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Research Article

Increasing Trend of Scrub Typhus in Madhya Pradesh: A Four-Year Retrospective Analysis

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I N F O

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A B S T R A C T

Background: In a region known as the 'tsutsugamushi triangle', concentrated in Southeast and Pacific Asia, the geographic distribution of endemic scrub typhus is linked to the spread of the reservoir mite. Scrub typhus appears to be particularly prevalent in the tsutsugamushi triangle, which spans around 13 million km^2 area and is bordered on the east by Japan, China, the Philippines, tropical Australia in the south, on the west by India, Pakistan, possibly Tibet, Afghanistan, and southern parts of the USSR in the north.

Methodology: This study aims to find the trend of occurrence of scrub typhus in various districts of Madhya Pradesh from 2017 to 2020. It is a retrospective observational study conducted among all laboratory-confirmed IgM ELISA patients positive for scrub typhus in Madhya Pradesh. Data was collected from the Integrated Disease Surveillance Program (IDSP) database on zoonotic diseases.

Results: According to statistics, in 2017, 29% of cases were found to be in rural areas and 71% in urban areas. In 2018, 97% of cases in rural areas and 3% in urban areas were recorded. Similarly, in 2019, 90% of instances were recorded in rural areas and 10% in urban areas, while in 2020, 97% of cases were reported in rural areas and 3% in urban areas.

Conclusion: The epidemiological data presented here can aid in the creation and timely implementation of public health strategies to lower the prevalence of scrub typhus in Madhya Pradesh.

Keywords: Scrub Typhus, Madhya Pradesh, Remerging Diseases,Trends

Introduction

The obligate intracellular bacteria *Orientia tsutsugamushi* causes scrub typhus (ST) or tsutsugamushi disease, a vector-borne rickettsial disease. A trombiculid mite serves as the principal reservoir, maintaining infection within populations by both transovarial and trans-stadial transmission. Outdoor activities, particularly workers engaged in agricultural practices and living near grasslands or fields, are associated

with a greater risk of exposure to scrub typhus. Humans are dead-end hosts, as there is no evidence of horizontal transmission.[1]

In a region known as the 'tsutsugamushi triangle', concentrated in Southeast and Pacific Asia, the geographic distribution of endemic scrub typhus is linked to the spread of the reservoir mite. Scrub typhus appears to be particularly prevalent in the tsutsugamushi triangle, which spans around 13 million km^2 area and is bordered on the east by Japan, China, the Philippines, tropical Australia in the south, on the west by India, Pakistan, possibly Tibet, Afghanistan, and southern parts of the USSR in the north. Eschar is a common lesion that begins as a vesicular lesion at the mite-feeding site. For more than a century, scrub typhus has been documented in these areas. Global climate change has been linked to the recent comeback and re-emergence of scrub typhus in the endemic area, which has influenced the dispersion of infected mites. Changes in agricultural techniques and human behaviour, as well as increases in diagnostic skills, are all possible reasons. Scrub typhus instances have been documented in Jammu and Kashmir, Himachal Pradesh, Uttarakhand, Bihar, West Bengal, Meghalaya, Rajasthan, Maharashtra, Karnataka, Tamil Nadu, and Kerala, among other Indian states.[2]

Scrub typhus is a prevalent cause of severe fever sickness in India, and due to its many manifestations, it is an essential differential diagnostic of other illnesses. The fundamental difficulty in managing it is establishing a high index of suspicion and identifying it early enough, despite poor resource allocation, especially in the absence of eschars.[3]

Scrub typhus manifests clinically as a vague, severe febrile disease that is difficult to identify. Nausea, vomiting, headaches, myalgia, and respiratory indications are all typical symptoms.[4] The presence of eschar at the bite site prior to the start of other symptoms is pathognomonic. However, depending on the location in the globe, the appearance of an eschar, generally on the front of the body, is recorded in 1–97% of scrub typhus patients. While medicines such as tetracycline, doxycycline, azithromycin, and rifampicin are effective in treating scrub typhus, the vague flu-like symptoms contribute to underdiagnosis and undertreatment of the illness in many countries.[5] Untreated scrub typhus can cause major complications and ultimately death.

As scrub typhus resembles many other conditions that cause pyrexia of unknown origin (PUO), the World Health Organization (WHO) has established a standard definition for diagnosing scrub typhus clinically, which is useful, particularly when starting treatment empirically and in areas where diagnostic facilities are not available.[6]

Scrub typhus cases have been reported in Madhya Pradesh constantly since 2015, with a rising tendency over the last six years. Madhya Pradesh is split into seven divisions (Bhopal, Indore, Ujjain, Jabalpur, Gwalior, Sagar, and Rewa) and 52 districts. Scrub typhus cases have been reported in the divisions of Ujjain and Gwalior in north- western Madhya Pradesh on a regular basis. Cases have also been reported in the eastern Madhya Pradesh divisions of Rewa and Jabalpur in the last two years. A large epidemic was recorded in four separate blocks in Mandsaur district, namely Dhundharka, Malhargarh, Shamgarh, and Suwasara, according to a monthly Surveillance Report from the Integrated Disease Surveillance Program, National Health Mission (October 2018).[7]

Case Definitions

- **Scrub typhus cases:** Patients with a febrile illness with or without an eschar confirmed by a molecular/ serological diagnostic test
- **Case fatality proportion:** The proportion of deaths among individuals diagnosed with scrub typhus
- **Sero-epidemiology of scrub typhus:** Sero-epidemiology study of scrub typhus using IgG test[8]

Methodology

This study aims to find the trend of the occurrence of scrub typhus in various districts of Madhya Pradesh from 2017 to 2020. It is a retrospective observational study conducted among all lab-confirmed IgM ELISA patients positive for scrub typhus in Madhya Pradesh. Data was collected from the Integrated Disease Surveillance Program (IDSP) database on zoonotic diseases. Due permission was taken from department head. At first, the data were arranged year-wise to reflect the yearly incidence of scrub typhus cases in the state from 2017 to 2020. This data was analysed to draw out trends of disease occurrence. The data was then broken down into the number of cases reported from each division throughout different months of the year, allowing for a geographical and seasonal fluctuation in the disease's incidence. The number of instances of scrub typhus was investigated in order to identify several epidemiological variables and their impact on the occurrence of scrub typhus.

Scrub typhus cases have been on the rise over the previous four years, according to the available statistics. Over a four-year period, 473 patients with scrub typhus IgM positive were studied for geography, age, sex, urban and rural distribution, and seasonal fluctuations in the seven divisions of Madhya Pradesh. The data collection was checked for completeness, and patients who did not fill out any of the above-mentioned factors were ruled out of the research.

Results

As per the available data, 473 patients were reported positive by the Elisa test over a 4-year period in the institutions of AIIMS Bhopal, NIRTH Jabalpur, Medical College Udaipur, and Kota Medical College Rajasthan.

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Cases of scrub typhus reported in Madhya Pradesh in the years 2017, 2018, 2019 and 2020 were 17, 96, 295 and 65 respectively, and the peak was seen in the year of 2019 (Figure 1).

District wise distribution

Table 1 presents data on occurrences across various districts in three consecutive years: 2018, 2019, and 2020. A total of 96 occurrences were recorded in 2018, increasing significantly to 295 in 2019 before declining sharply to 65 in 2020. District-wise, Mandsaur reported the highest numbers, peaking at 99 in 2019 but dropping to 16 in 2020. Other districts like Jabalpur and Rajgarh also showed notable activity in 2019. Many districts had no occurrences in certain years, indicating variability. The decline in 2020 may reflect external factors, such as disruptions caused by the COVID-19 pandemic.

Sexual Predominance

The positive cases of scrub typhus were found to be 53% male and 47% female in the year 2017, and 45% male and 55% female in the year 2018. Again, the cases reported for scrub typhus were 52% male and 48% female in the year 2019, and 55% male and 45% female in the year 2020 (Figure 2).

The cumulative male-to-female ratio was found to be 1.03:1.

Distribution according to Age Groups

Here the total reported cases have been divided into four groups: a) ≤ 20 years, b) 21–40 years, c) 41–60 years, and d) > 60 years. Maximum number of patients were from the age group of 21–40 years (214 patients) (Figure 3).

Distribution according to Urban and Rural Areas

According to statistics, in 2017, 29% of cases were found to be from rural areas and 71% from urban areas. In 2018, 97% of cases were recorded in rural areas and 3% in urban areas. Similarly, in 2019, 90% of instances were recorded in rural areas and 10% in urban areas, while in 2020, 97% of cases were reported from rural areas and 3% from urban areas. According to the statistics, the majority of agriculture field workers, both males and females, were infected with rickettsia (Figure 4).

Seasonal Variation

In our study, most of the cases were detected after the rainy season and during the colder months. Scrub typhus cases were reported between July and December from the year 2018 to 2020. A maximum of 62 cases were recorded in the month of September in the year 2018, 107 cases in the month of October in the year 2019, and 25 cases in the month of December in the year 2020 (Figure 5).

Table 1.District-wise Scrub Typhus Cases in Madhya Pradesh from 2018 to 2020

Districts	2018	2019	2020
Agar	1	2	-
Ashoknagar	3	-	-
Damoh	-	4	2
Dindori	-	-	2
Guna	4	7	-
Jabalpur	-	21	13
Katni	-	4	7
Mandla	-	1	-
Mandsaur	63	99	16
Narsinghpur	-	11	3
Neemuch	9	1	1
Panna	-	3	5
Rajgarh	1	83	-
Ratlam	10	12	5
Satna	-	14	5
Seoni	-	2	-
Shahdol	-	6	2
Sheopur	5	14	2
Shivpuri	-	2	-
Sidhi	-	1	-
Singrauli	-	4	1
Ujjain	-	1	-
Umaria	-	3	1
Total	96	295	65

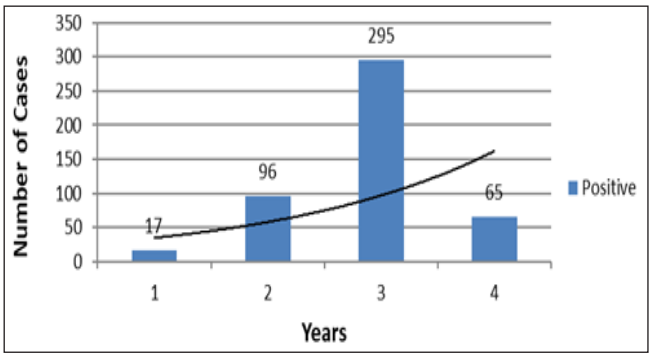

Figure 1.Status of Scrub Typhus in Madhya Pradesh (2017–2020)

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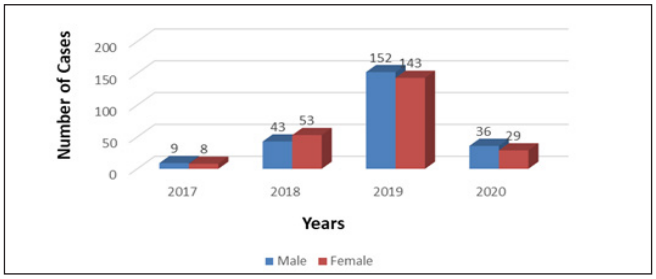

Figure 2.Gender-wise Distribution of Scrub Typhus Cases (2017–2020)

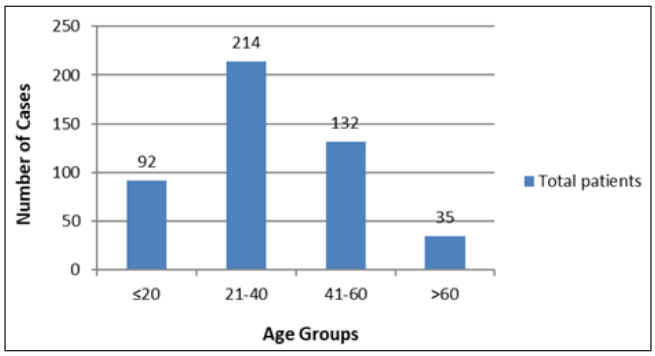

Figure 3.Age-wise Distribution of Scrub Typhus Cases Recorded between 2017 and 2020

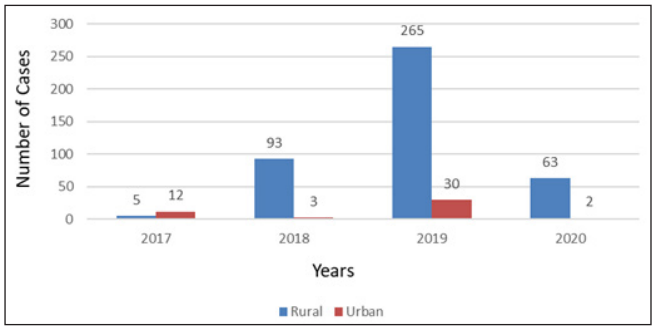

Figure 4.Locality-wise Distribution of Scrub Typhus Cases (2017–2020)

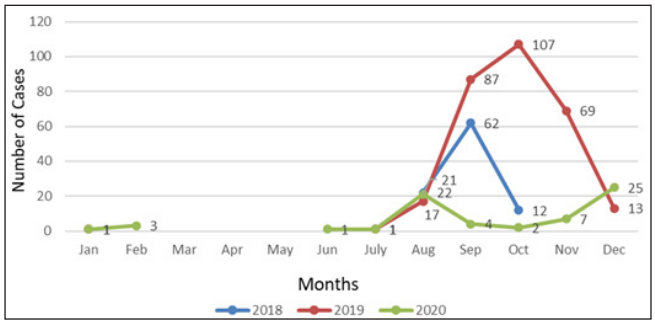

Figure 5.Seasonal Trend of Scrub Typhus from 2018 to 2020

Discussion

Scrub typhus outbreaks have been reported in different locations across India during the past few years. Data on the disease's prevalence in Madhya Pradesh, on the other hand, is currently insufficient to reflect the real situation. The number of laboratory-confirmed cases of scrub typhus in Madhya Pradesh has shown an increasing trend in the past few years, owing to a lack of information and awareness about the disease. After the monsoon season and throughout the cold season, which usually lasts from July to December, there was a seasonal propensity for cases to occur. Scrub typhus is still an underdiagnosed illness in India.

In this study, 473 patients with IgM positive for scrub typhus over a 4-year period were analysed for geography, age, sex, urban and rural distribution and seasonal variations observed in seven divisions. The male-to-female ratio was found to be 1.03:1. Similar results were observed in the study conducted by Das et al. where the male-female ratio was found to be 1.4:1.[6]

In our study, positive cases of scrub typhus were seen in 53% male and 47% female in 2017, 45% male, 55% female in the year 2018, 52% male, 48% female in the year 2019 and 55% male, 45% female in the year 2020. A chi-square value of 2.025 and p value of 0.56 were obtained which were not significant, indicating no gender-specific predilection. Contrary to this, a meta-analysis carried out by Devasagayam et al. showed equal distribution for both sexes (males (50.1%) and females (49.9%)) which was derived from 107 studies.[8]

In our study, among the cases reported in the year 2017, 29% were from rural areas and 71% were from urban areas, while among those reported in 2018, 97% were from rural and 3% were from urban areas. Among the cases reported in 2019, 90% were from rural and 10% were from urban areas, and 97% of the cases reported in 2020 were from rural areas and 3% were from urban areas. Similarly, a study on seroprevalence of scrub typhus found that out of 169 patients, seropositivity was higher in rural patients (25.0%) than in urban cases (18.1%).[9]

In our study, most of the cases were detected after the rainy season and in the cooler months between July and December from the year 2018 to 2020. Similarly, a study conducted in Nepal showed that the autumn, summer and winter seasons were in particular associated with the outbreak of scrub typhus cases.[10] A study conducted by Jeung et al. in South Korea divided Northern, Central, and Southern areas into nine provinces. The peak incidence of scrub typhus in each province was observed from September to November. Most cases were identified between late October and early November. The northern and central regions showed peak incidences in the fourth or fifth week of October, with only a rare incidence of scrub typhus in December. In the southern provinces, incidence peaks were observed between the fifth week of October and the first week of November.[11] Scrub typhus is still an underdiagnosed illness in India, with cases reported all throughout the nation, from the south to the northeast

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and northwest. The peak season for illness incidence in India is from August to November, and it mostly affects rural regions.[12] The scrub typhus outbreak starts after the monsoon and rainy season with the peak incidence in July followed by September.[13]

The epidemiological data presented here can aid in the creation and timely implementation of public health strategies to lower the prevalence of scrub typhus in Madhya Pradesh. Public awareness campaigns may be launched in all regions to encourage people to seek treatment if they are experiencing flu-like symptoms. Similarly, providing clinicians with guidelines and professional training in scrub typhus risk factors, such as times of year, geographic areas, occupations, and types of exposure to potential chigger habitat, could increase the likelihood of scrub typhus being considered in the differential diagnosis for patients with nonspecific febrile illness. The prompt delivery of test kits and medicinal medications to hospitals, particularly in high-risk locations, may help to enhance scrub typhus diagnosis and treatment.

This study is an essential step in understanding the occurrence of scrub typhus in Madhya Pradesh and the risk factors associated with it, which may help inform public health policies as well as the design of future studies.

Limitation of This Study

The limitation of this study is that the seasonal and district-wise variation of scrub typhus cases is not available for the year 2017.

Conclusion

The epidemiological data presented here can aid in the creation and timely implementation of public health strategies to lower the prevalence of scrub typhus in Madhya Pradesh. Public awareness campaigns may be launched in all regions to encourage people to seek treatment if they are experiencing flu-like symptoms. Similarly, providing clinicians with guidelines and professional training in Scrub typhus risk factors, such as times of year, geographic areas, occupations, and types of exposure to potential chigger habitat, could increase the likelihood of Scrub typhus being considered in the differential diagnosis for patients with nonspecific febrile illness. The prompt delivery of test kits and medicinal medications to hospitals, particularly in high-risk locations, may help to enhance Scrub typhus diagnosis and treatment.

This study is an essential step in understanding the occurrence of scrub typhus in Madhya Pradesh and the risk factors associated with it, which may help inform public health policies as well as the design of future studies.

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Conflict of Interest: None

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