Original Research Article

# Study of sociodemographic characteristics associated with patients of scrub typhus

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## Abstract

**Background:** Rickettsial diseases are some of the most covert re-emerging infection of the present times **Aims and Objectives:** To Study sociodemographic characteristics associated with patients of scrub typhus. **Methodology:** This prospective and hospital-based study was conducted in the Department of Pediatrics, SMGS Hospital and the Department of Microbiology, Government Medical College, Jammu over a period of one year W.E.F. November 1, 2010. Study population included pediatric patients between 1 to 19 years of age admitted in the wards and were selected by systematic sampling. **Result:** Maximum patient 34 (38.63%) were in age group of 11-15 years, followed by 28(31.81%) in the age group of 6-12 years. The total number of males and females included in the study were 46 (52.27%) and 42(47.73%) respectively. 19(21.59%) of the total patients had a positive family history of scrub typhus. most of the patients were from Sunderbani and Nowshera area, 10(11.35%) each, from Rajouri 8 (9.09%), Mendhar 5(5.68%) and Poonch 4 (4.55%), collectively accounting for 37(42.02%) patients from the western belt of the Jammu and Kashmir State. Month wise distribution of present study shows that scrub typhus patients were seen mostly between months of July and November with maximum clustering of the patients during the month of September and October with 51(57.95%) and 23 (26.14%) respectively. **Conclusion:** It can be concluded from our study that Maximum patient were in age group of 11-15 years, followed by 28. Particularly in the Sunderbani-Nowshera-Rajouri belt. Cases were reported between the month of July to November with maximum number of patients during September and October.

**Key Words:** Scrub typhus, Rickettsial diseases, Socio Demographic Profile of Scrub typhus.

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## INTRODUCTION

Rickettsial diseases are some of the most covert re-emerging infection of the present times. They are generally incapacitating and notoriously difficult to diagnoses; untreated cases can have fatality rates as high as 30-35% but when diagnosed properly, they are often easily treated (Batra *et al*.,2007)[1] Rickettsiaceae have been divided into following bio groups (Siberry and Dumbler, 2007)[5]: scrub typhus being one of the bio groups.

| Bio group | Disease | Vector | Host | Organism |
|---|---|---|---|---|
| Spotted fever | RMSF | Tick | Dogs, Rodents | Rickettasia |
| | Rickettsial pox | Mite | Mice | Rickettasia |
| | Indian tick typhus/ Bountonneuse fever, MSF | Tick | Dogs, Rodents | Rickettasia conorii |
| Typhus | Epidemic louse borne typhus | Louse | Human | Rickettasia prowazekii |
| | Brill-Zinsser diseases | Louse | Human | Rickettasia prowazekii |
| | Endemic/Murine flea-borne typhus | Flea | Rats | Rickettasia typhi |
| **Scrub typhus** | **Scrub typhus** | **Chigger** | **Rodents** | **Orientia tsutsugamushi** |
| Miscellaneous | Ehrlichioses and Anaplasmosis | Tick | Deer, dogs, rodents | Ehrilichia, Anaplasma |
| | TIBOLA (tick borne lymphadenopathy | Tick | Wild boar | Rickettasia, slovaca |
| | DEBONEL | Tick | Wild boar | Rickettasia, slovaca |

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RMSF-Rocky Mountain spotted fever, MSF-Mediterranean spotted fever DEBONEL-Dermacentor borne necrosis-eschar-lymphadenopathy. Scrub typhus is an acute febrile illness caused by Orientia tsutsugamushi (Ehrilichia, tsutsugamushi), first isolated and identified in 1930 in Japan (Paediatric Scrub Typhus, Access Date October 2011). In India, the presence of scrub typhus and other rickettsial diseases has been known for several decades. Scrub typhus in endemic to a part of the world known as " tsutsugamushi triangle", which extends from northern Japan and far –eastern Russia in the north, to northern Australia in the south, and to Pakistan and Afghanistan in the west (Seong *et al*, 2001)[6]. However, there has been a considerable decline in the incidence of scrub typhus in the past few decades, recent reports from several parts of India indicate that there is a resurgence of scrub typhus (Mathai *et, al,* 2003;;Gupta *et, al,* 2005 Somashekarm 2005)[7]. Scrub typhus is grossly under-diagnosed in India. The reported numbers are an under estimate due to lack of a community data base and non-availability of confirmatory tests (Chugh *et, al,* 2008). The term scrub typhus is used because of the type vegetation (i.e. terrain between woods and clearing) that harbours the vector. However, the name is not entirely correct because infection can occur in diverse habitats like seashore and semi deserts (Mahajan *et, al.*,2005)[9]. It is a zoonotic disease transmitted by the bite of larval mites (chiggers) of the Leptotrombidium deliense group. These larval mites usually feed on wild rats. Man is accidentally infected when he encroaches the mite infested areas known as the mite islands through occupational /agricultural exposure. Active rice fields are an important reservoir for transmission (Watt and Walker, 2006)[10]. The natural reservoir of infection is the adult mite from which the organism passes to larva by trans-ovarian transmission. An estimated one million cases occur annually and as many as one billion people living in endemic areas may have been infected at some time (Raoult, 2005)[11]. Because of reports of O. tsutsugamushi strains with reduced susceptibility to antibiotics (Watt *et al*, 1996 )[10] as well as reports of interesting interactions between this bacterium and HIV, a renewed interest in this illness has emerged (Watt *et al*, 2000a; Watt and prola,2003)[10]. O. tsutsugamushi multiplies at the inoculation site with formation of a papule that ulcerates and becomes necrotic forming an eschar with regional lymphadenopathy that progresses to generalised lymphadenopathy. In experimental infection, humans developed an acute febrile illness in 8-10 days of the chigger bite. Bacteraemia was present before 1-3 days of fever (Shrirai, 1982)[12]. The infection manifests clinically as a non-specific febrile illness often accompanied by headache, myalgia, nausea, vomiting, diarrhoea, cough or breathlessness. Fever of undetermined origin is the most frequent presentation. The 'text book' presentation with a dusky red maculopapular rash and an eschar marking the site of the infecting chigger bite is easily recognised Many workers, however, have emphasised the infrequency of these features (Lewthwaite and Savoor 1940; Brown *et al*.,1976). If present, the eschar and rash are easily recognised on light skins, but less noticeable on dark pigmented patients. In past clinical diagnosis of scrub typhus was dependent on detecting eschar, rash and history of outdoor activity (Blake 1945[2]). Eschar may also be mistaken for some ulcers seen in other conditions, unless diagnosed early and treated. Generalised lymphadenopathy and hepatospleenomegaly are seen in a majority of scrub typhus patients (Sirisanthana,2003).Gastrointestinal symptoms like vomiting, abdominal pain and diarrhoea occur in varying frequency. Respiratory symptoms in form of cough, pulmonary infiltrates are often present (Chanta and Chanta,2005). Cardiac involvement is often minor, however fatal myocarditis has been reported. (Sittiwangkul *et, al*.,2008)[13]. CNS involvement in the form of tremors, nervousness, nuchal rigidity, slurred speech with normal CSF can be seen. Hearing loss present in one third of patients with scrub typhus infection (Raoult, 2005; watt,2006)[11]. Severe life threating manifestations include interstitial pneumonitis, non-cardiogenic pulmonary edema, meningoencephalitis, acute renal failure and disseminated intravascular coagulation (Raoult, 2003; Walker *et al*., 2008. Mortality ranges from 0-30% but with appropriate treatment mortality is very rare (Cao, 2006; Watt, 2006)[3]. Routine laboratory studies in patients of scrub typhus patients reveal an early lymphopenia with late lymphocytosis. A decrease in the CD-4:CD8 lymphocyte ratio may also be noted. Thrombocytopenia is also seen (Chanta and Chanta, 2005)[4]. The haematological manifestations may raise suspicion of dengue infection (Watt, 2006)[10]. Elevated transaminases may be present in 75-79% of the patients. Hypoalbuminemia occurs in about of the cases while hyerbillirubinemia is rare. These findings may be especially prevalent in children (Chanta and Chanta, 2005; Chanta *et el*.,2007)[4]. The confirmatory tests are the indirect immunoperoxidase test and the immunofluorescent assay (Phetsouvanh *et al*., 2009)[14]. The organism has been identified by polymerase chain reaction (PCR) technique in clinical specimens (Raoult, 2005 Paris, 2009)[11]. The well Felix OX-K strain agglutination reaction may be the only serological test available in less developed countries but it is not a very sensitive assay (Watt and Walker,2006)[10]. The poor

sensitivity of the WF test is now well demonstrated but a good a good correlation between the results of the WF test and detection of lgM antibodies by an indirect immunofluorescence assay (IFA) is often observed (Raoult,1997)[11]. Other serological tests include latex agglutination, indirect hemagglutination, enzyme linked immunosorbent assay and dot blot immunoassay. Scrub typhus infection is prevalent in various parts of India including State of Jammu and Kashmir. These are one of the most difficult infections to diagnose in their early course and high index of suspicion is the key to early diagnosis. Epidemiological features and History of exposure to the vector are crucial for the diagnosis and failure of early diagnosis is associated with significant morbidity and mortality. Therapy is easy and affordable with dramatic results. No prospective study has been under taken in any part of the Jammu and Kashmir state. This study would bring about the socio-demographic characteristics associated with scrub typhus.

## MATERIAL AND METHODS

This prospective and hospital-based study was conducted in the Department of Pediatrics, SMGS Hospital and the Department of Microbiology, Government Medical College, Jammu over a period of one year w.e.f. November 1, 2010.Patients with Fever and generalised lymphadenopathy, Fever with rash Fever with rash and generalised lymphadenopathy were included into study while Patients with clinically compatible measles, Patients with leukemia or other immunocompromised states were excluded from the study. Study population included pediatric patients between 1 to 19 years of age admitted in the wards and were selected by systematic sampling. After taking formal consent from the parents / guardian of the patient, a complete physical examination was done. Laboratory investigations including a complete blood count, liver function tests, renal function tests, X-ray chest, ECG, 2-D ECHO were done, wherever needed. Although immunofluorescence assay is the gold standard test, it is not available in India. Though most of the Indian studies have used Weil-Felix as their methodology, we tested for lgM ELISA for scrub typhus, as per the manufacturer's directions (Kit: In Bios), in patients suspected to be suffering from the disease. The test was a qualitative ELISA for detection of lgM antibodies against Orientia tsutsugamushi in serum. Wells of each plate were coated with recombinant antigen mix. During testing, the serum samples were diluted with sample diluent and applied on each well. After incubating and washing wells were incubated with the substrate and acidic stocking solution was then added. The degree of enzymatic turnover was then determined by the absorbance measurement at 450 nm which was directly proportional to the concentration of lgM antibodies to Orientia tsutsugamushi.

## RESULT

A total of 90 patients fulfilled the inclusion criteria of present prospective and hospital-based study, conducted in the Department of Paediatrics, SMGS Hospital over a period of one year. Out of these 60 patients, 2 left against medical advice. The following observations were made during the study period.

**Table 1:** Age wise distribution of patients

| Age group (in years) | Study group | |
|---|---|---|
| | No | Percentage (%) |
| 1 – 5 | 13 | 14.78 |
| 6 – 10 | 28 | 31.81 |
| 11- 15 | 34 | 38.63 |
| ≥ 16 | 13 | 14.78 |
| **Total** | **88** | **100.00** |

Range=1.5- 18 years Mean age (±SD)=10.62 (± 4.48) years

The above table shows the age wise distribution of our study group. Maximum patient 34 (38.63 %) were in age group of 11-15 years, followed by 28 (31.81%) in the age group of 6-12 years, 13 (14.77%) patients each were in 1-5 years age group and ≥16 years age group respectively. The mean age (±SD) in the study group was 10.62 (± 4.48) years, with a range of 1.5-18 years.

**Table 2:** Gender wise distribution of the study group (n=88)

| Gender | Study group | |
|---|---|---|
| | No | Percentage (%) |
| Males | 46 | 52.57 |
| Females | 42 | 47.73 |
| **Total** | **88** | **100.00** |

The above table depicts the gender wise distribution of our patients. The total number of males and females included in the study were 46 (52.27%) and 42 (4773%) respectively.

**Table 3:** Distribution of the study group according to the family history of scrub typhus (n=88)

| Family history of scrub typhus | Study group | |
|---|---|---|
| | No | Percentage (%) |
| Yes | 19 | 21.59 |
| No | 69 | 78.41 |
| **Total** | **88** | **100.00** |

It may be observed that 19 (21.59%) of the total patients had a positive family history of scrub typhus, while 69 (78.41 %) patient did not have any positive family history of scrub typhus.

**Table 4:** Distribution of the study group according to the demographic area (n=88)

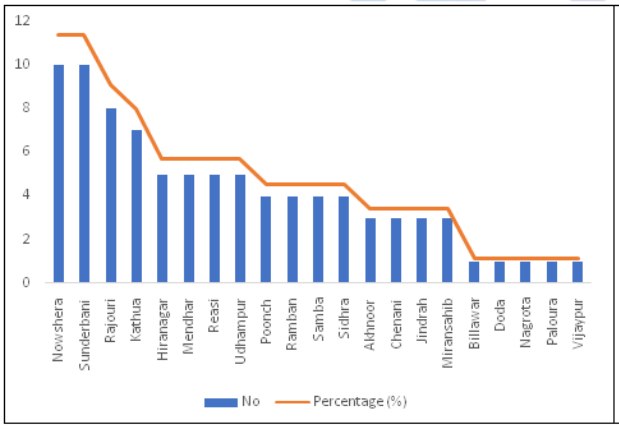
| Demographic area | Study group | |
|---|---|---|
| | No | Percentage (%) |
| Nowshera | 10 | 11.35 |
| Sunderbani | 10 | 11.35 |
| Rajouri | 8 | 9.09 |
| Kathua | 7 | 7.95 |
| Hiranagar | 5 | 5.68 |
| Mendhar | 5 | 5.68 |
| Reasi | 5 | 5.68 |
| Udhampur | 5 | 5.68 |
| Poonch | 4 | 4.55 |
| Ramban | 4 | 4.55 |
| Samba | 4 | 4.55 |
| Sidhra | 4 | 4.55 |
| Akhnoor | 3 | 3.41 |
| Chenani | 3 | 3.41 |
| Jindrah | 3 | 3.41 |
| Miransahib | 3 | 3.41 |
| Billawar | 1 | 1.14 |
| Doda | 1 | 1.14 |
| Nagrota | 1 | 1.14 |
| Paloura | 1 | 1.14 |
| Vijaypur | 1 | 1.14 |
| **Total** | **88** | **100.00** |

As seen from the above table that, most of the patients were from Sunderbani and Nowshera area, 10 (11.35 %) each, from Rajouri 8 (9.09%), Mendhar 5 (5.68%) and Poonch 4 (4.55%), collectively accounting for 37 (42.02%) patients from the western belt of the Ja mmu and Kashmir State. Seven (7.95%) cases were from Kathua, while 5 (5.68%) each cases were from Hiranagar, Reasi and Udhampur areas. Ramban, Samba and Sidhra contributed 4 (4.55%) patients each to the study. Three (3.41%) patients each were from Akhnoor, Chenani, Jindrah and Miransahib. One (1.14%) patient each reported from Billawar, Doda, Nagrota, Paloura and Vijaypur areas. Bar chart showing distribution of the study group according to the demographic area is given below.

**Table 5:** Month wise distribution of the study group (n=88)

| Month | Study group | |
|---|---|---|
| | No | Percentage (%) |
| July | 2 | 2.28 |
| August | 5 | 5.68 |
| September | 51 | 57.95 |
| October | 23 | 26.14 |
| November | 7 | 7.95 |
| **Total** | **88** | **100.00** |

Month wise distribution of present study shows that scrub typhus patients were seen mostly between months of July and November with maximum clustering of the patients during the month of September and October with 51 (57.95%) and 23 (26.14%) respectively. In the month of July 2 (2.28%) patients were reported, while in the month of August and November, 5 (5.68%) and 7 (7.96%) patients, respectively reported with signs of scrub typhus.



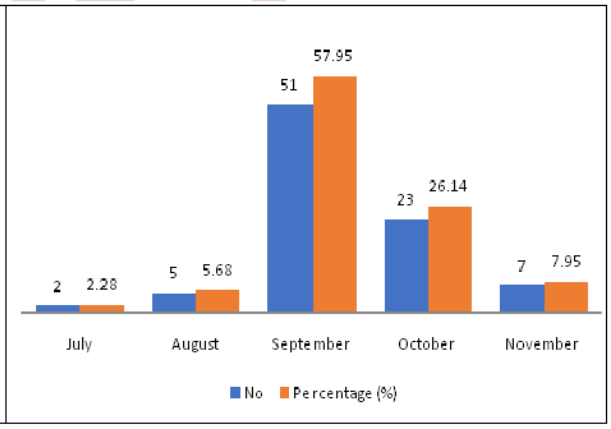




**Figure 1:** Distribution of study group according to demographic area **Figure 2:** Month wise distribution of the study group

**Table 6:** Distribution according to the socio-economic status of the study group (n=88)

| Socio-economic status | Study group | |
|---|---|---|
| | No | Percentage (%) |
| Upper –middle | 13 | 14.77 |
| Lower-middle | 39 | 44.32 |
| Upper-lower | 24 | 27.27 |
| Lower | 12 | 13.64 |
| **Total** | **88** | **100.00** |

The above depicts that the maximum number of patients in our study were from the lower-middle class comprising 39 (44.32 %) of the total patients in the study. Patients from the upper–lower class were 24 (27.27%) of the total, while patients belonging to the upper-middle and lower class were 13 (14.77%) and 12 (13.64%) respectively. Since our patients were from different backgrounds and regions, socio-economic status was classified taking into account education, occupation and per capita income of the family head

## DISCUSSION

Scrub typhus is widely endemic in many countries in Asia. Cases has been documented from Jammu and Kashmir, Himachal Pradesh, Uttaranchal, Rajasthan, West Bengal, Maharashtra, Kerala and Tamilnadu (Mathai *et al*.,2001[7]; Mahajan *et al*., 2006[9]; Batra *et al*., 2007[1]). A total of 90 patients fulfilled the inclusion criteria of our study, out of which 2 patients left against medical advice. In our study, the age range of the patients was 1.5 to 18 years. Sirisanthana *et al*. (2003)[15] included patients of less than or equal to 15 years, while Huang *et al*. (2009)[16] included patients between 1 to 13 years of age in his study. Digra *et al*. (2010)[17]included patients in the age group of 5-18 years. It was observed that the male to female ratio in our study was 1.09: 1 which is comparable to Digra *et al*. (2010) (1.1:1)[17]. But our results differ from Patil *et al*. (2006) and Rajendran *et al*. (2011)[18], who observed a ratio of 2.6:1 and 2:1 in their respective studies.

It may be inferred that scrub typhus is slightly more common in males. In our study, maximum number of patients were between the age group of 11 to 15 years amounting to 38.63% of the total number of patients. A maximum number of patients in our study belonged to the Nowshera-Sunderbani-Rajouri belt, which is comparable to Digra *et al*. (2010)[17].

In our study, majority of the patients reported during the cooler months of September (57.95%) and October (26.14%), which is comparable to the results of Liu *et al*. (2009)[18] and Digra *et al*. (2010)[17]. However, our results differ from Sirisanthana and Poneprasert (1989)[15]and Huang *et al*. (2009)[16], who reported more cases during the months of November to December and June to July, respectively.

The majority of our patients were from the upper lower and lower middle class comprising mainly of farming and cattle rearing community.

This could be because of the more of an outdoor exposure in these people.

## CONCLUSION

It can be concluded from our study that Maximum patient were in age group of 11-15 years, followed by 28. Particularly in the Sunderbani-Nowshera-Rajouri belt. Cases were reported between the month of July to November with maximum number of patients during September and October.

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