



SCENARIO OF SCRUB TYPHUS DISEASE IN MIZORAM, NORTHEAST INDIA

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ABSTRACT

Scrub typhus belongs to a group of Rickettsial diseases caused by an obligate intracellular gram-negative bacterium, *Orientia tsutsugamushi*. From January 2012, Integrated Disease Surveillance Programme (IDSP) Mizoram initiated the collection and recording of scrub typhus disease data from District hospitals and Private hospitals of the state. There were 907 confirmed cases and 34 death cases from January 2012 to July 2017. All age groups were affected while the younger age groups were affected more. The maximum number of cases was recorded from the age group of 20-30 years with 20.94% from the total number of cases. The median age was 34 years. Predilection between sexes was observed from the recorded data as males (58.22%) outnumbered females (41.71%) in terms of seropositivity. Perennial transmission of scrub typhus is observed in Mizoram as confirmed cases were recorded throughout the year and cases gradually increased with the monsoon. Cases were gradually increases with a peak in the month of October and November. Scrub typhus cases has been reported from 168 human habitations comprising of villages and towns inside the state. It is increasingly becoming a major public health concern in the state due to its endemicity, morbidity and mortality.

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INTRODUCTION

Scrub typhus belongs to a group of Rickettsial diseases caused by an obligate intracellular gram-negative bacterium, *Orientia tsutsugamushi*, tsutsuga means dangerous and mushi means insect or mites. The bacterium is maintained in Trombiculid mites through trans-ovarial and trans-stadial transmission (Kumar *et al*, 2010; and Traub and Wisseman, 1968). Scrub typhus was a dreaded disease in pre-antibiotic era and was first described from Japan in 1899. Severe epidemics of the disease occurred among troops in Myanmar and Sri Lanka during the second world war (McCallum, 2008). Scrub typhus is endemic in regions of eastern Asia and the south-western pacific and from Japan to India and Pakistan and is estimated that there are one million cases of this disease each year (Vas and Gupta, 2006). Scrub typhus is acute, zoonotic, febrile illness of human. Fever typically begins 6-21 days following the bite of infected mites, the larval stage, known as chiggers and is accompanied by maculopapular rash, headache and lymphadenopathy and a typical focal lesion or eschar may develop at the site of bite (Bavaro *et al*, 2005 and Azad, 1990). Human beings usually become infected when they encroach upon an area of infected chiggers mainly in rural and sub-urban areas. Delayed diagnosis or treatment of patient with inappropriate antibiotics

can cause serious complications such as renal failure, myocarditis, septic shock, meningoencephalitis and rarely, acute respiratory distress syndrome. The mortality rate ranges from 7% to 30% (Mahajan, 2005).

In India, scrub typhus is considered as a re-emerging infectious disease (Padbidri and Gupta, 1978). The first scrub typhus infection in the country was reported from the state of Assam and West Bengal during the second World War (Davis *et al*, 1947). Outbreaks of scrub typhus have been reported in Himachal Pradesh, Sikkim, West Bengal, Puducherry, Uttarakhand and north-western part of the country (Kumar *et al*, 2010). During 2010-2011, resurgence of scrub typhus was reported in Assam after a gap of 65 years, since its maiden report (Khan *et al*, 2012). Thereafter, sporadic cases of scrub typhus in the state of Assam as well as its neighbouring states have been reported (Gurung *et al*, 2013; Sharma *et al*, 2015; Singh *et al*, 2014 and Goswami *et al*, 2013). During October 2013 to February 2014, sero-surveillance was carried out by Regional medical research centre (RMRC), Dibrugarh team in north-eastern states of Nagaland and Meghalaya. In Nagaland, 145 samples were tested and 53 patients were positive with scrub typhus and among 150 patients tested, 80 patients were positive with scrub typhus in Meghalaya respectively (Siraj *et al*, 2016).

Geographical information of study area: Mizoram is a landlocked state in northeast India whose southern part shares 722 kilometres long international borders with Myanmar and

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Scenario of Scrub Typhus Disease in Mizoram, Northeast India

Bangladesh, and its northern part share domestic borders with Manipur, Assam and Tripura. It is the fifth smallest state of India with 21,087 square kilometres. It extends from 21°56 N to 24°31 N, and 92°16 E to 93°26 E. The tropic of cancer runs through the state nearly at its middle. Mizoram has a mild climate, being relatively cool in summer 20°C to 29°C but progressively warmer most probably due to climate change with temperature crossing 30°C and winter temperatures ranging from 7°C to 22°C. The region is influenced by monsoons, raining heavily from May to September with little rain during the cold season. The climate pattern is moist sub-tropical, with average state rainfall of 254 centimetres (extracted from Wikipedia).



Figure 1 Geographical Map of Mizoram, the study area.

MATERIALS AND METHOD

There has been no prior documentation of a case or cases of scrub typhus disease in the Health & family welfare

Table 1 Districtwise cases of scrub typhus of Mizoram from January 2012 to July 2017

SCRUB TYPHUS CASES FROM MIZORAM														
Sl. No.	Name of District	Total No. of Cases						Total No. of Death					G. Total	
		2012	2013	2014	2015	2016	2017	2012	2013	2014	2015	2016	Cases	Death
1	Aizawl East	98	28	84	34	7	30	5	2	2	4	0	281	13
2	Aizawl West	112	54	50	106	20	17	9	0	1	3	1	359	14
3	Lunglei	0	47	38	6	7	1	0	2	1	1	0	99	4
4	Saiha	9	10	2				0	0	0	0	0	21	0
5	Champhai	20	26	4		41	6	2	0	0		0	97	2
6	Kolasib	6	0	0				0	0	0		0	6	0
7	Serchhip	4	3	1	2	12	4	0	0	0		0	26	0
8	Mamit	3	7	0				0	0	0		0	10	0
9	Lawngtlai	0	0	3	2	3		0	0	0	1	0	8	1
		252	175	182	150	90	58	16	4	4	9	1	907	34

Source: Integrated Disease Surveillance Programme (IDSP), Mizoram

department, Mizoram or other concerned departments prior to the year 2012. The Integrated disease surveillance programme (IDSP) Mizoram initiated the collection and recording of scrub typhus disease data from District hospitals and Private hospitals within the state from January 2012. Data entry operators and Data managers under IDSP of all the 9 districts were assigned to collect every confirmed scrub typhus cases and death cases from their respective area and to report to State surveillance unit, IDSP in a specially designed format. The compiled data is then shared with Central surveillance unit, IDSP. In an outbreak of the disease, rapid response team consisting of epidemiologist, entomologist, microbiologist and other paramedics had been detailed to investigate the outbreak and to operate preventive and control measures and public awareness campaign.

At this stage, for the serological diagnosis of scrub typhus in Mizoram, only the rapid immunochromatographic test (ICT) has been utilised due to deficiency in diagnostic facilities in the state. The ICT used in the state is a SD-Bioline, tsutsugamushi test from standard diagnostics Inc. Hagal-dong, Kyonggi-do, Korea containing a major protein surface 56-kda antigen representative of *O.tsutsugamushi* (Karp, Kato, Gilliam). The ICT test detected IgA, IgM and IgG. Since this ICT also detects IgG antibodies, the patient may have had a secondary infection and thus positive which may lead to false positive for scrub typhus. In Mizoram, scrub typhus was suspected in all patients who had fever more than 5 days without an identifiable infection and exhibits the following clinical features: rash, hepatosplenomegaly, lymphadenopathy and eschar.

RESULT

During January 2012 to July 2017, there were 907 confirmed cases and 34 death cases recorded as from IDSP. Due to manpower and various other constraints, data could not be collected from private clinics and some private hospitals, confirmed cases and death cases as recorded by IDSP will be fewer in number than the actual number of cases. There was scrub typhus disease outbreak in Falkawn Referral Hospital areas, Aizawl west district, Mizoram in 2015, affecting 62 patients with 1 death recorded. In 2016 there was again the disease outbreak at Khawbung PHC area, Champhai district, Mizoram and 45 patients were recorded with no death cases. As recorded by IDSP, maximum number of cases were recorded in the year 2012 with 252 ICT confirmed cases and cases were declined with years. Among the 9 districts, Aizawl West district had maximum number of cases (359) of scrub typhus from January 2012 to July 2017. 13 deaths were

recorded from Aizawl East district while 14 deaths were recorded from Aizawl West district from the total death cases of 34.

All age groups were affected and the younger age groups were affected more than older ages by the disease. The maximum number of cases were recorded from the age group of 20-30 years with 20.94% from the total number of cases. The median age among the seropositive patients was found out to be 34 years. 5 positive cases were recorded from patients less than 1 year with an unfortunate 1 death of 2 months old male. The youngest patient recorded was a 2 months old male and the eldest was an 85 years old male. Predilection between sexes was observed from the recorded data as males (58.22%) outnumbered females (41.71%) in terms of seropositivity. Among the recorded 34 death cases, females (61.76%) were more in numbers than males (38.24%).

Table 2 Distribution of Ages and Sexes of scrub typhus disease

Age group	Number of cases	Male	Female	Death	
				Male	Female
Less than 1 year	5	4	1	1	0
1 - 10	125	75	50	3	3
11 - 20	140	85	55	2	3
21 - 30	190	110	80	1	3
31 - 40	183	111	72	3	5
41 - 50	125	76	49	1	5
51 - 60	71	35	36	2	0
61 - 70	47	21	26	0	2
71 - 80	16	9	7	0	0
81 - 90	5	2	3	0	0
Total	907	528 (58.22%)	379 (41.78%)	13 (38.24%)	21 (61.76%)
					34

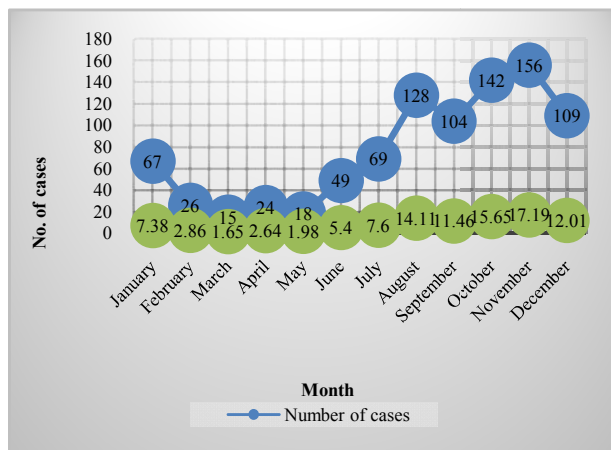


Figure 2 Graph showing monthly distribution of scrub typhus cases in Mizoram

Perennial transmission of scrub typhus is observed in Mizoram as confirmed cases were recorded throughout the year and number of cases were gradually increases with the monsoon rainfall. It is observed that from the month of June cases are gradually increases and has a peak in the month of October and November. Then from the month of December cases were declining gradually and in the months of March, April and May least number of cases were recorded.

Scrub typhus cases have been reported from 168 human habitations comprising of villages and towns inside the state. It is becoming a major public health concern in the state due to its endemicity, morbidity and mortality. Apart from villages and towns, Aizawl city, the capital of Mizoram also

has a report of 273(30.09%) from the total cases, reported from 41 localities inside the city. Positive cases were also found among people residing inside Aizawl city and has no history of travelling to rural areas or visiting forest. Nonetheless, maximum number of cases are found among farmers and cultivators who visited forested areas frequently. Zemabawk, ITI and Bawngkawn localities in Aizawl city have maximum number of confirmed cases of the disease.

Table 3 Localities in Aizawl with higher confirmed cases of scrub typhus.

Localities	First incidence	Last incidence	No. of cases
Zemabawk	12.1.2012	8.8.2017	34
ITI	26.7.2012	12.8.2017	31
Bawngkawn	28.1.2012	23.8.2017	30

DISCUSSION

The present finding supported the earlier finding that, most scrub typhus cases occurred between July and November which may be associated with increased exposure to infected chigger mites during the harvesting season as most cases are found among farmers and cultivators (Fuet *et al*, 2011). It was also observed that most seropositive individuals belonged to the physically active group involved in outdoor activities such as farming and agriculture. As males are more active in outdoor activities than females, seropositivity among male is much higher than females. Moreover, northeast India is highly vulnerable to climate change with a visible bearing on agriculture and forest sectors (Ravindranath *et al*, 2011). As high prevalence of scrub typhus disease has been shown to be associated with changes in climate (Rhee, 2013), Mizoram due to drastic climate change in recent decades may be associated with the emergence or re-emergence of this disease and its endemicity and continuous transmission throughout the year.

Occurrence of scrub typhus disease vector, Trombiculid mites, *Leptotrombidium deliense* is influenced by rainfall with more chiggers attached to the rodents in the wetter months of the year. Risk of exposure to pathogen, *Orientia tsutsugamushi* is greatest during the monsoon season (Francis *et al*, 1999). In Mizoram, the monsoon rainfall usually begins in the months of May and June and usually ends in the months of September to November, supporting the above findings by Francis *et al*, seropositivity for scrub typhus was also increases with the increase in rainfall. Cases gradually increases from July and reach the peak in November then gradually declines. As there is no relevant research work pertaining to the identification of vector species of scrub typhus in Mizoram, the specific vector species of scrub typhus in the state remain unidentified. However, as most of the vector species identified in India and other parts of northeastern states of India was *Leptotrombidium deliense*, the same would be very likely to be the main vector of scrub typhus disease in Mizoram as well.

The emergence or re-emergence of scrub typhus disease in Mizoram might be associated with the incidence of bamboo flowering in the state in the year 2007-2009 as several sporadic scrub typhus-like illness were claimed to be treated from those years by medical practitioners (recorded data not available). The emergence of the disease might be due to rapid increase in rodent population that feeds on nutritious bamboo fruits and flowers. Many rodent population outside

the state might migrated to the state due to the availability of food for them. The pathogen responsible for scrub typhus, *O.tsumugamushi* might be transported inside the state by the migrating rodents from various potential sites outside the state.

In Mizoram scrub typhus disease is not confined only to those rural areas but the urban city contributed 30.09% of the total recorded positive cases.

CONCLUSION

Mizoram is one of the wettest states in India enjoying annual rainfall of 254 centimetres and highly supported the condition favourable for chigger mites and rodents to thrive successfully. In addition to this, more than 80% of the total population depends on agricultural sectors and other various outdoor activities who are highly vulnerable to scrub typhus disease. The vegetation and terrain features of Mizoram also highly supported scrub typhus disease. As this disease is becoming endemic in the state, it is highly necessary to strengthen disease surveillance, research activities, awareness of this disease to health officials, workers and to public, laboratory diagnosis and treatment. Scrub typhus disease is increasingly a high significant public health problems for the state, next only to malaria in terms of seropositivity, morbidity and mortality.

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