

Seropositivity of Scrub Typhus Inpatients Attending a Tertiary Care Hospital in Western Odisha

Shuvankar Mukherjee¹, Anshuman Dash², Shreekant Tiwari³

¹Department of Microbiology, Hitech Medical College and Hospital, Rourkela, Odisha, India. ²Department of Microbiology, Hitech Medical College and Hospital, Rourkela, Odisha, India. ³Department of Microbiology, Hitech Medical College and Hospital, Rourkela, Odisha, India.

ABSTRACT

BACKGROUND

Scrub typhus is a vector borne Rickettsial disease caused by *Orientia tsutsugamushi* and has been reported from tsutsugamushi triangle which includes India. It is a re-emerging pathogen in India including the state of Odisha. This study was conducted to determine seropositivity of scrub typhus in patients attending a tertiary care hospital of Western Odisha.

METHODS

Fifty febrile patients who were negative for Malaria, Dengue and *Leptospira* attending a tertiary care hospital of Western Odisha were enrolled in the study. 3 ml of blood was collected, and serum was separated. IgM SD Bioline Tsutsugamushi lateral flow immunochromatography test was performed as per manufacturer instruction. Positive samples were confirmed by PCR method (Geno-Sen's ST Real Time PCR).

RESULTS

20% of patients were positive for IgM SD Bioline Tsutsugamushi card test. 60% of positive patients were male. 20% of positive patients were having pathognomonic eschar. 60 % of infected patients were in the age group of 10 - 30.

CONCLUSIONS

In this study, 20% of febrile patients were positive for Scrub typhus infection. So, it should be included in the differential diagnosis of a febrile patient in Western Odisha.

KEY WORDS

Scrub Typhus, Seropositivity, Western Odisha, Card Test.

Corresponding Author:

Shuvankar Mukherjee,
Staff Quarters, Room No. 28,
Hitech Medical College and Hospital,
Rourkela 769004, Odisha, India
E-mail: shuvankar.mukherjee@gmail.com

DOI: 10.14260/jemds/2020/42

Financial or Other Competing Interests:
None.

How to Cite This Article:

Mukherjee S, Dash A, Tiwari S.
Seropositivity of scrub typhus inpatients
attending a tertiary care hospital in
Western Odisha. *J. Evolution Med. Dent. Sci.*
2020;9(04):178-181, DOI:
10.14260/jemds/2020/42

Submission 11-11-2019,
Peer Review 07-01-2020,
Acceptance 14-01-2020,
Published 27-01-2020.



BACKGROUND

Scrub typhus also known as tsutsugamushi disease caused by *Orientia tsutsugamushi* (Tsutsuga means something small and dangerous and mushi means insect.)¹ is widely prevalent in Asia pacific area, so called tsutsugamushi triangle, a geographical region comprising of South East Asia and South west pacific.² Annually, one million Scrub typhus cases have been reported in these region, and one billion individual are at risk of contracting the illness.³ It causes acute undifferentiated fever with common symptoms such as fever, rash, nausea, vomiting, thrombocytopenia,⁴ so it can be confused easily with other diseases like Malaria, Dengue, Chikungunya, Enteric fever and Leptospirosis. Complication occur in 4% of patients like pneumonitis, meningo-encephalitis, jaundice, renal failure and myocarditis. Patient usually die due to multi organ failure.^{5,6} Previous study showed that scrub typhus was apparent in the endemic region for short time. Only sporadic data are available regarding scrub typhus in different areas, resulting in a gap of knowledge about the disease. The tsutsugamushi triangle.⁷ is a area covering more than 8 million Km², from the Russian Far East to Australia, and from Pakistan to the Japan.⁷ As this area is densely populated about one billion people are at risk of infection. Even the non-endemic region becomes vulnerable due to export of infection by air travel and globalisation. Epidemiological study of scrub typhus is difficult due to antigenic and genetic diversity of *O. tsutsugamushi* strains. It was popular as typhus like fever in India before 1917. Many military personnel of world war I along Burma border and 1965 Indo Pak war suffered fever due to this disease.⁷ In 1990 scrub typhus came back with full virulence at the Pakistan border of India.⁷ Insecticides and empiric antibiotic therapy decreased the disease prevalence thereafter in civilian life. However, scrub typhus is not a well diagnosed disease in India. Epidemiological data say that the disease is prevalent all over India. Maharashtra, Tamil Nadu, Karnataka, Kerala, Himachal Pradesh, Jammu and Kashmir, Uttaranchal, Rajasthan, Odisha, West Bengal, Bihar, Meghalaya, and Nagaland⁷ have reported the incidence of scrub typhus. Post monsoon august to October is the season of scrub typhus due to humid environment. Attack rate of *Orientia* is more in uneducated and rural population of India.

Scrub typhus is not always benign, sometimes it causes lot of complication. Multiorgan failure involving liver kidney, lung, heart, brain, vascular system leading to DIC and death has been reported.⁷ Primary target site of *Orientia* is lung so ARDS, Interstitial pneumonia are common. Meningoencephalitis leads to agitation, disorientation or even coma. Focal neurological involvement also can occur. CSF of patient of meningitis due to scrub typhus resembles that of TB or viral meningitis. Inner ear involvement leads to hearing impairment. Marked hyperaemia, haemorrhage on conjunctiva, GI mucosal haemorrhage and coagulation disorder including DIC can also be seen. In recent years scrub typhus has rapidly re-emerged to become important cause of PUO in different parts of India. 23 states of India have reported the presence of Scrub typhus and Odisha is one of them.^{8,9,10,11} Case fatality varies in different region ranging from 0 to 100%. However median case fatality rate is 1.4% and 6% in treated and untreated patient respectively.⁷

Therefore, development of effective measure to prevent, control and treat scrub typhus is an urgent health need of Indian community and to do this it is very much important to know local seropositivity rate of scrub typhus in different region of India. Keeping it in mind we have conducted a research to know seropositivity rate of Scrub typhus in patient with undifferentiated fever attending a tertiary care hospital of Western Odisha.

METHODS

It was a cross sectional study. Fifty (50) febrile patients attending in tertiary care hospital in Western Odisha from May 2019 to October 2019, who were negative for Malaria (by thin smear and thick smear examination) and Dengue (Dengue IgM ELISA) were enrolled in the study. Under aseptic precaution 3 ml of blood was collected and sera was separated, and sera was subjected to SD Biotec lateral flow immunochromatography test. 50 ul of serum put into sample well and one drop of buffer was added. Result was read after 15 minutes. Control band and test band if both were present the test was declared positive. Positive samples were confirmed by Positive samples were confirmed by PCR method (Geno-Sen's ST Real Time PCR).

Statistical Analysis

SPSS Software Ver. 16 was used for analysis of data.

RESULTS

A total of 50 febrile patients who were negative for Malaria, Dengue and Leptospira were enrolled. Their age ranged from 10 to 65 years. 60% (30/50) were male. 20% (10/50) were positive for IgM antibodies against *O. tsutsugamushi*. 60% (6/10) of positive patients were Male. 20% (2/10) of positive patient had eschar. Higher seropositivity of Scrub typhus; 60%(6/10) was seen in age group of 10-30 followed by 31-50 age group (30%) and 51-65 age group (10%).¹⁰ Samples positive for card test were confirmed by ELISA IgM assay. (In Bios International Inc., USA).

Gender	No. of Patients	Scrub Typhus +ve	Scrub Typhus -ve
Male	30	6	24
Female	20	4	16
Total	50	10	40

Table 1. Scrub Typhus Positivity among Male and Female

Age Group	No. of Patients	Scrub Typhus Positive
10-30	22	6
31-50	21	3
51-60	7	1

Table 2 Scrub Typhus Positivity in Different Age Groups

DISCUSSION

Chiggers or *Leptotrombidium* mites are the vector and primary reservoir of *Orientia tsutsugamushi*.¹² Mites remains infected throughout their life cycle.¹³ Chiggers or larva usually feed once on thin, tender, wrinkled skin for 2 to 3

days. Chiggers release some enzyme like material through saliva and dissolve host tissue around hair follicle but does not pierce skin. *Orientia* is found in salivary gland of infected mite. Both transovarian and transstadial transmission maintain *Orientia* in mites.^{12,13} Wild rodents can also be a source of infection to mites. As *Orientia* is an intracellular bacterium it is very much difficult to study mechanism of pathogenesis. Reinfection can occur due to short lived immunity and antigenic heterogeneity. However, data regarding epidemiology and pathogenesis of scrub typhus is scanty in literature compared to another disease.^{7,14}

According to World health organisation "Scrub typhus is probably one of the most underdiagnosed and under reported febrile illness requiring hospitalization. In our study seropositivity of Scrub typhus was 20% which was higher than Rao et al¹⁵ (2019), Raghunath et al¹⁶ (2018) Lalrinkima et al¹ (2017), Oberoi et al¹⁷ (2019) Pote et al¹⁸ (2018) but lower than Madhusmita et al¹⁹ (2019), Sahu et al²⁰ (2015) Saramma et al²¹ (2019), Rizvi et al²² (2019), Khan et al²³ and Jhakaria et al.²⁴ In our study Male affected more than female (60% vs 40%) Similar distribution was seen in Madhusmita et al¹⁹ (61.7%), Palas Das et al²⁵ (58%), Raghunath et al²⁵ (61%) Lalrinkima et al¹ (56.6%) but female more than male distribution was seen in Saramma et al²¹ (65% female), Rajendra et al²⁶ (64% female)). It may be due to fact that in this part of Odisha male are more involved in agricultural works than female. About age distribution our study showed that younger generation are affected more than older generation (60% in age group of 10-30, 30% in age group of 31-50 and 10 % in age group of 51-65) similar finding was reported by Saramma et al,²¹ Raghunath et al,¹⁶ Lalrinkima et al,¹ Rajendra et al²⁶ and Rizvi et al.²²

Eschar is papuloulcerative¹³ lesion with black crust which is the classic clinical feature formed at the site of mite feeding. It develops before fever onset and another symptom. It is found in 1 to 97% of patients depending upon geographical area. It is more prominent in white skinned people compared to dark skinned Indians⁷. Most common sites of eschar in male are abdomen specially 30 cm below the umbilicus followed by lower extremity and anterior chest. In female anterior chest and head neck are most commonly involved sites and in children axilla is the commonest site.¹³

In our study most pathognomonic sign eschar was found in 20% of positive patient which is higher than Madhusmita et al¹⁹ (17.9%), Patnayak et al²⁷ (12%), Saramma et al²¹ (8.7%), Navneet et al²⁸ (145), Christpal et al²⁹ (4.5%), Rajendra et al²⁶ (12%), Rizvi et al²² (0%) but lower than Patnayak et al²⁷ (48%), Das et al²⁵ (27.74%) and Sahu et al²⁰ (32%).

In India, the first case of scrub typhus was reported from Assam and West Bengal in the year 1945 and re-emergence of this was reported in 2010 after a gap of 65 years. Since then there are paucity of data about seropositivity of scrub typhus in different part of India.³⁰ In Odisha it varies from 3.5% to 48.7%. An eschar is not found in all cases of Scrub typhus, local seropositivity rate of Scrub typhus is very important information for clinician to rule out scrub typhus in undifferentiated fever and to formulate preventive strategy.

CONCLUSIONS

In this study 20% of febrile patients were positive for scrub typhus infection. 20% of infected patients showed pathognomonic eschar. Among scrub typhus positive patients 60% were male and 40% were female. It should be included in the differential diagnosis of a febrile patient in Western Odisha. Preventive measures like protective clothing and application of insect repellents along with public awareness about the disease transmission dynamics are important for reducing the disease prevalence.

Limitations

This study was limited by small sample size and the fact that it relied upon lateral flow card test not by ELISA IgM assay. However, a correlation of 97% between IgM ELISA and SD Bioline Tsutsugamushi rapid test was reported In India.³¹ A community-based study with a large sample size using ELISA IgM will give a better understanding of the prevalence and incidence of scrub typhus in Western Odisha.

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