

# Seroprevalence of Scrub typhus in a rural tertiary care hospital of Eastern India



Saswati Chattopadhyay<sup>1</sup>, Nabamita Chaudhury<sup>2</sup>, Tanusri Biswas<sup>3</sup>

<sup>1</sup>Associate Professor, <sup>2</sup>Assistant Professor, <sup>3</sup>Associate Professor & Head, Department of Microbiology, Burdwan Medical College, Burdwan, West Bengal, India

Submission: 06-06-2022

Revision: 26-08-2022

Publication: 01-10-2022

## ABSTRACT

**Background:** Scrub typhus is a Rickettsial infection caused by a gram-negative intracellular bacillus *Orientia tsutsugamushi*. It is an important cause of pyrexia of unknown origin (PUO). The infection is spread by the larval form of a mite--*Trombiculid* soft mite and is called 'chiggers'. The infection affects man accidentally. **Aims and Objectives:** The study was done to find the sero-prevalence of the infection in patients with high fever not responding to any treatment. **Materials and Methods:** The study was conducted for 1 year (January 2021 to December 2021 in patients of all ages and sexes complaining of high fever and body ache with/without seizures and change in mental status. The serum samples were subjected to immunoglobulin M enzyme linked immunosorbent assay for Scrub typhus after excluding the other causes of the common febrile illnesses such as Malaria, Japanese encephalitis), chikungunya, dengue, typhoid and leptospirosis. **Results:** The seroprevalence of Scrub typhus in this study period was 39.74 % amongst the 761/1915 positive samples. Maximum number of positive cases were noted in the cooler months of the year -- November 2021 (192 cases; 25.23%) followed by December (142; 18.66%). Of all the positive cases, maximum 396 (78%) were found in patients residing in the rural areas of the Purba Burdwan district. Furthermore, the maximum number of cases was found in the age group 0-10 yrs—463 (60.84%) but a very slight male predominance. No mortality, however, was reported. **Conclusion:** Scrub typhus is an emerging infection and early treatment can save many lives.

**Key words:** Scrub typhus; *Orientia tsutsugamushi*; *Trombiculid* mite.

## INTRODUCTION (205)

Scrub typhus is an easily treatable zoonotic disease of high mortality<sup>1</sup> which is caused by a gram-negative intracellular bacillus *Orientia tsutsugamushi*.<sup>2</sup> The infection is transmitted accidentally to men by *Trombiculid* soft mite; the wild rats, *Rattus*, are its natural hosts. It affects people of all ages causing very high fever, headache, myalgia and eschar (which though, pathognomonic is difficult to identify in dark skinned South Asians).<sup>3,4</sup>

About 1 week after the soft mite bite, the patient develops fever with rash, headache, cough, body ache, pain abdomen nausea and vomiting. The patients develop an eschar at the site of mite bite which is an ulcerative inflammatory

papule with black center but it is difficult to identify in dark skinned Indians. The eschar is the hallmark sign of scrub typhus but is present in 7-80% patients only.<sup>3,4</sup>

There may be multi system involvement--hepatitis, acute respiratory distress syndrome, disseminated intravascular coagulation<sup>5,6</sup> and even central nervous system involvement (12.5-26%)<sup>7,8</sup> leading to a diagnosis of acute encephalitic syndrome or acute undifferentiated febrile illness.<sup>9</sup>

The condition usually presents as pyrexia of unknown cause and so high degree of suspicion is required in the treatment of patients with high fever not responding to the usual antibiotics.

### Access this article online

#### Website:

<http://nepjol.info/index.php/AJMS>

DOI: 10.3126/ajms.v13i10.45554

E-ISSN: 2091-0576

P-ISSN: 2467-9100

Copyright (c) 2022 Asian Journal of Medical Sciences



This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License.

### Address for Correspondence:

Dr Saswati Chattopadhyay, Associate Professor, Department of Microbiology, Midnapore Medical College, Paschim Midnapore, West Bengal, India. Pin:-721101. **Mobile:** 9830304591 **E-mail:** dr.saswatichattopadhyay@gmail.com

### Aims and objectives

The aim of the study was to know the prevalence of the infection amongst febrile patients attending a rural tertiary care hospital of Eastern India.

### MATERIALS AND METHODS

An observational cross-sectional study was conducted in the Department of Microbiology, Burdwan Medical College and Hospital, West Bengal for a period of 1 year- January 2021 to December 2021. Patients of all ages and both sexes complaining of having acute onset of high fever and body ache with/without seizures and change in mental status were included in the study. Institutional Ethics Committee permission was obtained and informed consent was also taken from the patients/guardians for the study.

Detailed demographic data, complete history and clinical examination were done in each patient. A total of 1915 clinically suspected patients presenting to our hospital with the above symptoms were included in the study.

About 2 c.c. blood was collected aseptically; the sera were separated from the clotted blood samples and stored in aliquots at -20°C. The samples were tested for the presence of any bacteria such as typhoid and malaria parasites. Hb gm%, WBC and platelet counts of the patients were also estimated but were found to be normal.

All of the samples were subjected to an enzyme-linked immunosorbent assay (ELISA) test to detect the presence of immunoglobulin M (IgM) antibodies against Japanese encephalitis, chikungunya and dengue using the kit provided by the NIV, Pune. IgM ELISA for Scrub typhus was done using the InBios International Inc., Seattle, WA, USA kit. A cut off Optical density (OD) >0.5 was considered positive in IgM ELISA.<sup>3</sup>

The following were excluded from the study-

- Improperly collected samples.
- Patients with no informed consent.
- Samples IgM ELISA positive for JE, CHIKV and DENV were excluded from the study.

The detailed data obtained were entered into Microsoft Excel sheet and analyzed.

### RESULTS

A total of 1915 samples were collected from January 2021 to December 2021 and subjected to IgM ELISA for Scrub typhus; of these 1915 suspected cases 761 (39.74%) were

positive and rest 1154 were negative. A seasonal trend of increase of positive case was noted from July 2021 to December 2021 with peak incidence in the month of November 2021 (192 cases; 25.23%) followed by December (142; 18.66%). No positive samples were found in the months January, February and March. (Table 1)

Different districts of West Bengal and Jharkhand reported positive cases –maximum from Purba Burdwan itself (495; 65.05%) (Table 2)

Another interesting thing that was noted was that amongst the 495 positive cases reported from the district of Purba Burdwan, 396 (78%) were from people residing in the rural areas of the district and only 109 (22%) cases were from Sadar Burdwan and other urban areas of the district.

Amongst the 761 positive cases, it was noted that the maximum cases were found in the age group 0-10 years—463 (60.84%) followed by the age group 11-20 years (98; 12.88%). A male to female sex ratio of 1: 1.10 (398 males and 363 females) was also noted amongst the 761 positive Scrub typhus cases. (Table 3)

The minimum age which reported the infection is 27 days and the maximum age who reported the infection was 75 years.

**Table 1: Trend of scrub typhus throughout the year**

Month	Positive	Negative
January 2021	00	00
February 2021	00	00
March 2021	00	00
April 2021	04	29
May 2021	01	36
June 2021	26	72
July 2021	80	125
August 2021	82	155
September 2021	100	133
October 2021	134	164
November 2021	192	218
December 2021	142	222
Total	761 (39.74%)	1154

**Table 2: District-wise distribution of scrub typhus throughout the year**

West Bengal	District	Number
	Purba Burdwan	495
	Paschim Burdwan	42
	Birbhum	126
	Murshidabad	38
	Bankura	34
	Hooghly	14
Jharkhand	Pakur and Dumka	12
Total		761

**Table 3: Age & sex-wise distribution scrub typhus throughout the year**

Age	Male	Female	Total
0-10 years	268	195	463
11-20 years	45	53	98
21-30 years	20	29	49
31-40 years	22	28	50
41-50 years	18	33	51
51-60 years	16	17	33
>60 years	09	08	17
Total	398	363	761

## DISCUSSION

The name scrub typhus is derived from the terrain vegetation areas where the vectors-- “chiggers” infected with the intracellular bacteria, *O.tsutsugamushi* lives. The chiggers are the larval stage of the *Trombiculid* mite—a soft mite which gets infected through the blood meal taken by the bacteria. The word “typhus” is a Greek word meaning “fever with stupor” and “Tsutsuga” stands for small and dangerous while “mushi” means insect or mite.

It has been estimated that about 1 billion people worldwide are at risk and about 1 million people are developing the infection every year.<sup>4</sup>

A tsutsugamushi triangle has been found worldwide extending from Japan in the East to Philippines and Australia in the south, India and Pakistan in the West to Southern parts of Russia in the North. Hence the infection is rampant in India, Pakistan, Indonesia, Nepal, Sri Lanka, Thailand and other countries falling in this triangle.<sup>10</sup>

In India, the infection is endemic in most areas of the country, being present in the mountains of Kashmir in the North to Assam in the East, in the mountains and forest areas of the Western and Eastern Ghats and in the grasslands and river banks of the country. This is because the atmosphere in these areas is very much suitable for the bacteria (*O. tsutsugamushi*) to thrive infecting the mites which then spreads the infection.<sup>4</sup>

The prevalence of the infection is varied in different countries ranging from 0–8% to 60%.<sup>11</sup> In India, the prevalence rate varies from 13 to 63%.<sup>12</sup> In our study, the prevalence rate was 39.74% which is unlike the prevalence reported by Lakshmi et al in a study conducted in Telengana who found the prevalence to be 13.7%.<sup>9</sup> A study in Thailand however reported a sero positivity rate of 59.5%.<sup>13</sup>

The most of the infections was reported in the age group 0-10 year age group (463/761; 60.84%) followed by the age group 11-20 years (98/761; 12.88%) with slight male predominance than in females. Similar male

predominance was also found in a study conducted by Subbalaxmi et al in Andhra Pradesh.<sup>14</sup>

Maximum number of cases was found in the cooler seasons of the year with the highest number of cases being found in the month of November (192) followed by December (142). This finding is similar to different studies.<sup>3,15</sup>

Maximum number of cases was reported from the district of Purba Burdwan (505); of these maximum patients came from the rural areas of the district—396 (78%) and only 109 (22%) cases came from the urban areas of the district. This finding is in concordance with the studies conducted by Saha et al and also with the data found by Indian Council of Medical Research.<sup>16,17,18</sup>

Fever is the most common symptom reported by the different patients which is similar to other studies.<sup>3,9,19</sup>

No mortality was found in the study and all the patients recovered fully from the infection probably because of early diagnosis and increased use of the drug Doxycycline for the treatment of the infection.

### Limitations of the study

Molecular characterization of isolates was not studied.

## CONCLUSION

The diagnosis of scrub typhus should be kept in mind while treating all patients from high fever not responding to the usual group of antibiotics. This is because rickettsial diseases are re emerging in India especially in the Eastern and Southern parts of India. Furthermore, IgM ELISA is a very specific and economical diagnostic test for the early diagnosis and proper treatment of this re-emerging but highly treatable infection.

## ACKNOWLEDGEMENT

We are grateful to the Principal, Dean and Medical Superintendent of Burdwan Medical College for allowing us to conduct the study. We are also thankful to all the staff of microbiology laboratory for co-operating with us to carry out the study. Finally we are very much grateful to all the participants of this study for their full hearted support and co-operations.

## REFERENCES

- Rathi N, Rathi A. Rickettsial infections: Indian perspective. *Indian Pediatr.* 2010;47:157–64. <https://doi.org/10.1007/s13312-010-0024-3>
- Kelly DJ, Richards AL, Temenak J, Strickman D, Dasch GA.

- The past and present threat of rickettsial diseases to military medicine and international public health. *Clin Infect Dis*. 2002;34(Suppl 4):S145–69.  
<https://doi.org/10.1086/339908>
3. Mallick SK, Hazra S, Nandi T, Sarkar A. Scrub typhus: A hospital- based study in the northern districts of West Bengal, India. *Int J Res Med Sci*. 2019 Jun;7(6):2403-2407.  
<https://doi.org/10.18203/2320-6012.ijrms20192537>
  4. Chakraborty S, Sarma N. Scrub typhus: an emerging threat. *Indian J Dermatol*. 2017; 62 (5): 478.  
[https://doi.org/10.4103/ijd.IJD\\_388\\_17](https://doi.org/10.4103/ijd.IJD_388_17)
  5. Jeong YJ, Kim S, Wook YD, Lee JW, Kim KI, Lee SH. Scrub typhus: clinical, pathologic, and imaging finding. *Radiograp*.2007; 27(1):161-72.  
<https://doi.org/10.1148/rg.271065074>
  6. Tsay RW, Chang FY. Serious complications in scrub typhus. *J Microbiol Immunol Infect*.1998;31:240.
  7. Ben RJ, Feng NH, Ku CS. Meningoencephalitis, myocarditis and disseminated intravascular coagulation in a patient with scrub typhus. *J Microbiol Immunol Infect* 1999; 32: 57-62.
  8. Silpapoajakul K, Ukkachoke C, Krisanapan S, Silpapoajakul K. Rickettsial meningitis and encephalitis. *Arch Int Med*.1991; 151 (9):1753-7.  
<https://doi.org/10.1001/archinte.1991.00400090051010>
  9. Lakshmi NVMM Ram, Dharma VT, Sudhakaran S, Surya VMS, Emmadi R, Yadati SR, Modugu RN, Jyotsna A. Prevalence of scrub typhus in a tertiary care centre in Telangana, south India *Iran J Microbiol*. 2020 Jun; 12(3): 204–208.  
<https://doi.org/10.18502/ijm.v12i3.3237>
  10. Mahajan SK. Scrub typhus. *J Assoc Physicians India*. 2005;53:954–8.
  11. Taylar AC, Hill J, Kelly DJ, Davis DR, Lewis GE., Jr. A serological survey of scrub, tick, and endemic typhus in Sabah, East Malaysia. *Southeast Asian J Trop Med Public Health* 1986;17:613–619.  
<https://doi.org/10.4103/0019-557X.14629>
  12. Oberoi A, Varghese SR. Scrub typhus-an emerging entity: A study from a tertiary care hospital in North India. *Indian J Publ Heal*. 2014; 58 (4): 281.  
<https://doi.org/10.4103/0019-557X.14629>
  13. Ramyasree A, Kalawat U, Rani ND, Chaudhury A. Seroprevalence of Scrub typhus at a tertiary care hospital in Andhra Pradesh. *Indian J Med Microbio*.2015; 33(1): 68.  
<https://doi.org/10.4103/0255-0857.148381>
  14. Subbalaxmi MV, Madisetty MK, Prasad AK, Teja VD, Swaroopa K, Chandra N, et al. Outbreak of scrub typhus in Andhra Pradesh--experience at a tertiary care hospital. *J Assoc Physicians India* 2014; 62:490–496.  
<https://doi.org/10.1186/1471-2334-12-s1-p77>
  15. Mathai E, Rolain JM, Verghese GM, Abraham OC, Mathai D, Mathai M, et al. Outbreak of scrub typhus in Southern India during the cooler months. *Annals New York Acad Sci*. 2003; 990 (1):359-64.  
<https://doi.org/10.1111/j.1749-6632.2003.tb07391.x>
  16. Saha B, Saha S, Mitra K, Ghosh S, Naskar A, Ghosh MK, et al. Socio-demographic and clinico-epidemiological study of scrub typhus in two tertiary care hospitals of Kolkata. *J Assoc Phys India*.2018; 66-22.
  17. Guidelines for diagnosis and management of rickettsial diseases in India, New Delhi: Department of Health Research Director General, Indian Council of Medical research; 2015: 20.
  18. Narlawar UW, Lilare RR, Gawande BS. Epidemiology and clinical profile of scrub typhus outbreak in a tertiary care centre of Central India. *Int J Community Med Public Health* 2019;6: 4867-9.  
<https://doi.org/10.18203/2394-6040.ijcmph20195070>
  19. Sarkar K, Acharyya A, Ghosh S, Ghosh M, Bhattacharya A, Ghosh K. Clinical Manifestation and Complications of Scrub Typhus Cases: A Hospital-based Observational Study from Rural Part of West Bengal. *Int J Med Public Health*. 2020;10(4):180-3.  
<https://doi.org/10.5530/ijmedph.2020.4.39>

**Authors Contribution:**

**SC-** Concept and design of the study, prepared first draft of manuscript, preparation of manuscript, and revision of manuscript. **NC-** Concept and design of the study, prepared first draft of manuscript; **TB-** Reviewed the literature and manuscript preparation.


**Work attributed to:**

Burdwan Medical College, Burdwan, West Bengal, India, Pin: 713104.

**Orcid ID:**

Dr.Saswati Chattopadhyay -  <https://orcid.org/0000-0002-0945-4637>

Dr.Nabamita Chaudhury -  <https://orcid.org/0000-0001-7929-6294>

Dr.Tanusri Biswas -  <https://orcid.org/0000-0002-8599-5531>

**Source of Support:** Nil, **Conflict of Interest:** None declared.