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Scrub typhus outbreak in rural area of Purba Medinipur district, West Bengal, India in 2021

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ABSTRACT

Background: Scrub typhus is a reemerging zoonotic disease with no definite preventive measures. Mild to severe clinical manifestation of scrub typhus are occurring in tropical countries. We conducted investigation to confirm the outbreak and vector survey to ascertain transmission of scrub typhus.

Methods: A cross sectional study was conducted in Sahid Matangini block of Purba Medinipur district, West Bengal, India between November' 2020 and January' 2021. All suspected scrub typhus cases were included for investigation. Environmental and vector survey was also conducted in affected villages.

Results: Among total 71 cases, 51 cases were tested for scrub typhus and positivity rate was 13.72% (7/51). Positivity rate was higher in women 9.80% (5/51) than men. Cases found in adult women in the age group of 19-45 years were 35.21% (25/71) and in the children below the age of 15 years were 23.94% (17/71). All the patients developed fever followed by headache, myalgia, cough, rash & eschar. Outbreak started in November' 2020 and maximum cases were found in December' 2020. Dumping of household waste inside house was 93%, agriculture fields close to residential houses were 80% and pet animals in household were 69% of total case patients. Trap positivity was 37.5% (3/8) and after examination in laboratory ectoparasites such as adult mites were identified.

Conclusions: This was an outbreak of scrub typhus. Mites were found in peri-domestic areas. Household waste is to be dumped away from the residential houses. A clean and vegetation free household environment with proper washing of feet and hand may decrease the risk of scrub typhus.

Keywords: Scrub typhus, Outbreak, Purbamedinipur district, West Bengal, India

INTRODUCTION

Scrub typhus is a zoonotic disease transmitted by infected chigger mite.¹ The clinical features varied from mild to severe illness, even death with mortality rate was 30%.²⁻⁴ The affected children develops nonspecific febrile illness and with typical eschar in 40% cases.⁵ More than one billion of the people are at risk and one million new cases occurring annually.⁶ Scrub typhus cases are increasing wide spread and recently reported from Africa, South

America and Middle East.^{7,8} The disease is endemic in Asia and Pacific region.⁹ In India, Scrub Typhus is reported in East, West and Himalayan region.^{10,11} In West Bengal, outbreak of scrub typhus was reported in Darjeeling district in 2005.¹² A seasonal increase of cases was reported during the cooler month in South India.¹³ Scrub Typhus cases have the higher incidence among the rural agriculture worker than the non-agriculture worker.¹⁴ The evidence of scrub typhus in Purba Medinipur district was very few in last year. But in recent, year the numbers of cases have been increased. There were clustering of scrub typhus cases in Sahid Matangini block of Purba Medinipur district, West Bengal; India. We investigated the outbreak with the following objectives; to confirm the outbreak, find out the risk factor of scrub typhus and to recommend preventive measures of the outbreak.

METHODS

We conducted the investigation at Sahid Matangini block of Purba Medinipur district during November 2020 and February 2021. The block Sahid Matangini has a population of 1,99,210 and is situated at eastern part of the district and has nine Gram Panchyate (GP).¹⁵ The main income of the population is agriculture and literacy rate is above 87%.¹⁵

Study setting

A cross section study was conducted at Sahid Matangini block of Purba Medinipur district of West Bengal during November 2020 and February 2021 for scrub typhus.

Case definition

We defined scrub typhus as acute febrile illness of any duration with any one of the following such as mark of bite mark (Eschar), Encephalitis or meningo-encephalitis, sign of vital organ involvement, haemorrhaemogic manifestation. Acute febrile illness for 5 days or more, which have been already tested for malaria and dengue and found negative. But with any two of the followings findings such as macula-papular rash, lymphadenopathy, definite myalgia, dry cough, hepatomegaly/ hepatitis with jaundice were present.¹⁶

Data collection and laboratory investigation

We constructed a data collection format. Health workers were trained for data collection. All cases were line listed according to case definition. Fever cases were primarily tested for malaria with the help of rapid antigen test (RAT) and microscopic examination of blood slides. Blood samples were collected and serum were separated at local block primary health center and then sent to public health laboratory at District Hospital, Tamluk, Purba Medinipur for detection of scrub typhus in ELISA method for confirmation of the cases. We also collected the data for environmental assessment, socio-economic status of the household.

Entomological assessment

Entomologist of the district surveyed the villages for assessment and identification of vector for scrub typhus. They assessed the mosquito density and mosquito breeding sites. They also searched for rat (rodents), mite and pet animals and their behaviors with the household. Rat were trapped and brought them to entomological laboratory at the office of chief medical officer of health, Tamluk, Purba Medinipur for examination.

Materials used for trap

Rodents were trapped using (wire cage) traps of the size of $3" \times 3" \times 10"$ (W × H × L) designed for live capture of rats. Traps were set up at outdoors (peri-domestic areas) in Saira, Bolluk, Mahishda and Paikpari villages of Sahid Matangini block of Purba Medinipur district. Sites were selected observing the presence with scrubby vegetation and rodent burrows. Six traps were placed in these selected areas on each day to catch rates. The traps were baited with fried Rooti and Gur. The traps were placed one hour before sun set (1700 hour) and retrieved the next day morning (0600 hour) and brought back to the laboratory. The captured rodents were anaesthetized and identified through morphological features.¹⁷

Collection of ectoparasites and identification

The ectoparasites including chigger (larval) mites were collected by combing the animals against the fur over a white enamel sheet. The snout, ears, limbs and axillary regions of individual animals were combed and the ectoparasites were preserved in 70% ethanol until they were mounted on slides. Mites were mounted in mounting medium, examined under microscope and identified up to species level, following standard taxonomical keys. Other ectoparasites collected were also mounted in the mounting medium, examined under microscope and identified using the standard taxonomical keys. Chigger index: Number of mite found and divided by number of rodent screened.

Data analysis

Data were entered in epi-info software and excel and then analyzed. We described the data in term of time, place and person distribution. Findings were plotted in tables and figures.

RESULTS

Total 71 cases were found during the study period of November 2020 to February 2021. Among the total cases, 51 cases were tested for scrub typhus in ELISA method at Public Health laboratory, district hospital; Tamluk. Among them 7 (seven) cases were tested positive for scrub typhus. The positivity rate among women was highest 9.80% (5/51) in compared to men 3.92% (2/51) (Table 1). In age wise distribution of case patients, maximum cases were women 59.15% (42/71). Age group wise distribution, 35.21% (25/71) case patient were in the age group of 19-45 and they were female. Child cases such as below 15 years of age were 23.94% (17/71) and above 60 years age group was 15.49% (11/71) (Table 2).

Epidemic curve showed cases started from November 2020 and maximum cases were found in 3^{rd} week of

December 2020. Then cases gradually decreased after 2nd week of January 2021; there was no case was seen (Figure 1). After receiving information from the block

health authority the rapid response team (RRT) of the district along with block RRT visited the villages on 3rd week of December 2020 and identified cases.

 Table 1: Sex wise distribution of positive cases in outbreak of scrub typhus, Sahid Matagini block, Purba Medinipur district, West Bengal, India 2021.

| Sex | Positivity rate (%) | Negativity rate (%) | Positivity in total tested | Total tested |
|--------|---------------------|---------------------|----------------------------|---------------|
| Male | 10.52 (2/19) | 89.47 (17/19) | 3.92 (2/51) | 37.25 (19/51) |
| Female | 15.62 (5/32) | 84.37 (27/32) | 9.80 (5/51) | 62.74 (32/51) |
| Total | 13.72 (7/51) | 86.27 (44/51) | 13.72 (7/51) | 100 (51/51) |



Figure 1: Epidemic curve of outbreak of scrub typhus in Purba Medinipur district, West Bengal; India 2021.

Table 2: Age wise distribution of scrub typhus cases,Sahid Matangini Block, Purba Medinipur district'West Bengal, India' 2021.

| Age group (years) | Male | Female | Ν | % |
|-------------------|------|--------|----|-------|
| 1-5 | 6 | 4 | 10 | 14.08 |
| 6-10 | 6 | 4 | 10 | 14.08 |
| 11-18 | 4 | 0 | 6 | 8.45 |
| 19-45 | 6 | 21 | 25 | 35.21 |
| 46-60 | 2 | 7 | 9 | 12.67 |
| >60 | 5 | 6 | 11 | 15.49 |
| Total | 29 | 42 | 71 | 100 |

Active case search was done and all cases patients were line listed. All cases were tested for malaria and found negative. Ten swab samples were tested for COVID-19 and found negative. Fifteen samples were tested for dengue and found negative also. Rash and eschar were present in few case patients. We tested 51 samples for scrub typhus. Seven cases were found positive (Figure 2). All the patients developed fever. Patient developed other signs and symptoms such as headache which was 59.15% (43/71), cough was 43.66% (31/71) and rash was present in 28.16% (20/71). Less common features such as myalgia, conjunctival congestion, Eschars was also present (Figure 3). Cases were distributed in 14 villages of Sahid Matangini blocks. Among them, five or more cases were detected in the six villages, where cluster of cases were present (Table 3).



Figure 2: Laboratory test and positive cases in outbreak of scrub typhus in Purba Medinipur district, West Bengal, India.



Figure 3: The signs and symptoms of outbreak of scrub typhus in Purba Medinipur district, West Bengal' India 2020.

Epidemiological finding

About 93% (66/71) of the case patient preserved their household waste inside the houses. Agriculture field were closed to their residence was 80% (57/71). Presence of bushes within five meter of houses of the case patient was 85% (60/71). Finally, 69% (49/71) of case patient had habit to rear pet animal in their houses. These might indicates presence of rodent in and around household (Table 4).

| Village | Population | Cases | ELISA Confirmed cases | Test positivity |
|------------|------------|-------|-----------------------|-----------------|
| Alinan | 4339 | 10 | 1 | 10.00 |
| Balluk | 3565 | 14 | 2 | 14.29 |
| Dhalhara | 7150 | 2 | 0 | 0.00 |
| Janubasan | 5363 | 5 | 0 | 0.00 |
| Kaktia | 2100 | 4 | 0 | 0.00 |
| Kankarda | 1913 | 1 | 0 | 0.00 |
| Khoshkhana | 1369 | 2 | 0 | 0.00 |
| Mahishda | 4279 | 9 | 2 | 22.22 |
| Paikpari | 2595 | 6 | 1 | 16.67 |
| Panchberia | 776 | 6 | 0 | 0.00 |
| Sabalara | 3393 | 1 | 0 | 0.00 |
| Saira | 4122 | 6 | 1 | 16.67 |
| Soyadighi | 2704 | 3 | 0 | 0.00 |
| Udaychak | 1387 | 2 | 0 | 0.00 |
| Total | 45055 | 71 | 7 | 9.86 |
| | | | | |

 Table 3: Distribution of scrub typhus cases in Sahid Matangini block of Purba Medinipur district, West Bengal, India' 2021.

Table 4: Epidemiological finding of outbreak of scrub typhus outbreak of Sahid Matangini block, Purba Medinipur district, West Bengal' India 2021.

| Epidemiological findings | Ν | % |
|---|----|----|
| Cases stoking waste inside houses | 66 | 93 |
| Cases have Pucca house | 66 | 93 |
| Presence of water body within 100 meter residence | 65 | 92 |
| Cases have Pucca toilet | 63 | 89 |
| Presence of bushes within 5 meter of house | 60 | 85 |
| Presence of cesspool around house | 58 | 82 |
| House of cases closed to agriculture field | 57 | 80 |
| Cases had Pet animal in house | 49 | 69 |
| Cases use cot while sleeping | 46 | 65 |
| Cases engaged in agriculture work | 34 | 48 |
| Cases rearing poultry | 12 | 17 |

Entomological findings

A total of 8 traps were placed in Saira, Bolluk, Mahishda and Paikpari villages for collection of rodent for seven days. Trap positivity rate 37.5% (3/8). We found three Rattus Rattus (species of rodent). After observation of Rattus Rattus in laboratory we found ectoparacites such as; mite (adult and larvae), lice and others species. The mites which were found were leptotrombidium genus which is responsible for transmission of scrub typhus. The chigger index was high as 9.66. Mite infestation was found highest amongst the rodents trapped followed by lice and others (not identified) (Table 5).

DISCUSSION

This was an outbreak of scrub typhus fever at Sahid Matangini block of Purba Medinipur district, West Bengal, India. Because, there was no confirm case of scrub typhus was detected in previous years. All cases developed fever and most of them had myalgia, cough and rash over the body. A few developed eschar. All these cases developed mild signs and symptoms of typhus fever. None of them developed altered sensorium and unconsciousness. These findings were similar with the CDC guidelines.¹⁸ Positivity rate among the female were maximum in comparison to male. Same finding was reported in a study done in central India by Gujar et al.¹⁹ Presence of bushes and household waste inside the house premises may harbor the rodents. Especially trombiculid mite is responsible for the transmission of scrub typhus.¹⁷ Similar environmental conditions were found in our investigation. Presence of water body within 100 meter of house will be 3.5 fold increased risk of scrub typhus fever. Similarly, people at risk those who are engaged in waste materials clearing, working in forest and agriculture field, river banks. Because infected mite harbor there due to optimal environment for the larval mite and people may acquire scrub typhus.²⁰ In our study, case patient were involved in keeping waste materials inside houses, agriculture field were closed to resident, water bodies were situated closed to residential house. The trombiculid mites were also identified from the trapped rodent Rattus rattus.

 Table 5: Entomological findings of scrub typhus outbreak at Sahid Matangini block, Purba Medinipur district;

 West Bengal' India 2021.

| Trap Laid | Trap Positive | Rodent species | Trap positivity rate Ecto Mite | Ecto-j | parasites found | | Chigger index |
|-----------|---------------|----------------|--|--------|-----------------|--------|---------------|
| | | | | Mite | Lice | Others | |
| 8 | 3 | Rattus rattus | 37.5% | 29 | 6 | 6 | 9.66 |

It is shown in the research work in Bhutan that maximum scrub typhus cases were present among the age group of 21-40 years.²¹ In our study most of the cases were in the age group of 19-45 years. Scrub typhus cases among the age group of less than 10 years were present 28%, which was slight higher than the study by Pote et al it was 18.5% only.²² In our study, the vector survey report revealed that the chigger index was high 9.66 though the critical value is 0.96 per rodent.¹⁷ Vector density is one of the indicators for transmission of scrub typhus. But the transmission also depends on vector density, seasonality and rodent species.²³ In our study, health workers were sensitive to identify the fever and notice the district health authority in time. Therefore, early intervention was undertaken to control the outbreak. Specific vector and mite for the scrub typhus were identified in the domestic and peri-domistic areas. Clinical features and laboratory confirmation of scrub typhus indicated the outbreak of scrub typhus. All the cases were treated with Government treatment protocol and there was no death. Environmental precautionary measures were suggested to the villagers as dumping of household waste away from the residential house. We suggested washing of feet and hands while coming from the fields. As there is no vaccine for scrub typhus fever, extensive awareness on fever to health care provider and community people is required to prevent scrub typhus transmission. Further study is required to identify the risk factors for scrub typhus.

Limitations

This is only the descriptive investigation. Findings were not justified with statistical method. Only rates and proportions were used.

CONCLUSION

This was an outbreak of scrub typhus. Mites were found in peri-domestic areas. Household waste is to be dumped away from the residential houses. A clean and vegetation free household environment with proper washing of feet and hand may decrease the risk of scrub typhus.

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