



## ORIGINAL RESEARCH ARTICLE

## Scrub Typhus (*Orientia tsutsugamushi*), A rapidly spreading epidemic in Chennai - A standalone lab experience

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**Abstract:** Scrub typhus (*Orientia tsutsugamushi*), is a strict intracellular bacterium which is reported to be a recent threat to parts of southern India. There is re-emergence of scrub typhus during the past few years in Chennai. Scrub typhus is an acute febrile illness which generally causes non-specific symptoms and signs. The clinical manifestations of this disease range from sub-clinical disease to organ failure to fatal disease. This study documents our laboratory experience in diagnosis of scrub typhus in patients with fever and suspected clinical symptoms of scrub typhus infection for a period of two years from April 2014 to April 2016 using immunochromatography and IgM ELISA methods. The study was conducted on 648 patients out of whom 188 patients were found to be positive for scrub typhus. Results also showed that pediatric (0 -12 years) and young adults (20 – 39 years) were more exposed to scrub typhus infection and female patients were more infected compared to male. The study also showed that the rate of infection was higher between September to February which also suggested that the infection rate is proportional to the climatic condition. Statistical analysis showed that the mean age of the patients in this study was 37.6, standard deviation was 18.97, CV % was 50.45.

**Key words:** Scrub typhus; *Orientia tsutsugamushi*; Immunochromatography; IgM ELISA

### Introduction

*Orientia tsutsugamushi* is a gram negative intracellular bacterium that causes scrub typhus. It is transmitted to humans by larval forms (chiggers) of trombiculid mites [1]. Scrub typhus presents clinically as a febrile illness with headache, nausea, body ache, vomiting, diarrhoea, cough or dyspnoea [2]. The complications of scrub typhus include interstitial pneumonia, acute renal failure, meningoencephalitis, gastrointestinal bleeding and multi organ failures and may end fatally, unless promptly diagnosed and treated [3]. In India, epidemics of scrub typhus have been reported from north, east and south India [4]. Outbreaks of scrub typhus are reported in southern India during cooler months of the year [5]. Although the disease is endemic in our state, it is grossly under diagnosed owing to the non-specific clinical presentation, lack of access to specific diagnostic facilities and low index of suspicion by clinician [6]. Being a referral and a standalone laboratory, samples are received from various part of Chennai. There have so far been few reports on scrub typhus from southern India. Many of such studies were from Vellore district [7] and from Pondicherry district [8]. Hence, the present study was undertaken to assess scrub typhus as the aetiology of fever in and around Chennai to provide a valuable epidemiological data from southern India.

### Materials and Methods

#### Study setting

This study was carried out in a standalone laboratory (Anderson Diagnostics and Labs) at Chennai, Tamil Nadu.

#### Design

This retrospective study was conducted for a period of two years from April 2014 to April 2016 among patients with fever. Patients of all ages presenting with fever, after ruling out other common causes of fever such as typhoid, malaria, dengue, leptospirosis and chikungunya were included in this study.

#### Methodology

In our study, the serum samples were subjected to Rapid immunochromatography test (Standard diagnostics, BIOLINE) which contains a 56 kDa antigen of *Orientia tsutsugamushi*. The SD BIOLINE Tsutsugamushi Test is a rapid, qualitative and differential test for the detection of antibodies (IgG, IgM, IgA) to *Rickettsia Tsutsugamushi* in human serum, plasma, whole blood.

The IgM capture ELISA (InBios kit) method is based on the capture of IgM antibodies, which is a qualitative ELISA method for the detection of IgM antibodies to *O. Tsutsugamushi* in serum. Wells of each plate have been coated with unique recombinant antigen mix. During testing, the serum samples are diluted in InBios sample

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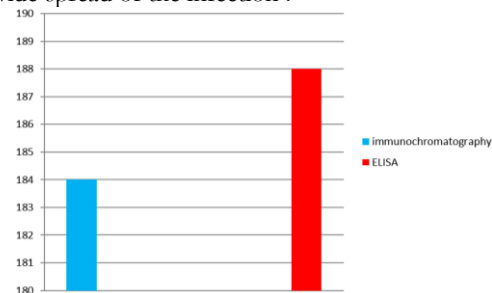
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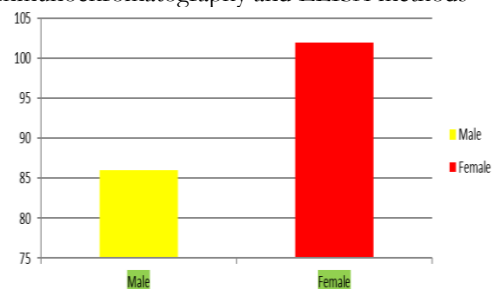
diluents and applied to each well. After incubation and washing, the wells are treated with polyclonal goat anti – human IgM antibodies labeled with enzyme horseradish peroxidase (HRP) and substrate added after second incubation. Absorbance measured after adding stopping solution at 450 nm. Absorbance measured is directly proportional to the concentration of IgM antibodies.

## Results

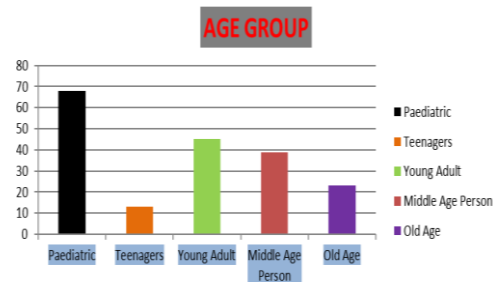
The study was conducted for a period of 2 years from April 2014 to April 2016. A total number of 648 patients were included in the study, out of which 184 were tested positive for scrub typhus IgM by immunochromatographic and 188 patients were tested positive by IgM ELISA method (Fig.1) The patients with suspected clinical symptoms of scrub typhus with fever and other symptoms such as headache, skin rashes, lymphadenopathy and eschar were taken into consideration. Presence of Eschar brings the patient earlier to physician. In our study, presence of eschar could be elicited in 87 positive patients (46%), as we are standalone lab and clinical symptoms could not be followed in all patients regularly. Locality of the patients didn't have any effect on the infection rate, since infection was widespread throughout all regions of chennai. Female patients (Fig. 2) were more prone to the infection in our study compared to males. Age group of the positive patients were studied and infection rate was higher in paediatric age group (0-14) and young adults (19-39) (Fig. 3). Climatic conditions play a key role in acquiring infection which could be seen from the results, months ranging from september to february (Fig. 4) with cooler climatic conditions favored more wide spread of the infection .



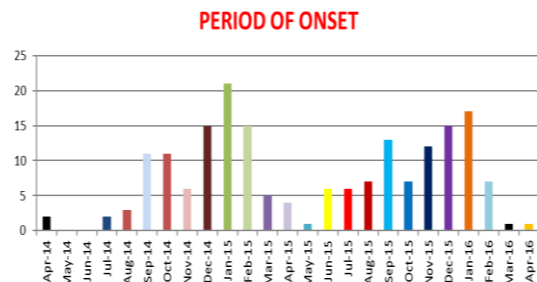
**Figure 1:** Comparison of results by immunochromatography and ELISA methods



**Figure 2:** Distribution of Scrub typhus among positive patients



**Figure 3:** Distribution of scrub typhus among different age groups



**Figure 4:** Periodicity of scrub typhus cases in Chennai, 2014-2016.

## Discussion

Scrub typhus is one of the notifiable, mite-borne disease [9]. Scrub typhus (tsutsugamushi disease) is a febrile disease that is endemic in Asian-Pacific areas. Scrub typhus can be serious illness which endangers the life if not treated on time. Most often it manifests with variable presentation. There is no vaccine available so far. At present there is less evidence from trials of effects of different broad spectrum antibiotics in scrub typhus. Diagnosis of scrub typhus is based upon the geographical history, physical signs and is confirmed by the rapid response to specific chemotherapy [10]. Doxycycline and tetracycline are similar drugs, both have been used to treat this condition [10,14]. Antigenic differences in *Orientia tsutsugamushi* are an important consideration for serological diagnosis of scrub typhus, because at the present time, the number of scrub typhus serotypes is not completely known. The variable major outer membrane protein (vOmp) of *O. tsutsugamushi* used for serotyping varies from 53 to 63 kDa, even among isolates from the same country [12]. Tsay *et al.*, in a hospital based study in Taiwan, noted fever (100%), chills (39%), cough (24%), headache (21%), diarrhea (18%), eschar (60%), adenopathy (33%) and rash (21%) in 33 patients of scrub typhus. However, occurrence of eschar is rare in South-East Asian patients, whereas 46% of the patients were reported with eschar in our study [13]. The rate of occurrence of scrub typhus was more in female patients compared to males and the increase in number of cases in our study between October to February is comparable with the study done by Kweon *et al.*, [9]. Statistical analysis showed that the mean age of the patients in

this study was 37.6, standard deviation was 18.97, CV % was 50.45.

### Conclusion

The scrub typhus can be serious illness which endangers the life if not treated on time. Most often it manifests with variable presentation. There is no vaccine available so far. In addition, Immunity to one strain doesn't confer immunity to another. The Clinician needs strong suspicion about scrub typhus as a cause of fever particularly in rainy season. Hence, early diagnosis and prompt treatment would reduce considerable morbidity and mortality in cases of scrub typhus.

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