALT. Other parameters were within normal range. None of the patients had Hyperbilirubinemia or elevation in cholestasis markers (ALP). Transaminitis defined in the present study as greater than 3 times elevation in AST, ALT levels were observed in 50% of patients in the Pre monsoon group as compared to 55% patients in the Post monsoon group. Mean value of ALT in Pre monsoon cluster was 100±40 IU and in Postmonsoon cluster was 200±160 IU and the severity of ALT elevation was significantly higher in Postmonsoon cluster (p value 0.04).

CRP is an inflammatory marker. The upper limit of normal for CRP in our laboratory is 6.0 mg/L. CRP greater than the cut off value indicates activation of systemic inflammatory response. Raised CRP was present in all the patients but the extent of elevation was higher in Postmonsoon cluster of patients suggesting more severe degree of inflammation in Postmonsoon cluster of patients. Mean CRP level in Pre-monsoon cluster was 35±27 mg/L and in Post monsoon cluster was 92±80 mg/L and the difference was significant (p value 0.02).

Complications and Clinical Outcomes :

AKI was a common complication and was present in 41.7% and 65% patients in Pre- and Postmonsoon group of patients. However, the AKI was non oliguric and none of the patients required Renal Replacement Therapy.

Incidence of ARDS was widely variable from studies all over India (ranging from 12% to 73.3%)¹¹⁻¹⁵. In our study ARDS was present in 3 (25%) and 8 patients (40%) in Pre- and Postmonsoon cluster respectively. 5 patients from Postmonsoon cluster required mechanical ventilation and none of the patients from Pre-monsoon cluster required mechanical ventilation. Myocarditis was another complication which was found in both the clusters. The incidence of Myocarditis was 16.7% in the Pre-monsoon cluster as compared to 30% in the Postmonsoon cluster. In our study overall 75% of patients had Hypotension at presentation but only 18.75% required pressor support. Incidence of shock in report from North India was 16-20%¹²⁻¹⁵. However two studies from Vellore reported a strikingly higher incidence of shock (60-65%)^{8,12}. One patient in the Postmonsoon group also developed myositis which resolved without any sequelae.

Two patients from Pre-monsoon cluster (16.7%) and 8 patients from Postmonsoon cluster (40%)

needed ICU admission and all of them recovered (Tables 2-4).

DISCUSSION

After its re-emergence, Scrub typhus has become an important cause of morbidity and mortality in patients presenting with Acute Febrile Illness during monsoon and Postmonsoon season¹⁹.

According to WHO, Scrub typhus is probably one of the most underdiagnosed and underreported febrile illnesses requiring hospitalization⁴.

Scrub typhus is an endemic zoonoses caused by *O. tsutsugamushi*. Trombiculid mites serves as vector as well as reservoir for this Infectious Disease. Humans are the accidental hosts. The disease is transmitted to humans through bite of Trombiculid mites.

Previously considered a Seasonal Disease with distribution mainly in the Rural Areas, cases are being increasingly recognized in the Metropolitan Cities and beyond the Monsoon months^{1,8}. In our study we got a greater number of patients from urban and semiurban area in comparison to Rural areas.

In our study we got clustering of cases with 12 patients were admitted during the dry months of April and May and another cluster of 20 patients during the Postmonsoon months from August to November. In this study we present a comparison of clinical profile and laboratory data of the Pre-monsoon versus Postmonsoon cluster of Scrub typhus patients admitted in our institution.

Fever and constitutional symptoms like Headache, Myalgia, Malaise were the most common presenting features in both these groups.

Upper and Lower Respiratory Symptoms like Cough, Shortness of Breath, Chest Pain and Sore Throat, Stuffy Nose was common manifestation which was present in both the groups without any significant difference in incidence.

Our study found a statistically significant higher number of GI manifestation in the form of vomiting and abdominal pain in Postmonsoon cluster of patients the significance of which is not known.

Tachycardia and Tachypnoea were the most common signs present on physical examination in both the clusters of patients.

Presence of Eschar is more common in the Postmonsoon group (50%) compared to 33.4% in the Pre monsoon group, but the difference was not statistically significant. Though one of the most specific clinical features of Scrub typhus infection, clinician should not give over reliance on presence of eschar as absence of it does not rule out the possibility of Scrub typhus infection.

Table 2 — Clinical characteristics of Scrub typhus patients in the Pre monsoon and Post monsoon clusters

Clinical features	April-May (N=12)	Aug-Nov (N=20)	p value (Fisher's exact test)
Symptoms :			
Fever	12 (100%)	20 (100%)	1.00
Headache	12 (100%)	20 (100%)	1.00
Myalgia	12 (100%)	20 (100%)	1.00
Sore throat	5 (41.7%)	12 (60%)	0.46
Cough	10 (83.3%)	17 (85%)	1.00
Chest Pain	7 (58.4%)	16 (80%)	0.24
Sputum	2(16.7%)	6 (30%)	0.68
Shortness of breath	10 (83.3%)	16 (80%)	1.00
Nausea	4 (33.3%)	9 (45%)	0.71
Vomiting	nil	4 (20%)	0.01
Abdominal pain	nil	4 (20%)	0.01
Cognitive impairment	6 (50%)	11 (55%)	1.00
Signs :			
Eschar	4(33.3%)	10 (50%)	0.47
Tachycardia	12 (100%)	20 (100%)	1.00
Tachypnoea :			
Hypotension	8 (66.7)	16 (80%)	0.43
Rash	2 (16.7%)	4 (20%)	1.00
Palpable Liver	3 (25%)	5 (35%)	1.00
Palpable Spleen	7 (58.4%)	12 (60%)	1.00
Lymphadenopathy	2 (16.7%)	4 (20%)	1.00
Encephalopathy	5 (41.7%)	9 (45%)	1.00
Complications :			
AKI	5(41.7%)	13(65%)	0.35
ARDS	3(25%)	8(40%)	0.63
Myocarditis	2 (16.7%)	6 (30%)	0.68
ICU admission	2 (16.7%)	8 (40%)	0.24
Mechanical ventilation	nil	5 (25%)	0.13

Maculopapular rash was present in 4 patients in the Postmonsoon group (20%) which is comparable to the data in studies from both Vellore and the Himalayan region (20-22%)^{8,11}.

However, rash was absent in all patients in the Pre-monsoon cluster.

Among laboratory findings, most conspicuous finding is Thrombocytopenia (78%). Most studies in

Table 3 — Laboratory characteristics of Scrub typhus patients in the Pre monsoon and Post monsoon clusters

Laboratory abnormalities (cut-offs)	Cluster 1 (n=12)	Cluster 2 (n=20)	p value (Fisher's exact test)
Anaemia (Hb < 11 g/dL)	4 (33.3%)	13 (65%)	0.14
Leucocytosis (TLC >11000 cells/cu mm)	2 (16.7%)	4 (20%)	1.00
Leukopenia (TLC <4000 cells/cu mm)	4 (33.3%)	4 (20%)	0.43
Thrombocytopenia (Plat count <1.0 lakh/cu mm)	8 (66.7%)	17 (85%)	0.38
Hyponatremia (Na < 135 mEq/L)	5 (41.7%)	8 (40%)	1.00
Hypokalaemia (K < 3.5 mEq/L)	4 (33.3%)	3 (15%)	0.37
Hyperkalaemia (K > 5.5 mEq/L)	4 (33.3%)	9 (45%)	0.71
Transaminitis (ALT, AST > 3x ULN)	6 (50%)	11 (55%)	1.00
Renal dysfunction (Sr. Creatinine >1.5 mg/dL)	8 (66.7%)	20 (100%)	0.01
Raised CRP (> 6.0mg/dL)	12 (100%)	20 (100%)	1.00

Table 4 — Baseline Laboratory parameters in Scrub typhus patients in the Pre-monsoon and Postmonsoon clusters

Laboratory abnormalities	Cluster 1 (n=12)	Cluster 2 (n=20)	P value (Unpaired t-test)
Haemoglobin (g/dl)	11.5±4	9±3.5	0.07
Leucocyte count (cells/cu mm)	8000±3500	12000±8500	0.13
Plat count (cells/cu mm)	2.0±0.3	1.2±0.5	<0.001
Sodium (mEq/L)	130±6	122±5	<0.001
Potassium (mEq/L)	3.2±0.5	3.3±0.5	0.58
Urea (mg/dl)	52±30	96±80	0.07
Creatinine (mg/dl)	1.6±0.6	2.4±1.2	0.04
ALT (IU/L)	100±40	200±160	0.04
AST (IU/L)	90±30	155±130	0.10
C reactive protein (mg/dl)	35±27	92±80	0.02

India have reported almost similar rates of Thrombocytopenia¹¹⁻¹⁵. Severity of Thrombocytopenia was statistically significantly higher in Postmonsoon cluster ($p < 0.001$). So it is to be kept in mind that like Dengue, Scrub typhus is also a cause of fever with Thrombocytopenia. Besides Thrombocytopenia, incidence and severity of Anaemia was much more common in Postmonsoon cluster and it was very close to statistical significance.

Leucocytosis was more common in the Postmonsoon group (20%) whereas leukopenia was more common in Pre monsoon cluster (33.3%).

The most common Electrolyte abnormality in rickettsial illness is Hyponatremia. This is attributable to Endothelial Injury and increased capillary permeability as well as Syndrome of Inappropriate Antidiuretic Hormone (SIADH). In our study 40.6% of patients had Hyponatremia. Although the incidence of hyponatremia is equivalent in both Pre-monsoon and Postmonsoon clusters, severity of Hyponatremia was more in Postmonsoon cluster which was statistically significant ($p < 0.001$).

Previous studies have reported hepatic dysfunction in patients with Scrub typhus with Hepatocellular pattern of abnormality. This was ascertained by our study as well. Transaminitis up to 5 times ULN was noted in 50% and 55% of the patients in Pre- and Post monsoon cluster of patients respectively. Severity of ALT elevation was significantly higher (p value 0.04) in Postmonsoon cluster suggesting more severe level of Hepatocellular Injury. But Hyperbilirubinemia or clinical Jaundice was not seen in any of our patients¹⁷.

The most common complications of Scrub typhus in various studies are ARDS, AKI, Myocarditis and Circulatory dysfunction, Sepsis, MODS, and DIC¹¹⁻¹⁸.

ARDS incidence is widely variable from studies all over India (ranging from 12% to 73.3%)¹¹⁻¹⁵. In our study 41.7% and 65% patient fulfilled the criteria for ARDS. Out of them 5 (15.6%) was put on ventilatory support.

Myocarditis is another dreaded complication of

Scrub typhus. In our study 75% of patients had hypotension at presentation, but only 18.75% of patients required pressor support.

AKI was present in 41.7% and 65% patients from Pre- and Postmonsoon cluster respectively. This figure was in line with figures reported elsewhere in India (18-64%)^{8,11-15}.

One female patient in the Postmonsoon group presented with bilateral thigh pain and lower limb weakness. Her serum CPK total level was raised and EMG suggestive of myositis. Muscle involvement is a rare complication in Scrub typhus patients, and mostly in the form of Rhabdomyolysis^{20,21}. Our patient had transient myositis which resolved without any sequelae.

Case fatality was nil in our study. Data from other Indian studies have shown that the case fatality rate in Scrub typhus has ranged from 1.2% to as high as 46.3% depending on the complications^{8,11-15}. Higher case fatality rates are attributable to a lack of awareness of this disease and delay in diagnosis and administration of antibiotics. From a study in South India, an observational study has shown a reduction in mortality with an increasing awareness of this infectious disease¹⁸.

This study has some limitations.

Firstly, this is a single-centre study of a relatively small number of patients.

Secondly, data collection was done retrospectively. So, the generalizability of the clinical and laboratory data remain unclear.

Further studies are needed to find out the correlation of disease severity with Demographic and Clinico-laboratory data with larger number of patients. Further studies are also needed to find out the role of greater numbers of Chiggers being attached to rodents during Monsoon months and role of more severe degree of inflammation in Postmonsoon cluster of patients in explaining its greater severity in Postmonsoon months.

CONCLUSION

With the changing epidemiology of Scrub typhus, it is now among the commonest causes of AFI in India.

According to WHO, Scrub typhus is probably one of the most under diagnosed and under-reported febrile illnesses requiring hospitalization. In our study we found significant number of patients from Urban and semiurban areas and in wet Monsoon months as well as in dry months of the year. We must keep this in mind that Scrub typhus infection does not always follow definite Geographical and Seasonal pattern of distribution.

A high index of suspicion should be maintained as the clinical feature cannot be differentiated from other causes of Acute Febrile Illness. Like Dengue, Scrub

typhus is also a cause of fever with thrombocytopenia. Presence of eschar, though one of the most specific manifestations, is less sensitive. Absence of eschar does not exclude scrub typhus infection. Early diagnosis and management are warranted to prevent disease complications and fatality. The disease shows dramatic response to Doxycycline if instituted early.

In this study we compared the clinical and laboratory profile of pre-monsoon and Postmonsoon cluster of patients and the incidence of their complication. This is probably the first study in India that focuses on Scrub typhus cases occurring during wet Monsoon months with those presenting beyond these months.

Our study had some interesting observation.

Despite apparent similarities in the clinical presentation of this disease in the Pre-monsoon and Postmonsoon months, our study demonstrated some differences in clinical and laboratory profile as well as incidence of complication in between two clusters of patients. GI manifestation in the form of abdominal pain and vomiting was significantly more common in Postmonsoon clusters. Severity of Thrombocytopenia, severity of Hyponatremia, extent of ALT elevation and severity of CRP elevation was significantly greater in the Postmonsoon group (P value <0.05). Renal parameters was worse in Postmonsoon cluster of patients. Extent of elevation of Serum Creatinine was much more severe in Postmonsoon cluster of patients (p value <0.05).

We found Scrub typhus patients presenting during classical Monsoon months had greater severity in terms of complications. Incidence of AKI, ARDS, Myocarditis, Shock were common complications in both the groups and were found in larger number of patients in Postmonsoon cluster, but the difference was not statistically significant. More number of patients in Postmonsoon clusters required ICU admission and Mechanical ventilation. Though a significant number of our patients had morbidity and complications, case fatality was nil in our study. We observed that though the Scrub typhus infection occurs in Postmonsoon wet months as well as Pre-monsoon dry months, it poses bigger challenges in Postmonsoon months in terms of its severity. More Chiggers remain attached to the rodents during wetter months may have some implication in relation to the greater incidence and severity of this infection. More severe degree of inflammation as evidenced by clearly greater elevation of CRP in Postmonsoon cluster may explain the occurrence of greater complication in that cluster. Further studies are required in this field.

Further studies are also needed to find out the correlation of disease severity with Demographic and Clinico laboratory data with larger number of patients.

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