

Review Article

Emergence of Scrub Typhus in Kerala: A Review in the Context of Escalating Cases

R Rajendran¹, K Regu², M S Sasi³, S N Sharma⁴

¹Former Joint Director and Consultant, ²Former Additional Director and Consultant, ⁴Former Joint Director and Consultant, National Center for Disease Control, Ministry of Health and Family Welfare, Government of India, Thiruvananthapuram, Kerala, India

³Former Assistant Director, Directorate of Health Services, Government of Kerala, India

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Corresponding Author:

R Rajendran, National Center for Disease Control, Ministry of Health and Family Welfare, Government of India, Thiruvananthapuram, Kerala, India

E-mail Id:

rajendran061@gmail.com

Orcid Id:

<https://orcid.org/0000-0003-2080-9723>

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A B S T R A C T

Scrub typhus (ST) is an emerging vector-borne zoonotic disease. It is caused by the bacterium *Orientia tsutsugamushi* and transmitted to humans through the bite of infected trombiculid chigger mites. An estimated one billion people are at risk of contracting scrub typhus, with roughly one million active cases occurring globally each year. The WHO has designated scrub typhus as a seriously under-acknowledged, neglected public health threat in the Asia-Pacific region. In India, scrub typhus is reportedly resurging across multiple regions, spanning the northern, northeastern, western, and southern states. In Kerala, since its first documented report in 1998, there has been a regular hike in infection and fatality rates all through the years. Of all the districts, Thiruvananthapuram comes with 74.0% of cases and 51.0% of deaths. The highest case incidence and death in Thiruvananthapuram could be attributed to the capital city having been infected from military camps long ago and remaining undetected for a long period, by which time the disease must have spread to a wider area in the district. It must be from Thiruvananthapuram; the disease eventually spread to other areas of Kerala. Scrub typhus has undoubtedly become a critical public health crisis in Kerala. Although awareness of the disease is steadily increasing, more medical and administrative efforts are needed to deal with the threat and to contain its rapid advance. Most existing studies on ST in Kerala focus primarily on hospital-based research. There is a lack of in-depth research into the disease's spatio-temporal epidemiological risk factors, including systemic complications, climatic drivers, and most importantly, ecological and entomological factors. This review examines the epidemiology, geographic distribution, and seasonal dynamics of scrub typhus in Kerala.

Keywords: Scrub typhus, *Orientia tsutsugamushi*, Risk factors, Case fatality rate, Seasonal variation

Introduction

Scrub typhus is a vector-borne zoonotic infection caused by an obligate, intracellular, Gram-negative bacterium *Orientia tsutsugamushi*, which is transmitted to humans through the bites of larval trombiculid mites (chiggers). The term “scrub” refers to the type of low-lying vegetation that serves as the primary habitat for the vector. The word “typhus” derived from the Greek word “typhos,” meaning “fever with stupor” or “smoke,” and the hazy, delirious state of the afflicted.¹

Scrub typhus remains one of the most underdiagnosed febrile illnesses requiring hospitalization in endemic regions. Due to a lack of pathognomonic clinical features and a heavy reliance on serological testing, it is frequently difficult to distinguish it from other common febrile diseases, such as murine typhus, typhoid fever, and leptospirosis.² The epidemiology of scrub typhus is shaped by a complex interplay of climatic variables, the genetic diversity of the pathogen, and the special arthropod vector species. The prevalence of scrub typhus in endemic areas is linked to specific habitats and anthropogenic factors, such as farming or forest-related activities that increase the frequency of mite encounters.³ Individuals face the highest risk of exposure when encountering chiggers perched on grass blades, bushes, or shrubs during agricultural labor or outdoor activities, including recreation and open defecation. After an average incubation period of 10–12 days, the clinical onset is sudden. Key diagnostic indicators of scrub typhus infection include high fever, rigors, intense headache, conjunctiva inflammation, and localized or generalized lymphadenopathy.⁴

Scrub typhus is transmitted by the larval stages of the mite, *Leptotrombidium deliense*, commonly known as chiggers. These vectors congregate in specific, sharply demarcated soil patches called “mite islands,” where microecological conditions are ideal for their survival. Human infections occur when people venture into these “mite islands” and are bitten by chiggers. While feeding, the chiggers inject a large number of *O. tsutsugamushi* bacteria from their salivary glands into the human host. A signature dark scab, called an eschar, frequently forms at the site of the bite. The initial presentation of scrub typhus is non-specific, beginning abruptly with shaking chills, high fever, a severe headache, conjunctivitis, and swollen lymph nodes. Mostly humans are accidental hosts, while natural hosts such as small mammals, particularly field mice and rodents, form the primary reservoirs for the disease.^{4,5}

Historically the earliest clinical description of scrub typhus is found in the Zhouhoufang, a Chinese manual authored in 313AD.⁶ In 1899, Japan reported and described the first scientifically recognized clinical case of scrub typhus.⁷ As early as 1902, physicians working in Indonesia

identified a new disease they called ‘pseudotyphoid’, which closely resembled scrub typhus.⁸ In 1908, researchers first documented scrub typhus in eastern Taiwan. In the same year, the first clinical cases of scrub typhus in the Philippines were identified in two military personnel. Since then, the disease has been documented throughout the archipelago.⁹ In 1910, cases of scrub typhus, then known as “Mossman fever,” were first reported in North Queensland and islands of the Torres Strait.¹⁰ Subsequently, scrub typhus was reported from Vietnam, Korea, and East and West Malaysia.^{11,12,13}

Scrub typhus is a significant public health challenge concentrated within the “tsutsugamushi triangle” (TT) of the Asia-Pacific region, spanning approximately 13 million Km². This endemic zone puts over a billion people at risk and accounts for nearly one million reported cases annually. The expansive area covers a diverse array of territories across Asia and the Pacific, categorized into four primary zones: (1) The Western frontier: spans from the mountainous terrains of Afghanistan and Tajikistan through Pakistan, Nepal, and India, extending down to the islands of Sri Lanka and the Maldives; (2) The Northeast sector: encompasses the vast landscapes of China and eastern Russia, reaching the Korean Peninsula, Japan, and Taiwan; (3) The Central Hub: Includes the mainland Southeast Asian countries of Myanmar, Thailand, Laos, Cambodia, and Vietnam, as well as the archipelagos of Malaysia and the Philippines; and (4) The Southern Perimeter: Stretches across Indonesia and Papua New Guinea, descending into Australia and scattered island chains throughout the southwestern Pacific Ocean.¹⁴

In India, the presence of this disease was formally established in 1913 by Lt. Col. McKechnie, who identified a typhus-like illness that confirmed its long-standing endemicity.¹⁵ Since then, typhus-like illness was reported from many parts of the country.^{16–19} Scrub typhus was specifically identified as a form of the disease in 1917.²⁰ The first serologically identified cases of scrub typhus in India were reported in 1932.²¹ Between 1932 and 1934, an outbreak of typhus fever emerged in the Simla Hill stations of Sabathu, Dagshai, and Kasauli.²² Between 1937 and 1942, India documented two distinct scrub typhus outbreaks characterized by varying geography but consistent clinical findings. The first outbreak occurred in Lansdowne, located in the Garhwal district of the United Provinces. The second outbreak was identified in Jhansi, a plain region.²³ Since the Simla hills emerged as a major endemic hotspot for scrub typhus in the early twentieth century, pioneer investigators have remained deeply engaged in studying the disease’s eco-epidemiology in these highland areas well beyond the 1940s.²⁴ The first Indian case of scrub typhus pathogen *Orientia tsutsugamushi* (formerly *Rickettsia tsutsugamushi*) was identified by Webster in 1940.²⁵ Major outbreaks of scrub typhus occurred along the Assam-Burma border

during World War II and again in 1965 during the Indo-Pakistani War.^{26,27}

As a part of a comprehensive study on rickettsial diseases in India, Kalra and Rao investigated typhus fever in Jammu and Kashmir, conducting extensive surveys of vector mites within the local vegetation.²⁸ The 1990 resurgence of scrub typhus in an Indian Army unit stationed along the northwestern border of Pakistan marked a turning point in the disease's epidemiology. This outbreak signaled the return of the infection to India after it had remained largely dormant following the Indo-Pak conflicts of 1965 and 1971.²⁹ In 1993, eight cases were reported among troops stationed along the Pakistan border.^{30,31}

After the 1990s, the incidence of scrub typhus in India declined due to a combination of widespread insecticide use, the empiric treatment of febrile illnesses, and shifting lifestyle patterns.³² Following a decade of quiescence, scrub typhus resurfaced in Vellore (Tamil Nadu) between 2001 and 2002.³³

While scrub typhus remains under-diagnosed in India, field epidemiology and outbreak investigation studies reveal its presence nationwide. Since 2002, scrub typhus cases have been documented across diverse regions, including South & West (Kerala, Tamil Nadu, Karnataka, Andhra Pradesh, Puducherry, Goa, Maharashtra, and Gujarat); North & Northwest (Haryana, Chandigarh, Himachal Pradesh, Uttar Pradesh, Uttarakhand, Rajasthan, and Jammu & Kashmir); East & Central (Madya Pradesh, Odisha, West Bengal, and Jharkhand); and Northeast (Arunachal Pradesh, Assam, Nagaland, Manipur, Mizoram, Meghalaya, Tripura, and Sikkim).³⁴⁻³⁷ Across India, the peak period for scrub typhus infection generally aligns with the monsoon and post-monsoon seasons, though the exact timing varies by regions. In states like Uttar Pradesh, Uttarakhand, and the Northeast, outbreaks are concentrated during the rainy season and its immediate aftermath, peaking between July and November.³⁸ In South India (Kerala & Tamil Nadu), the surge occurs during the cooler, post-monsoon months, typically spanning September to January, with a notable spike often recorded in December.^{39,40} From January 2022 to 6th March 2026, a total of 2, 55,563 Scrub typhus cases were reported in India.⁴¹

Establishment of Scrub typhus endemicity in Kerala

Reports of scrub typhus in Kerala have been documented since 1998 by the State Prevention of Epidemic and Infectious Disease (PEID) cell at Government Medical College, Thiruvananthapuram.⁴² Despite its established existence in South India, prior to 1998, the presence of scrub typhus in Kerala was obscured by significant under-recognition and a lack of systematic reporting.

In January 2001, Dr. K. Regu from the National Center for Disease Control (NCDC) in Kozhikode visited the Department of Infectious Diseases (IDD) at the Government Medical College, Thiruvananthapuram. The Head of the Department reported a recent surge in cases of Pyrexia of Unknown Origin (PUO) accompanied by generalized lymphadenopathy. Because these patients were unresponsive to standard antibiotic therapies, the department requested diagnostic assistance. To identify the cause, 18 serum samples collected from the patients were sent to the Department of Zoonoses at NCDC Delhi. Seven of these samples tested positive for scrub typhus. Following confirmation and guidance from NCDC, Delhi, clinicians initiated doxycycline treatment, resulting in a drastic clinical improvement in the patients.⁴³

As cases continued to rise, an investigation was conducted across various parts of Thiruvananthapuram district in January 2002. The investigation identified a significant number of scrub typhus cases in Mamam, a village near the Attingal Municipality in Thiruvananthapuram district. The study revealed a staggering infection rate, with about 80% of the inhabitants of Mamam already suffering from the infection. Many persons with scars of eschar were also seen. During this study, significant clusters of scrub typhus cases were identified in both the hilly and plain terrain of Nedumankad taluk.⁴³ The scrub epidemic in the investigated area is triggered by a number of environmental and host factors favorable for the survival of the pathogen and the vector in the area. The higher density of rodents and rats in the area must have served as a natural host for the vector mites. Investigators also found that grass from the rodent-infested fields was collected to feed the goats and cattle kept at most homes. The practice of storing grass bundles inside residential structures in close proximity to sleeping quarters likely established a pathway for zoonotic or environmental pathogens to humans.

Epidemiological and Geographical distribution of scrub typhus in Kerala

Since the scrub typhus was first recorded in the Thiruvananthapuram district in 1998, sporadic cases have been reported annually from other districts as well in Kerala, spreading from Thiruvananthapuram to various other districts across Kerala.^{44,45} In 2011, a total of 161 scrub typhus cases (150 confirmed and 11 probable) and two deaths were reported across four districts in Kerala: Thiruvananthapuram, Kollam, Pathanamthitta, and Kozhikode. Both of the two fatalities occurred in Thiruvananthapuram district, one in January and the other in July. Thiruvananthapuram accounted for the majority of scrub typhus cases (141), with infections occurring year-round and peaking significantly in December. Patients were typically presented with fever, eschar, headache,

and myalgia. These infections were primarily linked to occupational exposure in areas with dense vegetation or environments harboring rodents and mites⁴⁶. Scrub typhus was formally added to Kerala's IDSP surveillance list in 2012 due to increasing infection rates⁴⁷.

Due to unspecific clinical manifestations and symptomatic presentations, the diagnosis of scrub typhus requires highly specific confirmatory tests⁴⁸. Since the delay in diagnosis and treatment increases the mortality risks, patients, particularly those with pre-existing comorbidities, require vigilant monitoring for potential complications⁴⁹. Seroprevalence studies of scrub typhus in Kerala are critical to addressing the re-emergence of this zoonotic disease^{50,51}. These studies provide clinicians with the diagnostic insights for early detection and prompt management of undifferentiated febrile illnesses (UFI)⁵². Various seroprevalence studies carried out in Kerala and elsewhere emphasize that scrub typhus IgM ELISA should be a mandatory component of diagnostic panels for UFI, particularly during the post-monsoon season⁵³. In addition to this, molecular studies on scrub typhus are essential for tracking the evolution of *O. tsutsugamushi* and establishing correlations between specific serotypes or genotypes and clinical severity in future outbreaks⁵⁴.

Entomological studies on vectors of scrub typhus in Kerala

During an eco-entomological investigation in scrub typhus-affected regions of Thiruvananthapuram in October 2012, researchers identified several rodent species, including *Rattus rattus*, *Mus musculus*, *Bandicota indica*, and *Suncus murinus*. These hosts yielded various ectoparasites, specifically *Xenopsylla cheopis*, *Leptotrombidium deliense*, *Haemophysalis* species, and lice⁴⁶. This study highlights the critical need for continuous surveillance of rodent and vector populations to manage the risk of zoonotic diseases.

A study on ectoparasites, specifically chigger mites, conducted across rural, urban, coastal, and forest habitats in Thiruvananthapuram district identified twenty mite species, including *Leptotrombidium deliense*, *Schoengastiella ligula*, and *Echinolaelaps echidninus*. Additionally, flea species such as *Xenopsylla cheopis* and *X. astia* were recovered from rodent and shrew hosts. The researchers concluded that extensive surveillance of rodents and ectoparasites is vital for public health authorities to implement effective arthropod-borne disease control strategies⁵⁵. Environmental factors, including dense plantations, heavy scrub vegetation, woodpiles, and the proximity of rodents, domestic animals, and wet agricultural fields, serve as significant risk factors for scrub typhus. Furthermore, behavioral habits such as poor personal hygiene, sitting or sleeping directly on the floor, and disposing of household waste in backyards significantly elevate the risk of scrub typhus infection⁵⁶.

Trends in Scrub typhus Incidence and Mortality

Between 2012 and 2025, Kerala recorded 7,681 confirmed cases of scrub typhus and 140 deaths, reflecting sustained endemic transmission over a 14-year period. Between January and July 17, 2026, Kerala recorded 319 confirmed cases of scrub typhus and four deaths⁵⁷, underscoring the disease's emergence as a significant public health concern in the state. A longitudinal analysis of scrub typhus in Kerala reveals a significant escalation in disease burden over the last fourteen years (Figure 1). While the initial seven-year period (2012-2018) recorded 3,062 confirmed cases and 39 deaths (CFR: 1.27%), the subsequent period (2019-2025) shows an increase to 4,619 cases and 101 deaths (CFR: 2.19%). This upward trend in both incidence and lethality is indicative of a period of sustained endemic transmission in the state. The COVID-19 pandemic significantly disrupted national surveillance systems for communicable diseases. Consequently, reported scrub typhus incidence and mortality during the peak pandemic years (2020-2023) in Kerala likely represent an underestimation. Actual figures would have considerably been higher had routine diagnosis and reporting protocols gone uninterrupted.

Trend analysis of reported scrub typhus incidence in Kerala reveals a peak in 2015 with 1,149 cases, followed by significant resurgences in 2024 and 2025 with 981 and 857 cases, respectively (Figure 1). The surge in scrub typhus cases to 1,149 in 2015 compared to 433 in the previous year could also be due to increased clinical awareness and improved diagnostic detection, along with a significant shift in the epidemiological factors.

Prior to 2015, scrub typhus was often mistaken for dengue, leptospirosis, or enteric fever because they share nearly identical symptoms, such as high fever, headache, and muscle pain. The accuracy of scrub typhus diagnosis improved significantly by 2015, when Kerala's healthcare system transitioned from the older Weil-Felix test to the more reliable IgM ELISA^{53,54}. Improved surveillance frameworks under the Integrated Disease Surveillance Program (IDSP) facilitated the systematic logging of cases that were previously unaccounted for in official statistics.

DHS data analysis reveals that the cumulative case fatality rate (CFR) for scrub typhus remains at 1.86%. However, significant annual variations were observed; the CFR peaked at 10.26% in 2012, followed by 3.30% in 2022, 2.77% in 2023, and 2.42% in 2019 (Figure.2). In Kerala, annual variations in scrub typhus case fatality rates are primarily driven by environmental impacts on vector dynamics, the genetic heterogeneity of the pathogen, and the promptness of clinical intervention. While overall mortality rates for scrub typhus in India historically range from 7% to 30%¹⁴, Kerala records a remarkably low CFR of 1.82% over a 14 year period.

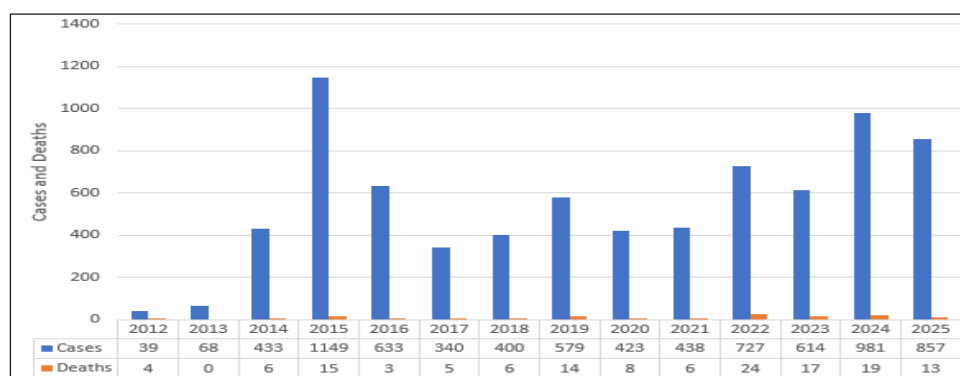


Figure 1. Annual Scrub Typhus Cases and Deaths in Kerala (2012-2025)

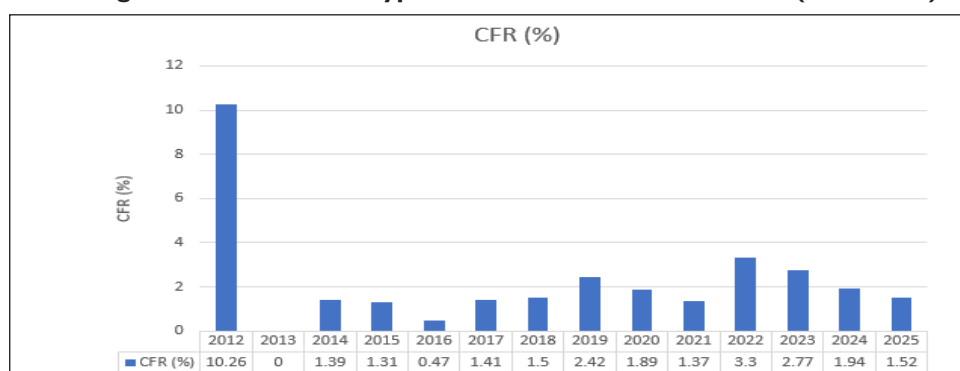


Figure 2. Longitudinal Case Fatality Rate of Scrub Typhus in Kerala (2012-2025)

The case distribution of scrub typhus across Kerala exhibits significant geographic heterogeneity, with Thiruvananthapuram emerging as the state's primary hot spot by accounting for the vast majority of reported cases. From 2012 to 2024, Thiruvananthapuram district accounted for 5,063 (74.20%) of the 6,824 confirmed cases in Kerala. Notable scrub typhus prevalence was also recorded in Wayanad (478-7.0%), Kozhikode (326-4.77%), and Kollam (183-2.7%). District-level data for reported scrub typhus cases and fatalities between 2012 and 2024 are presented in Table 1. Disease prevalence remained below one percent in the districts of Pathanamthitta, Idukki, Alappuzha, Ernakulam, Trissur, and Kasaragod (Table 2). The consistently high volume of scrub typhus cases recorded in Thiruvananthapuram, Wayanad, and Kozhikode indicates a combination of ecological and proactive public health measures, including regular orientation programs for

medical personnel, public awareness programs, enhanced disease surveillance, follow-up, state-of-the-art medical facilities, etc. The highest case incidence and death in Thiruvananthapuram could be attributed to the capital city having been infected from military camps long ago and remaining undetected for a long period, by which time the disease must have spread to a wider area in the district. It must be from Thiruvananthapuram; the disease eventually spread to other areas as well in Kerala. Thiruvananthapuram district reporting a higher percentage of Kerala's scrub typhus cases (74.20%), while simultaneously maintaining the lowest CFR (1.28%), is also attributed to prompt surveillance and early clinical intervention. While the scrub typhus incidence remained comparatively low, the disease accorded a disproportionately high CFR in several of the districts, including Thrissur (8.62%), Idukki (6.56%), Malappuram (5.97%), and 4.92% in Kollam (Table 2).

Table 1. District-wise Scrub typhus cases and deaths (in parenthesis) reported in Kerala (2012 – 2024)

Districts	Year													
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
TVM	3 [2]	49	360 [3]	947 [11]	457 [1]	226 [3]	262 [2]	406 [6]	323 [5]	357 [3]	535 [14]	405 [7]	733 [8]	5,063 [65]
KLM	4 [1]	3	7 [1]	31 [2]	23 [1]	9	10 [2]	16 [1]	3	6 [1]	7	10	54	183 [9]

PTA	-	2	7 [1]	1	-	4	7	5	5	2	9	9	16 [1]	67 [2]
IDK	1		-		4	-	5	9	4	3 [1]	6 [1]	11 [1]	18 [1]	61 [4]
KTM	-		-		-	5	8	14	13	10	15	5 [2]	12	82 [2]
ALP	-		1		2	1	-	6	2	3	13	20 [1]	5	53 [1]
EKM	-		-		-	-	-	1	4	1	10	4	8	28
TSR	-		1	7	17	6 [1]	1	3	3	-	10 [2]	7 [1]	3 [1]	58 [5]
PLD	-		3 [1]	8	8	7	6	10	5 [1]	8	9 [1]	26	26	116 [3]
MPM	-	1	10	4	1	2 [1]	6 [1]	3 [1]	1	2	37 [4]	38 [1]	29	134 [8]
KKD	16	4	32	50 [1]	15	11	39	32 [3]	16	19 [1]	27 [2]	38 [1]	27 [3]	326 [11]
WYN	10	6	10	96 [1]	96 [1]	53	43 [1]	61 [3]	27 [2]	20	27	17 [2]	12 [1]	478 [11]
KNR	-	2	2	5	9	7	9	11	17	6	18	15 [1]	18 [4]	119 [5]
KGD	5 [1]	1	-	-	1	9	4	2	-	1	4	9	20	56 [1]
Total	39 [4]	68 [0]	433 [6]	1,149 [15]	633 [3]	340 [5]	400 [6]	579 [14]	423 [8]	438 [6]	727 [24]	614 [17]	981 [19]	6,824 [127]

TVM- Thiruvananthapuram, KLM- Kollam, PTA- Pathanamthitta, IDK- Idukki, KTM- Kottayam, ALP- Alappuzha, ERM- Ernakulam, TSR, Thrissur, PKD- Palakkad, MPM- Malappuram, KKD- Kozhikode, WYN- Wayanad, KNR- Kannur, KGD- Kasaragod.

Table 2. District-wise total number of cases and deaths reported in Kerala (2012 – 2024)

Districts	Cases	%	Deaths	%	CFR (%)
TVM	5,063	74.20	65	51.18	1.28
KLM	183	2.70	09	7.09	4.92
PTA	67	0.98	2	1.57	2.98
IDK	61	0.89	4	3.15	6.56
KTM	82	1.20	2	1.57	2.44
ALP	53	0.78	1	0.80	1.89

ERM	28	0.41	0	0.00	0.00
TSR	58	0.85	5	3.94	8.62
PKD	116	1.70	3	2.36	2.59
MPM	134	1.96	8	6.29	5.97
KKD	326	4.77	11	8.66	3.37
WYN	478	7.00	11	8.66	2.30
KNR	119	1.74	5	3.94	4.20
KGD	56	0.82	1	0.79	1.79
Total	6,824	100.00	127	100.00	1.86

The monthly distribution of reported scrub typhus cases and fatalities in Kerala between 2012 and 2024 is presented in Table 3. The cumulative data showed that scrub typhus cases peaked in December (n=1,038; 15%), followed by January (n=849; 12.4%) and November (n=802;11.8%).

Similarly, the cumulative data shows that scrub typhus fatalities were highest in November (n=20; 15.8%), with January (n=17; 13.4%) and October (n=16; 12.6%) recording the next highest totals (Table 3).

Table 3. Month-wise scrub typhus cases and deaths (in parenthesis) reported in Kerala (2012 -2024)

Months	Year													
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
JAN	7	5	33 [2]	168 [2]	117 [2]	23	20	94 [1]	115 [2]	36 [2]	37 [1]	98 [1]	96 [4]	849 [17]
FEB	3 [1]	1	41	56 [3]	92 [1]	7	6	47 [1]	73	41	24	56 [2]	62	509 [8]
MAR	1	1	14	23 [1]	28	12 [1]	4	28	20	15	23	33 [1]	25 [1]	227 [4]
APR	5	1	6	14	14	16	4	27 [1]	7	10 [1]	14 [1]	21 [1]	12	151 [4]
MAY	4 [1]	2	16	35	21	12	6	15 [3]	12	9	23	16	29 [1]	200 [5]
JUNE	4	1	20 [2]	97 [2]	52	18	21 [2]	15	35 [2]	32 [1]	66 [2]	22	33	416 [11]
JULY	5	-	31	171 [4]	64	57	40	62 [2]	47	49	127 [5]	32 [2]	112 [1]	797 [14]
AUG	1	5	34	110	106	27	42	53	19 [1]	35 [1]	98 [3]	49 [1]	122 [1]	701 [7]
SEP	2	4	49	83 [1]	51	28 [1]	50 [1]	26 [2]	7	47	63 [1]	40 [3]	105 [3]	555 [12]
OCT	1 [1]	1	60	101	22	27 [1]	34 [2]	51	18	52	71 [7]	44	97 [5]	579 [16]

NOV	4 [1]	10	47 [1]	147 [2]	29	55 [2]	56	58 [3]	36 [1]	46 [1]	92 [3]	106 [4]	116 [2]	802 [20]
DEC	2	37	82 [1]	144	37	58	117 [1]	103 [1]	34 [2]	66	89 [1]	97 [2]	172 [1]	1,038 [9]
Total	39 [4]	68 [0]	433 [6]	1,149 [15]	633 [3]	340 [5]	400 [6]	579 [14]	423 [8]	438 [6]	727 [24]	614 [17]	981 [19]	6,824 [127]

Seasonal variations in the incidence of scrub typhus cases

The month-wise distribution of scrub typhus cases reported in Kerala from 2012 to 2024 is presented in Figure 3. Of the 6,824 total cases, the highest proportion occurred during the winter season from November to January (n=2,689; 39.4%), followed by the monsoon period from June to August (n=1,914; 28.0%). The post-monsoon period of September and October accounted for 1,134 cases (16.6%). The summer season (March & April) accounted for only 5.5%

(Figure 3). An earlier study similarly found that scrub typhus occurs predominantly during and immediately after the monsoon season⁵⁸. This stark seasonal variation underscores a complex interplay among local ecology, meteorological factors, and human behavior.

Of the 127 total fatalities recorded during the study period, nearly 90% (n=114) were clustered within the monsoon and post-monsoon intervals (Figure 3). These mortality data confirm that the high-precipitation months constitute the primary transmission period of the disease.

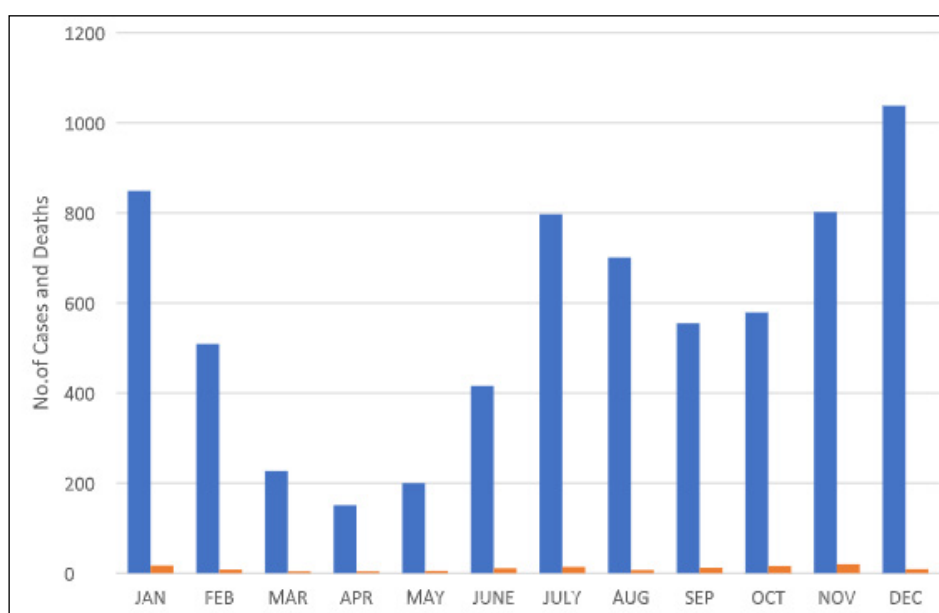


Figure 3. Month-wise total number of Scrub typhus cases and deaths reported in Kerala (2012- 2024)

Conclusion

Kerala recorded 7,681 scrub typhus cases and 140 deaths over a 14-year period. The disease is endemic, exhibiting periodic epidemic spikes alongside significant seasonal and geographic variation. Environmental and behavioral exposures serve as critical determinants of transmission risk. To reduce ST cases, the health department and local self-governments (LSGs) must collaborate on key interventions. Their focus should include vector control, keeping habitats rodent-free, clearing vegetation around homes, practicing proper food and kitchen waste disposal,

and running rigorous public awareness campaigns on risk factors and timely treatment. The ST situation in Kerala requires a 'One Health' approach that integrates human, animal, and environmental data for planning and framing intervention and research towards management of the disease. At the same time, healthcare providers must urgently strengthen diagnostic capacity at primary and secondary levels by integrating molecular testing into routine protocols to ensure early detection. Effective control of ST requires monitoring vector-host ecosystems, reducing environmental risks, community education and protection, and early diagnosis and treatment.

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