

# Prevalence and knowledge of scrub typhus in patients with acute febrile illness in teaching hospital, Chitwan, Nepal

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## ABSTRACT

**Background:** Infection from scrub typhus has been documented in different areas of Nepal and Chitwan is one of the risk-prone areas. **Objective:** This study aimed to find out the prevalence of scrub typhus in patients suffering from an acute febrile illness (AFI) as well as their knowledge about it. **Materials and Methods:** Descriptive study was conducted in Chitwan Medical College (CMC), a tertiary care teaching hospital in Chitwan. A total of 301 patients with AFI admitted in different medical units and screened for scrub typhus by immunoglobulin M enzyme-linked immunosorbent assay method were selected purposively as a study sample. Face to face interview, record review, and blood reports were used to collect the required information. Data were collected from May 1, 2018, to December 31, 2018. Before data collection, ethical approval was obtained from CMC Institutional Review Committee. Obtained data were entered into IBMSPSS version 20 for window and analyzed using descriptive and inferential statistics. **Results:** The findings of the study revealed that 13.3% of patients with AFI were positive for scrub typhus. The most common symptoms among patients were fever (100%), headache (59.1%), vomiting (27.0%), and cough (26.7%). Out of 301 patients, only 70 (23.3%) had heard about scrub typhus. Among 70 patients, more than half 41 (58.6%) had a high level of knowledge on scrub typhus. On item wise knowledge, more than half of the patients knew that scrub typhus as infectious disease (52.9%), transmitted through the bite of mites (61.4%) but not transmitted through person to person (65.7%). However, only 38.6% knew that scrub typhus rapidly spread in the rainy season. Moreover, less than half of the patients knew that wearing closed footwear (41.4%), using insect repellents (48.6%), and avoiding traveling to mite infected areas (45.7%) are the preventive measures of scrub typhus. **Conclusion:** Our results highlight that scrub typhus infection is an important cause of AFI, and patients must be routinely screened for the proper diagnosis and timely treatment. Moreover, very few had heard about scrub typhus and its preventive measures, so awareness program on scrub typhus is needed for the risk groups to enhance their knowledge.


**KEY WORDS:** Prevalence; Knowledge; Scrub Typhus; Patients; Acute Febrile Illness

## INTRODUCTION

Scrub typhus is an acute febrile infectious illness caused by bacteria *Orientia tsutsugamushi*, a mite-borne bacterium and transmitted to the humans and rodents by the bite of infected

chiggers (i.e., larval mites). Scrub typhus is endemic in most countries of the South-East Asia Region including Nepal.<sup>[1]</sup> A report on the descriptive epidemiology of scrub typhus in Nepal revealed that a total of 47 districts were affected by scrub typhus in the 2016 AD.<sup>[2]</sup>

It affects people of all age groups, but people working in farmlands and vegetable fields, engaged in harvesting in autumn and other outdoor activities such as picking wild fruit, collecting firewood, and spending leisure activities such as camping, walking, and resting on grassland are at the higher risks for scrub typhus infections.<sup>[3]</sup>

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Scrub typhus patients face multiple signs and symptoms which can range from mild to life-threatening episodes. Onset is usually characterized by high fever, intense generalized headache, diffuse myalgias, eschar or skin ulcer, fatigue, anorexia, rash, and altered mental status.<sup>[4-6]</sup> Studies have also shown multi-organ dysfunction in terms of bronchopneumonia, toxic hepatitis, acute cholecystitis, toxic myocarditis, heart failure, pleural effusion, emphysema, renal, and central nervous system dysfunction in patients.<sup>[4,5,7]</sup> These signs and symptoms are non-specific and resemble other infectious diseases such as malaria, enteric fever, dengue, or leptospirosis, so it is difficult to differentiate clinically from other infections.<sup>[8]</sup> As a result, patients may remain undiagnosed or might have delayed diagnosis and treatment. If undiagnosed or diagnosed late, it may prove to be life threatening. Hence, Sinha *et al.* recommended that scrub typhus should be considered in the differential diagnosis of patients with acute febrile illnesses, including those with renal impairment, liver function test abnormalities, altered sensorium, pneumonitis or acute respiratory distress syndrome to minimize mortality and morbidity associated with scrub typhus.<sup>[9]</sup>

Scrub typhus is preventable if people take the preventive measures properly such as avoiding contact with infected chiggers, avoiding travel to the areas with lots of vegetation and brush, using insect repellents in the exposed skin and clothing when spending time in outdoor activities.<sup>[6]</sup> Authors also recommended that public awareness, vector control, early diagnosis, and treatment as the most important measures for the prevention and management of scrub typhus.<sup>[10]</sup>

Scrub typhus is endemic in many districts of Nepal and Chitwan is the most affected district contributing to 34.4% of total cases in 2016.<sup>[2]</sup> Hence, healthcare workers and people living in this area need to be vigilant about the said disease. The previous study conducted in Korea showed limited awareness regarding scrub typhus among people.<sup>[11]</sup> To researchers' knowledge, few studies were conducted on the prevalence of scrub typhus, but none of the study was conducted to explore knowledge among community people residing in Nepal. Hence, this study aimed to look into the prevalence of scrub typhus and knowledge about it among the population, which, in turn, will be helpful in providing essential data for the planning and intervention of the screening and awareness program on scrub typhus for the risk group.

## MATERIALS AND METHODS

A descriptive cross-sectional study was conducted in Chitwan Medical College (CMC), a tertiary care teaching hospital (TH) at Bharatpur. Patients with acute febrile illness (AFI) admitted in the Medicine Department of CMC-TH from May 1, 2018, to December 31, 2018, and screened for scrub

typhus were selected purposively as the study sample for the study. The semi-structured interview schedule, record review, and bio-physiological measurement were used as research tools. Before data collection, ethical approval was obtained from CMC Institutional Review Committee, and data were collected by the researchers themselves. First of all, patients with AFI were identified from their record file. Then, charts were evaluated. Purpose of the study was explained to the patients, and verbal informed consent was taken from them. Then, patients were interviewed to obtain information on sociodemographic, disease-related, and knowledge on scrub typhus. Further, patients' blood samples sent for the test by *O. tsutsugamushi* specific immunoglobulin M enzyme-linked immunosorbent assay (IgM ELISA) (Scrub Typhus Detect IgM ELISA kit, Inbios, USA) at the lab of CMC and interpreted as per the manufacturer's instructions as positive, equivocal, and negative were reviewed.

The collected data were coded and entered into SPSS version 20 for the window. Descriptive statistics such as frequency, percentage, mean, standard deviation, median, and interquartile range were used to describe patients characteristics, prevalence, and knowledge on scrub typhus. Total knowledge score was calculated by summing the score of all knowledge items and further classified into two categories (low and high) based on the mean value.

## RESULTS

A total of 301 patients with AFI were recruited for the study. Highest percentages of patients were between the age group of 20 and 40 years followed by 40–60 years. Mean age of the patients was  $39.37 \pm 17.4$  years. Majority of the patients were female (55.8%). Nearly two-third (62.8%) patients were from an urban area, and the highest percentages were involved in agriculture (29.2%) and household work (26.6%) [Table 1]. Highest percentages of patients with AFI were reported in the months of August (17.9%), September (24.6%), and October (21.9%) (not shown in table).

All 301 cases were admitted in the ward with the provisional diagnosis of AFI. The median duration of fever was 6 (4–7) days. More than half (59.1%) of the patients had complained of headache followed by vomiting (27.1%) and cough (26.7%). Most of the patients had a history of exposure to domestic animals (82.1%), being closest to the forest or bushy area (81.4%), and history of rats infestations (77.7%). Majority of them had grass cutting history (69.4%), vegetation around houses (64.1%), and history of living near forest area (59.8%) [Table 2].

Among 301 patients with AFI, 13.3% were positive for scrub typhus and 17.3% had equivocal results by IgM ELISA [Table 3].

**Table 1:** Socio-demographic characteristics of the patients, *n*=301

Characteristics	Frequency (%)
Age in year	
<20	50 (16.6)
20–40	111 (36.9)
40–60	104 (34.6)
≥60	36 (12.0)
Mean age and SD: 39.78 (17.4) years	
Sex	
Male	133 (44.2)
Female	168 (55.8)
Residence	
Rural	112 (37.2)
Urban	189 (62.8)
Occupation	
Farmer	88 (29.2)
Household worker	80 (26.6)
Student	59 (19.6)
Service	28 (9.3)
Business	17 (5.6)
No job	7 (2.3)
Other (abroad, driver, and labor)	22 (7.3)
Food habit	
Veg	24 (8.0)
Non-veg	277 (92.0)

Out of 301 AFI patients, only 70 (23.3%) had heard about scrub typhus (not shown in table). Among 70 patients, 52.9% knew scrub typhus as infectious disease, 61.4% knew the mode of transmission through the bite of mite, and 38.6% reported that scrub typhus spreads rapidly during the rainy season. Regarding symptoms, most of the patients reported fever (92.9%) as a symptom of scrub typhus followed by headache (65.7%) and myalgia (50.0%). On risk groups, majority of the patients had knowledge that people living near forest (78.6%), sitting or lying on grass (55.7%), and working in field (51.4%) are vulnerable for contracting scrub typhus. However, very few knew that people working in the parks (11.4%) are also at risk. Regarding the preventive measures, highest percentages of the patients knew that using insects repellents (60.7%), avoiding travel to mite infected areas (72.0%), and wearing long sleeves, pants, and closed footwear (82.2%) were the preventive measures of scrub typhus, while very few had knowledge on leathering with soap in a hot bath or shower (7.1%), using ground covers while sitting (10.0%), and destroying objects such as bottles and buckets (18.6%) [Table 4].

Out of 301 patients, only 70 (23.3%) had heard about scrub typhus. Among 70 patients who heard about it, more than half 41 (58.6%) had a high level of knowledge on scrub typhus [Table 5].

**Table 2:** Signs and symptoms and predisposing factors among patients, *n*=301

Variables	Frequency (%)
Signs and Symptoms*	
Fever	301 (100.0)
Headache	177 (59.1)
Vomiting	81 (27.0)
Cough	80 (26.7)
Abdominal pain	44 (14.7)
Dyspnea	40 (13.3)
Diarrhea	10 (3.3)
Myalgia	11 (3.6)
Dizziness	11 (3.6)
Hepatosplenomegaly	7 (2.3)
Predisposing Factors*	
History of exposure to domestic animals	247 (82.1)
Home near to forest or bushy area	245 (81.4)
Infestation by rats	234 (77.7)
History of grass cutting	209 (69.4)
Vegetation around houses	193 (64.1)
History of living near forest	180 (59.8)
History of visit to forest	105 (34.9)
Open field defecation	8 (2.7)

\*multiple response

**Table 3:** Prevalence of scrub typhus among patients (*n*=301)

Scrub typhus	Frequency (%)
Positive	40 (13.3)
Equivocal	52 (17.3)
Negative	209 (69.4)

## DISCUSSION

Scrub typhus is common among patients with AFI but only a few patients had heard the term scrub typhus and its preventive measures. Among these groups, more than half had a high level of knowledge about scrub typhus.

Out of 301 patients with AFI, 13.3% of patients were seropositive for scrub typhus and 17.3% had equivocal results by IgM ELISA. This is consistent with the results of the other studies conducted in Nepal, in which the prevalence of scrub typhus was 22.58% and 44.1%, respectively, among clinically suspected patients.<sup>[10,8]</sup>

Sign and symptoms of scrub typhus are non-specific. High fever, intense generalized headache, diffuse myalgia, rash, and an eschar at the site of the chigger bite are the most common symptoms of scrub typhus<sup>[6]</sup> which are similar to the finding of this study, where patients' common presenting symptoms were fever (100%), followed by headache (59.1%), vomiting (27.0%), and cough (26.7%). Moreover,

**Table 4:** Item wise knowledge on scrub typhus among patients, *n*=70

Knowledge item	Correct response
	Frequency (%)
Meaning of scrub typhus as infectious diseases	37 (52.9)
Mode of transmission to person by bite of infected mites	43 (61.4)
It is not transmitted from person to person	46 (65.7)
Scrub typhus is rapidly transmitted in the rainy season	9 (38.6)
Fever is a symptom of scrub typhus	65 (92.9)
Headache is a symptom of scrub typhus	46 (65.7)
Myalgia is also a symptom of scrub typhus	35 (50.0)
Cough is also present in patients with scrub typhus	17 (24.5)
Backache is a symptom of scrub typhus	17 (24.5)
Eschar is a symptom of scrub typhus	3 (4.3)
People living near the forest are at risk	55 (78.6)
People who sit or lie on the grass are at risk	39 (55.7)
People who work in the field are at risk	36 (51.4)
People who stay near the riverbanks are at risk	18 (25.7)
People who work at the park are at risk	8 (11.4)
Wearing long sleeves and pants and closed footwear such as boots with socks are a preventive measure	29 (41.4)
Using insects repellents prevents scrub typhus	34 (48.6)
Avoiding travel to mite infected areas helps to prevent scrub typhus	32 (45.7)
Proper sanitation helps to prevent of scrub typhus	20 (28.6)
Destroying discarded objects such as bottles and buckets helps to prevent scrub typhus	13 (18.6)
Using ground covers while sitting is another method of scrub typhus	7 (10.0)
Taking bath lathering with soap in a hot bath or shower is a preventive measure of scrub typhus	5 (7.1)
Vaccine is not available for the scrub typhus	15 (21.4)

**Table 5:** Level of knowledge on scrub typhus among patients

Level of knowledge	Frequency (%)
Low knowledge ( $\leq 10.24$ )	29 (41.4)
High knowledge ( $> 10.24$ )	41 (58.6)
Total	70 (100)

It is mean knowledge score (SD): 10.24 $\pm$ 3.73, obtained score (minimum score-2, maximum-18). SD: Standard deviation

Varghese *et al.* (2014) also noted fever (100%), nausea/vomiting (54.0%), shortness of breath (49.0%), headache (46.0%), cough (38.0%), and altered sensorium (26.0%) in patients with scrub typhus.<sup>[12]</sup>

In our study, majority of patients who had undergone screening test for scrub typhus had history of exposure to

predisposing factors such as exposure to domestic animals (82.1%), being closest to forest or bushy area (81.4%), and history of rats infestations (77.7%), grass cutting (69.4%), vegetation around houses (64.1%), and history of living near forest area (59.8%). Research studies<sup>[10,13-15]</sup> also reported that people working in the fields (i.e., farmers), residing in rural areas with their houses near the grasslands, living at the edge of village, sitting on grass for breaks, and having close contact with rats have higher risks for scrub typhus.

Regarding knowledge, only 23.3% of patients had heard the term scrub typhus. On item wise knowledge, out of those who heard the term scrub typhus, 52.9% knew scrub typhus as infectious disease, 61.4% knew about the mode of transmission through the bite of mite, and 38.6% knew that the scrub typhus spreads rapidly during the rainy season. Kim *et al.* also reported that 61.4% of patients in Korea heard the term scrub typhus, 44.4% of patients knew that scrub typhus is caused by small mite and 48.5% knew that it does not infect others.<sup>[11]</sup>

Signs and symptoms of scrub typhus are nonspecific and resemble symptoms of other illnesses. Hence, delayed diagnosis and treatments are common. Knowledge of signs and symptoms among people helps to seek early medical treatment and prevention of complications. In our study, most of the patients knew fever (92.9%), headache (65.7%), and myalgia (50.0%) as sign and symptoms of scrub typhus but very few (4.3%) had knowledge about the eschar. Similarly, the study in Korea revealed that 60.2% of patients were aware that symptoms of scrub typhus are similar to flu-like symptoms such as headache, fever, and chills and 48.5% were aware that the most characteristic signs of scrub typhus as eschar lesions.<sup>[11]</sup>

Knowledge of the areas where people have a higher risk of getting bitten by mite is important for the application of preventive measures in day to day life. Our study revealed that majority of the patients had knowledge that people living near the forest (78.6%), near grasslands (55.7%), and working in field (51.4%) are the risk groups of scrub typhus. However, very few knew that people working in the parks (11.4%) are also at risk.

We found that the highest percentages of the patients had knowledge on the scrub typhus prevention strategies such as using insects repellents (60.7%), avoiding travel to mite infected areas (72.0%), and wearing long sleeves, pants, and closed footwear (82.2%) while very few had knowledge about leathering with soap in a hot bath or shower (7.1%), using ground covers while sitting (10.0%) and destroying objects such as bottles and buckets (18.6%). These findings are consistent with the previous study conducted in Korea where majority were aware of the use of tick repellent, not to sit or lie on the grass, wear long sleeves, pants, and boots, take off work clothes immediately after outdoor work, take

a bath or shower after outdoor work and keep separate work and daily clothes as preventive measures for scrub typhus.<sup>[11]</sup> These observations demonstrated that creation of general awareness on scrub typhus as well as preventive strategies is very important.

Our study has certain strengths such as all the patients enrolled were admitted in the hospital with the diagnosis of AFI and underwent screening for the scrub typhus test recently. Moreover, the proportion of patients with scrub typhus was calculated and patients' knowledge regarding the topic was also explored. Despite this, our study also has certain limitations that should be considered while interpreting the findings. First, our study used only IgM ELISA method for the screening. Second, small sample size and single setting might affect the generalizability of our findings. Third, our study population was all admitted patients with AFI and therefore may not represent those attending outpatient departments of hospital and community settings. Still, findings could be helpful to plan and implement health awareness program on scrub typhus and its preventive measures as well as the implementation of strategies for the regular screening of scrub typhus as a differential diagnosis in patients with AFI.

## CONCLUSION

Scrub typhus infection is one of the most important causes of AFI, but very few patients knew the term scrub typhus, and hence, the lack of knowledge is evident among them. Therefore, patients with AFI must be investigated for scrub typhus. Moreover, emphasis should be given to raise general awareness among patients with AFI to decrease the incidence of scrub typhus.

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