ENVIRONMENT RISK FACTOR INFLUENCING SCRUB TYPHUS IN KUSHINAGAR(U.P.)

A thesis Submitted

In partial fulfillment of the requirement

For the degree of

MASTER OF TECHNOLOGY

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(Environmental Engineering)

By,

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LUCKNOW.

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CERTIFICATE

Certified that the project entitled "**ENVIRONMENT RISK FACTOR INFLUENCING SCRUB TYPHUS IN KUSHINAGAR(U.P.)**" submitted by Mohammad Minnatullah (1170470006) in the partial fulfillment of the requirements for the award of the degree of Master of Technology (Environmental Engineering) of Babu Banarasi Das University is a record of students' own work carried under our supervision and guidance. The project report embodies results of original work and studies carried out by students and the contents do not form the basis for the award of any other degree to the candidate or to anybody else.

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DECLARATION

We hereby declare that the project entitled "**ENVIRONMENT RISK FACTOR INFLUENCING SCRUB TYPHUS IN KUSHINAGAR(U.P.)**" submitted by Mohammad Minnatullah (1170470006) in the partial fulfillment of the requierements for the award of the degree of Master of Technology (Environmental Engineering) of Babu Banarasi Das University is a record of our own work carried under the supervision and guidance of Mr. Kamal Nabh Tripathi, Assistant Professor Department of Civil Engineering BBD University, Lucknow.

To all the best of my knowledge this project has not been submitted to Babu Banarasi Das University or any other University or Institute for the award of any degree.

Mohammad Minnatullah

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LIST OF SYMBOLS/ ABBREVIATIONS

%	Percent
@	At the rate
Ab	Antibody
AES	Acute encephalitis syndrome
Ag	Antizen
JE	Japanese Encephalitis
“C	Degree Celsius
WHO	World Health Organisation
DNA	DeoxyriboNucleic Acid
ELISA	Enzyme-linked Immunosorbent Assay
Fig	Figure
AFI	Amniotic Fluid Index
CNS	Central Nervous System
RNA	Ribonucleic Acid
Km	Kilometer
Mg	Milligram
Min	Minute
N-PCR	Nested Polymerase Chain Reaction
MBGL	Meters Below Ground Level
Mb	Millibar
Mm	Milimeter
RPM	Revolution per minute
ST	Scrub typhus

ABSTRACT

Scrub typhus is an acute febrile widespread disease in Asia & Pacific islands which causes unspecific symptoms & signs/ This is one of the biggest disease in our country especially iii terai region and South India for many years/The cause of AES is Scrub typhus having vector a mite, is revealed for last two years in Kushinagar, It is becoming a common disease in Kushinagar district. Many deaths are reported due to this disease. Many researches has been done regarding this crucial topic. No vaccine is still available against it. Doxycyclin, tetracycline, cholram phenicol, etc are some prevention. So, the mortality rate is high. Only bacterium or vector is not responsible for causing disease, Environmental factors such as temperature, rainfall, humidity, etc also influence i.e., increase or decrease the chances of disease. These environmental factors provide favourable conditions for its incidence. My study of scrub typhus case was during the period of January 2018 to December 2018 in Kushinagar district. In this study, my aim is to examine and analyze the effects of environmental elements on the incidence of scrub typhus in the sub-tropical district of Kushinagar during the study period and prefer for health prevention and control methods.

The aforesaid environmental factors affect the incidence and cause of Scrub typhus drastically as there is a high need to control this disease. So, a survey was conducted regarding this aspect)

CONTENTS

GENERAL

The district characterized by a hot summer and pleasant cold winter, Kushinagar is located in the terai belt of eastern up, India having its capital Lucknow 330 km east, lies between latitude 26°132' N and 27°292' N and longitude 83°052' E and 83°974' E and covers an area of 3483.8 sq.km. Kushinagar District is bounded on the east by Bihar state, on the southwest by Deoria District, on the west by Gorakhpur District, and on the northwest by Maharajganj District. It is part of Gorakhpur Division. The average elevation above the sea-level is 80 meters. The normal slope is towards south & south east. It was considered a mini hill station by British rulers, situated on the left bank of river Rapti at the confluence of rivers Rapti and Rohin. The city is a featureless plain but having some geographical variation such as ox-bow lakes, talc and remnants of river channels. There are numerous water bodies within the city and the biggest Ramgarh Tal is situated in the south-eastern part of the city.

The year can be categorized in four seasons. The cold season which is from end November to February is followed by summer, from March to middle June. The south-western monsoon season occurs between middle June to September and the post monsoon season is contributed by October and November. There has been average rainfall of 941 mm. The pre-monsoon depth of water level is 2.50 to 11.7 mbgl and the post monsoon depth of water level is 1.42 to 10.40 mbgl. The district has general maximum and minimum temperature varying from 44.10°C to 5°C respectively. The month of May and June are hottest and December and January are the coolest. Population of Kushinagar district is 4,436,275 (as per the census 2011) and the population density is 4559 person/km. There are 7 administrative divisions/tehsil and 19 number of blocks

1.2 SCRUB TYPHUS

Scrub typhus is an acute illness spread in the eastern hemisphere, especially in south and south-eastern Asia. About 27% cases of deaths due to scrub typhus are in the areas of the Asia-pacific region and the mortality rate upto 35.5%. Scrub typhus is called by other names

as tsutsugamushi (disease mite), akamushi (red mite) fever, kedami (hairy mite) fever, flood fever, tropical fever, Japanese river fiver, rural fever, mite borne typhus and chigger borne disease.

The term 'scrub typhus' was coined by Fletcher in 1927 for associating the disease with wasteland. The term 'scrub typhus' is gained from the world war 2 incidence when armed forces of Asiatic/ pacific regions encountered the outbreaks of the disease with exposure to a scrub environment and, the 'typhus' is derived from Greek word 'typhus' meaning `stupor'. About one million cases takes place yearly and more than one billion people are living in endemic area.

Orientia tsutsugamushi is the causative agent of scrub typhus which is transmitted to humans by the bite of larval stage of trombiculid mites belonging to genus Leptotrombidium. A specific skin lesion, an eschar occurs on the proliferation of bacterium. After the incubation of 10-12 days, the patient experience headaches, fever, general lymphadenopathy and a norexia other symptoms are enlargement spleen, delirium, prostration and disturbance. The mortality range is 6 to 10%. Death occurs due to direct result or secondary effects of encephalitis, pneumonia and circulatory failure. The general course of the disease and the prognosis van considerably depending on the character of the endemic strain. Primarily, the antigenic diversity of the three prototype strains, Gilliam, Karp and Kato were reported from New Guinea, Japan and Burma respectively (Shishido, 1962). Later on, more than thirty antigentically district serotypes are present in the endemic areas of the tsutsugamushi triangle' (Ohashi et al., 1996).

The trombiculid mite larva can be found at any place which is abundant with rodents. The mite vectors need ground moisture for nourishment. The people living in urban areas are acquiring an 0.tsutsugamushi infection which is antigenically similar to those that cause scrub typhus in rural people. The reason for this new infection is not still identified. Scrub typhus is usually successfully treated with doxycycline, tetracycline or chloramphenicol (Twartz et al., 1982). At present, no effective and acceptable vaccine is available.

1.3 SCRUB TYPHUS IN THE WORLD

Scrub typhus is one of the most common forms of Rickettsial disease. As, the outbreak of Scrub typhus infection has been reported from several regions during the past two decades.

It was reported from Camp Fuji in 2000 & 2001(Jiang et al., 2003), from Palau in 2001-2003 (Durand et al., 2004) from Maldives in 2002; (Lewis et al., 2013) and from southern India, Sri Lanka, and the Maldives in 2003 (Mathai et al., 2003; Kuiaratne, 2003). It is proved but less data is gathered in the countries such as India, Pakistan, Maldives, Sri Lanka, and Indonesia. Pakistan lies at or near the western fringe of the tsutsugamushi triangle end emicity. Serological evidence of scrub typhus has been reported from Kundiz and Badakshan provinces of Afghanistan, but no clinical cases have been indentified (Arsen'eva, 1982).

1.4 SCRUB TYPHUS IN INDIA

Scrub typhus has been occurred in many parts of India but specific laboratory tests for diagnosis are not available still. In India, this disease was considered as a typhus like fever in 1917. During World War 2, scrub typhus was the major cause of fever among the troops deployed among the Assam-India-Burma (Myanmar) border with a mortality rate of 5% (Tattersall. 1945; Sayen et al., 1946). A survey was held in the states of Rajasthan and, Jammu and Kasmir in 1970s by using complement fixation test. In 1990,

a unit of army deployed at the Pakistan border of India suffered with this disease resulting the fatality of many people.

Nlathai et.al, reported an outbreak of scrub tmthus in Sothern India during the cooler months from October 2001 to February 2002 (Mathai et al., 2002). An outbreak of scrub typhus was reported during autumn of 2003 in Himachal Pradesh (Sharma et al., 2005). Epidemics of scrub typhus have been reported from (1) Tamil Nadu during 2002-2003; (Varghese et al,. 2006); (2) Himachal Pradesh during 2003 and 2004;(Mahajan et al., 2006); (3) Tamil Nadu in 2007; (Abrahamsen et al., 2013); (4) Pondicherry during 2006-2008; (Vivekananda et al., 2010); (5) Goa during 2009-2010; (Narvecar et al., 2012); (6) Assam and Nagaland during 2010-2011; (Bithu et al., 2014); (8) Jaipur during 2012 (Sinha et al., 2014). A study was conducted in 2011 on adult patients from the rural Telangana region (Subbalaxmi et al., 2012) and many patients from Tamil Nadu, Andhra Pradesh and Telangana, from the period 2006-2011.

1.5 SCRUB TYPHUS IN KUSHINAGAR

Scrub typhus is considered as a possible cause of the mass children's death in Kushinagar. Around 70 children died within five days. Some experts are not fully convinced with the scrub typhus as the killer. George Varghese, professor at Vellore Christian medical college, says that the symptoms do not belong to scrub typhus as per reported in Kushinagar.

The district is defamed for the brain fever epidemic that kills large no of children every voar. And, those who survive emance with physical & mental disabilities. In 2005, more than 1000 children death to the disease. Alarmed, the officials have sent a missive to all hospitals to beef up their stock of a specific antibiotic that would help them contain the spread of Scrub Typhus virus.In a circular issued to the chief medical officers of all the districts in the state, the director for infectious diseases has stated that as antibiotics Azithromycin/Doxycyclin work for AES patients who have tested positive for Scrub Typhus, they should be maintained in stock.

Since the late 70s, it was thought that the JE virus caused the brain inflammation outbreak when brain fever began to stalk Kushinagar. But now, scrub typhus is also linked with the deaths occur in Kushinagar district. The scale of deaths due to this has expanded in recent years.

1.6 NEED AND IMPORTANCE OF THE WORK

Though the Scrub typhus disease is endemic in our country but it is extremely under diagnosed. This is due to non-specific clinical examination of the disease, lack of reach to the specific diagnostic facilities in Kushinagar city, and low range of suspicion by the clinicians. This study was aimed to find out the factors and causes for AES. The findings of this study will definitely provide possible remedies of such disease. For the betterment of the society, this study makes people aware of this disease. By knowing the influential environmental factors through this study, we can somewhat change or evolve the circumstances which will reduce the approach of this disease to larger part of area. The purpose of this work to provide the operational guidelines about the environmental risk factors.

1.7 OBJECTIVES OF THE WORK

Scrub typhus is a major public health threat and endemic in Kushinagar District including South and South-eastern Asian regions, as the number of case-patients has been increasing dramatically. The study is to report the specific environmental and

physio-geographical factors, including epidemiological factors associating the potential risk in the areas affected by scrub typhus. By recognizing and understanding the aforesaid factors and local patterns of the disease, the individual can get rid of this hazardous disease in future

1.8 ORGANIZATION OF DISSERTATION

The dissertation is organized into five chapters.

Chapter 1 Includes the introductory part of the dissertation, need and importance of the work, Objectives of the work and organization of dissertation.

Chapter 2 Attempts to review the literature on historical background, phylogeny and classification. Differentiation of Orientia from genera, epidemiology, seasonality of scrub typhus. etiology, life cycle, symptoms and signs, prevention, JE, Life cycle of Japanese encephalitis, vectors of Japanese encephalitis, outbreak of JE disease, prevention of JE and work done by other investigators in this field and the concluding remarks.

Chapter 3 Deals with survey and data collection on environmental risk factor influencing scrub typhus in Kushinagar district.

Chapter 4 Provides the result and discussion.

Chapter 5 Provides the conclusion and recommendations.

2.1 General

Mahima Muttal et al., 2018 reported that scrub typhus is the cause of acute encephalitis syndrome in Kushinagar, Uttar Pradesh. This cause to known after the study of 46 patients during, August 17- October 16, 2016. Father, about 41.6% cases and 914 cases in 2011-12 and in 2013-14 respectively were reported with the unknown cause of AES. The team collected blood samples using ELISA, more than 50% patients were sullering from seizures, altered sensorium and periftibilid (denial littatfilgannithi IgG was detected in (TM patients flrid Ig(i in 8296(') drawba -k of this study was that they had selected the patients. from same village under smile einnonnictital conditions i.e, rick factors. Mt); showd ::tutiv the (die patients from thtlerent i ilhiges so that the envitoninental conditions get change and triat1011 W01111 help in the comparison and detection cat disease.
Muriwkar NW et a1,, 2016 reported on the 370 Al S patients and 109 patients suffering 110111 acute febrile illness, in Got ikhpur, littar Node h Al.S have been occurrin in Gor ikliptir for many years. the AI'S includekl Japanese encephalitis (Ji..), herpes sthiptcx,, entroviruscs, Chandipura virus, meakdes, tmottpilis dengue, varicella, partiovincs, West Nile, malaria & typhoid. The team in\ c,,tigated that there is a role of scrub typhus in AFS. report has been done of the pat is nts admitted to hospital during September 2015 to t. ktober 2015. the blood samples, DNA extracts. PCK %ere done. list serum for Igki antibodies %%Lie tested against Ori•ntia tsultugainushi using ELISA. NS inflammation had been detected from 222 patients among 370_ About 68% patients had seiturcs, and more than SO% kid vomiting, altered sensorium, upwrolling, cif eyes, hePatonlegabt its:11v*, congestion 365 were tested for IgM antibodies against O. txunugann There was 63% of patients with AIM and 54% \s ill) AEI as Ig,N1 antitxxlies against scrub typhus. This indicates that scrub typhus have an Muhl-tint role of AILS & All, in Kushinagar region. According to the (Murhelcar del., 2016), the further studies and detection are require4 so to redu e the number of patients suffering from AES duct to scrub typhus.

According to Jain P, Prakash S, Tripathi PK "Emergence of Oriental tsutsugamushi as an important cause of acute encephalitis syndrome in India of 540 enrolled patients, 33.3% (180) tested positive for at least one pathogen of which 23.3% were co-positive for more than one pathogen. Most samples were positive for scrub typhus IgM or PCR (25%), followed by IgM positivity for JEV (8.1%), WNV (6.8%), DV (6.1%), and ChikV (4.5%).M. tuberculosis and S. pneumoniae each was detected in ~ 1% cases. H. influenzae, adenovirus, Herpes Simplex Virus -1, enterovirus, and measles virus, each was detected occasionally. The presence of Scrub typhus was confirmed by PCR and sequencing. Bihar strains resembled Gilliam-like strains from Thailand, Combodia and Vietnam"The highlights of this pilot AES study were detection of an infectious etiology in one third of the AES cases, multiple etiologies, and emergence of O.tsutsugamushi infection as an important causative agent of AES in India.

According to **Watt G, Kantipong P, and de Souza M** "HIV-1 suppression during acute scrub-typhus infection “In HIV-1-infected individuals, viral load has been reported to rise transiently if an acute infection with another organism occurs. Our study was prompted by the unexpected finding that HIV-1 copy number fell during an acute infection with Oriental tsutsugamushi, the causative agent of scrub typhus. :Median viral load 3 days after admission was significantly lower in the scrub-typhus group than in patients with other infections (193% vs 376% of day 28 values, p=0.03). In four O. tsutsugamushi-infected patients HIV-1 RNA copy number fell by three-fold or more

compared with day 28 values, and HIV-1 copy numbers were below the assay threshold in two patients with scrub typhus. Five of seven HIV-1 isolates from non-typhus patients with CD4 lymphocytes less than 200 cells/micro were syncytia-inducing variants, whereas all ten isolates from O. tsutsugamushi-infected individuals matched by CD4-cell count were non-syncytia inducing (p=0.03). Sera from an HIV-1-negative patient with scrub typhus had potent HIV-1-suppressive activity in vitro. Sera from typhus-infected mice inhibited HIV-1 syncytia formation and bound by immunofluorescence to HIV-1-infected lymphocytes.

According to Bang HA, Lee MJ, Lee WC "Comparative research on epidemiological aspects of tsutsugamushi disease (scrub typhus) between Korea and Japan “In order to compare the epidemiological aspects of tsutsugamushi disease (scrub typhus) between Korea and Japan, we analyzed the current state of tsutsugamushi disease outbreaks and related risk factors. The average prevalence rate of tsutsugamushi disease from 2001 to 2005 in Korea was higher than that in Japan (7.2 and 0.3 per 100,000 population, respectively) (P<0.01). The seasonal distribution in Korea showed that the incidence of tsutsugamushi disease in autumn (94.5% of total cases) was higher than in Japan (38.2%) (P<0.01), while the incidences of outbreaks in other seasons were much higher in Japan (P<0.01). In Korea, more females (64.8%) were infected than males (35.2%) (P<0.01), while there was no significant difference in Japan. The remarkable difference between the gender distribution in Korea and Japan is believed to reflect cultural differences between the two countries in terms of work, dress and ornamentation. In both countries, elderly people (over 60 years old), especially in rural areas, showed a very high prevalence rate (50%), which is possibly due to increased outdoor activities and a decreased number of young people in those areas. These differences in tsutsugamushi disease risk factors reflect the different influences of vectors/hosts, climate, and geographical and cultural characteristics between the two countries.

According to Eamsila C, Singsawat P, Duangvaraporn A. "Antibodies to Oriental tsutsugamushi in Thai soldiers “Thai soldiers who were conscripted, Royal Thai Army forces, professional Border Patrol Police, or local militia (Thai Rangers) located in any of
seven provinces of Thailand were bled in April and again, four months later, in July 1989. In 1991, soldiers from five different locations in southern Thailand were bled once, in July. Serum samples were tested by indirect fluorescent antibody assay for antibody to Oriental (formerly Rickettsia) tsutsugamushi, etiologic agent of scrub typhus, with any titer > or = 1:50 considered positive. Prior to field exercises, prevalence of antibody varied significantly between different types of units, ranging between 18.6% for Thai Rangers and 6.8% for the Royal Thai Army. The April prevalence, July prevalence, and incidence varied significantly by province in 1989, with highest incidence being 14.5% in Kanchanaburi and the lowest 0% in Uttaradit. The prevalence in southern Thailand in 1991 varied between 1.6% and 6.8%. The data demonstrate that O. tsutsugamushi is widely distributed in Thailand and that military activity consisting of field exercises that simulate combat conditions significantly expose soldiers to infection.

According to Kim, DM; Yun, NR; Yang, TY; Lee, JH; Yang, JT; Shim, SK; Choi, EN; Park, MY; Lee, SH. "Usefulness of nested PCR for the diagnosis of scrub typhus in clinical practice: A prospective study “The aims of this study were to determine the diagnostic accuracy and clinical usefulness of using nested polymerase chain reaction (PCR) for the diagnosis of scrub typhus through a prospective comparison of nested PCR and indirect immunofluorescent antibody assay (IFA). We conducted a multi-center prospective study of patients who were suffering with possible scrub typhus infection. Whole blood samples were collected for PCR testing, and sera were obtained for

serology evaluation using the indirect IFA and the passive hem agglutination assay (PHA). We prospectively studied 135 patients with possible scrub typhus. One hundred eighteen patients were confirmed as having scrub typhus, 7 patients were undetermined, and 10 patients were confirmed as having other diseases. The results of nested PCR assay showed a sensitivity of 82.2% and a specificity of 100%. Ninety-six of the 118 patients were positive for IgM on their admission day. Of the 22 patients who were negative for IgM antibody at admission, 19 had positive results for nested PCR of the buffy coat.

According to M. Saminathan, K. Karuppanasamy, S. Pavulraj, A. Gopalakrishnan and R.B.Rai "Acute Encephalitis Syndrome (AES) is a group of Clinical neurologic manifestation caused by wide range of viruses and bacteria. Japanese encephalitis (JE) is considered as a main viral aetiology of patients with AES. Leptospirosis as a new aetiology of the patients presenting AES. There is seasonal and geographical variation in the causative organism. The outbreak of diseases usually coincides with the onset of climate change where the density of vectors fluctuates for transmission of the infectious organism either biologically or mechanically, while encephalitis due to other viruses specially entero-viruses occurs throughout the year as it is a water borne disease. The newly introduced West Nile Encephalitis (WNE) virus also causes acute encephalitis syndrome. The case fatality and morbidity is very high."

2.2 HISTORICAL BACKGROUND

For centuries, the population of Japan and China suffered from tsutsugamushi disease and its relation with chigger bites. The term tsutsugamushi is derived from the two Japanese words 'tsutsuga' meaning (something small & dangerous) and 'mushi' meaning (creature). Rural residents of those countries often know that the best way to avoid being infected was to avoid areas infected by these arthopods (Walker,1991).
The oldest report of this disease was a Japanese report by Harshimoto in 1810. Harhimoto explained it as the 'tsutsuga' found along the banks of the upper tributaries of the Shinano river. Early Chinese and Japanese investigators suspected that the ill disease was related to small mites. Investigations on the etiology of the disease were initiated in 1893 by Kitasato (Blake et a1.,1945(a)) who surveyed under Robert Koch. In 1908, a similarity was identified by Japanese workers between mechanism of transmission of scrub typhus & RMSF. In 1918 Kitashima & Miyajina concluded that the etiological agent of scrub typhus belonged to the same group as the agents of RMSF & typhus (Kitashina et al; 1918). Hayashi isolated an agent Theileria tsutsugamushi from mites. This agent was not cause of sit but the name tsutsugamushi was present. The first description of the causative agent of this disease was done by Nagayo in 1930. He called it as Rickettsia Orientalis. Then, in 1931 Ogata explained Rickettsia tsutsugamushi. In 1996 the honour of Nagayo & Ogata this was named as Orientia tsutsugamushi. Through epidemiological data, the disease is classified into urban & typhus & rural typhus. The rural typhus takes place in grass or shrub land, so called as shrub typhus by Britishes & Americans during World Ward II. Other names of scrub typhus which are also used-chigger borne rickettsiosis, kedani (red mite) fever, flood fever, Japanese river fever and tropical typhus.
Scrub typhus is caused only in Asia. The dramatic impact of the disease in the Asia-Pacific theatre of the war drove the substantial effort during and immediately after the war to prevent, control and treat the disease (Card and Walker, 1947). Some 1255 cases were reported in just four months on two small islands off the north coast of Irian Jay, the Dutch New Guinea (Irons et al., 1947). This disease dragged the attention when more

than 15000 cases of infection were diagnosed in the army during World War II, with a mortality rate of 1% to 35%. This was due to the fact that large number of none immune individuals were introduced in the ecological area of trombiculid mites. Similar reason is for the deaths in

Vietnam War. Thus, this disease cannot be linked with war conditions or natural hazards. The name 'scrub typhus' was derived from second world war as it was being linked tha the vectors of scrub typhus were belonged to scrub vegetation. This disease has similar features with epidemic typhus such as fever, headache, & rashes but the distivtive features of scrub typhus is gennalized lymph adenopathies and presence of an eschar skin lesion. In 1982, the WHO showed that most of the high proportional fevers of unknown origin were undiagnosed scrub typhus cases, having characteristic fever, eschar and ademopathies. A meeting of WHO was held, in 1993, on global burden of rickcttsial disease. The scrub typhus has currently seen in Australia and Japan that proves that the endemic scenario of the disease cannot be neglected.

2.3. PHYLOGENY AND CLASSIFICATION

2.3.1 Taxonomy of Orientia tsutsugamushi

Table 2.1: Taxonomy of Orientia tsutsugamushi

Kingdom	Monera
Phylum	Proteobacteria
Class	Alphaproteobacteria
Order	Rickettisiales
Family	Rickettisiaceae
Genus	Orientia
Species	Tsutsugamushi

Earlier, the order Rickettsiales consisted of three families including-
(1)Rickettsiaceae (genera Rickettsia, Coxiella, Rochalima and Ehrlichia)

(2)Bartonellaceae (genera Bartonella, Haemobartonella, Eperythrozon and Gramhamella)

(3)Anaplasmataceae (genus Anaplasma)

Recently, the order Rickettsiales consist of only two families-

(1) Rickettsiaceae (genera Rickettsia and Orientia) and

(2) Anapiasmataceae (genera Amp/flaunt:, Ehrlichia, Wolbachia, and Neorickettsia)

All the species in the family Rickettsiaceae are obligate intracellular bacteria which in the eukaryotic cytoplasm. The genus Rickettsia is subdivided into three groups as the `scrub typhus group' (STG), 'typhusgroup (TG) and 'spotted fever group' (SFG). The SFG and TG have many species while STG has only one species, Ostsutsuganneshis There are various strains of atsutsugamushi Were compared only to Kato, Karp and Gilliam strains and they are found to be genetically similar to these strains (Ohashi et al., 1995). The number of serotypes has been enhanced due to new diagnostic methods. It should be opined that most of the Otsuisztganneschi sprains have <1% deflection in gene sequences

2.4 EPIDEMIOLOGY

Scrub typhus is an intense febrile disease predominant inside a 13,000,000-akmz Asia-Pacific area, from Pakistan, India and Nepal in the west, to Southeastern Siberia, Gina, Japan and Korea in the north to Indonesia, the Philippines, northern Australia and the interceding Pacific islands in the south. The endemic area of scrub typhus is regularly alluded as the Isutsugamushi triangle' covers a territory of in excess of 5 million square miles that hosts around I_ billion individuals (Figure 2.1). Endemic zones territory from ,,ommon tropical auxiliary development (scrub) vegetation to temperate zones (e.g., Kashmir, Korea, and Mount Fuji) and even the Himalayas over 3000 in height (fensenius et al. 2004). In any case, sporadic instances of scrub typhus have been accounted for well outside the generally endemic areas such as Dubai, Africa and Chile (Ghorbani et al., 199 Izzard et 2010; Bakens et ale, 2011).

Figure 2.1: Geographic distribution of tsutsugamushi disease (Oaks et al., 1983)

2.5 SEASONAL OCCURRENCE OF SCRUB TYPHUS

The seasonal occurrence of scrub typhus fluctuates as indicated by the atmospheres in distinctive nations, and the ailment happens all the more regularly amid blustery seasons. Notwithstanding, episodes have been accounted for amid the cooler season in southern India (Mathai et al., 2003). The connection between scrub typhus rate and atmosphere write mirrors the conduct and population densities of trombiculidae in different circumstances (Kawamura et al., 1995). Scrub typhus has been named "summer type" as human contaminations normally happen amongst Spring and November with a pinnacle event amongst June and August in summer and "harvest time winter compose" as cases

happened with this kind of scrub typhus happened from September to December with an crest occurrence in October (Liu et al., 2009). In India scrub typhus was accounted for regularly from August through October with L. deliense being the essential vector (Kalra., 1952). (Tattersall, 1945; Sayen et al., 1946& Kalra, 1952). The soldiers were suffered from the disease, scrub typhus deployed on the Assam- India-Burma border during World War IL They were suffered all around the year but mainly from October to December.

2.6 ETIOLOGY

The main arthropod vectors of 0. t.stutsugamushi are trombiculid mites(Chiggers) have a place with the order Acarina and family Trombicuiidae found inside Inc genus and subgenus of trombiculid parasites: Leptotrombidium. More than 150 types of this subgenus have been depicted from Asia (Vercammen and Langston, 1975,) under 10 are known as vectors (Traub and Wisseman, 1974). Othergenera of chiggers are Ascoschoengastia, Blankaartia, Gahrliepia, Eutrombicula, Microtrombicula and Odontocarus. They consist of the pathogen and play role in transmission. In Japan two types of scrub typhus are there: (1) Transmitted by L. Aakamushi basically in the mid year months and (2) Transmitted by L. Pallidum and L. Scutellare, happens in winter season.

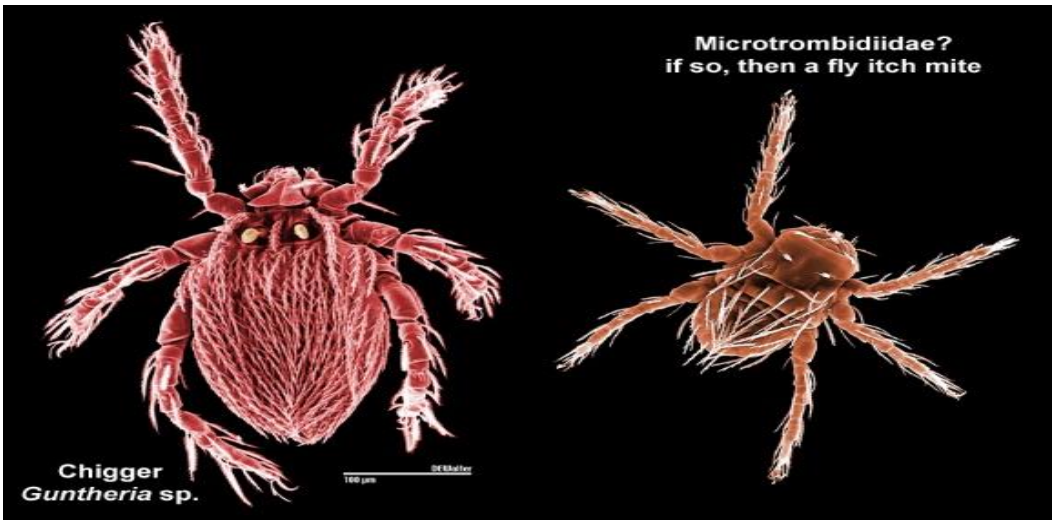


Figure 2.2: Adult and larval chiggers (mites)

Predominance and circulation of these vectors are firmly identified with the presence of both types of infection. L. Pallidum transmission is done in Japan, Korea, and the Primorje district of Russia in two pinnacles, harvest time to winter and pre-summer to late-spring at 18°C to 20°C; 1.,, scuteliare transmission happens in Japan, China, and Malaysia in fall and winter at 18°C to 20°C; and transmission by L. deliense, L. fletcheri, and L. arenicola happens in warm, moist tropical territories year-around. For instance when the temperature transcend 20°C in late-spring, L. akamushi turns out to be particularly pervasive along watenvay banks, when temperatures fall underneath 18-20°C, L. pallidum and L. scutellare increase in forests and along hedgerows between worked fields (Rapmund, 1984).

2.7 LIFE CYCLE

The life cycle of these mites (Figure 2.3) take after a similar general example, with the enduring grown-up shape that stores on the ground upwards of 15 eggs for each day, which bring forth into the six-legged larvae, or chiggers, nymph and adult. The eggs are laid separately on the surface of the soil. The larva leaves the egg-shell what's more, turns out to be extremely dynamic. Inside 48 hours subsequent to rising up out of eggs, chiggers join to a host and nourish for the following 2-12 days. The hosts can be reptiles, flying creatures or well evolved creatures, the larvae appends to the skin. At the point when the larvae sustain they enter the upper dermis of the have with their chelicerae, and after that infuse a histolytic salivary discharge that disintegrates the hidden tissue which seems to solidify to frame a connection to the chelicerae. In this 'stylostome' a central tubular depression creates through which more salivation is passed. This contains stomach related compounds that render the host tissue sufficiently fluid to be taken up through the stylostome, the larvae therefore encourages not on blood but rather on incompletely processed host tissue, tissue juices and serum exudates. Upon repletion, the chiggers drop to the floor, where following a couple of days they transform to a pupa-like stage from which they rise as eight-legged nymph. Approximately 2 weeks after the fact the sprites go as the second progressed pupa-like stage and develop as grown-ups. The two sprites and grown-ups are foragers and predators that feast upon arthropods and their eggs in the dirt and on flotsam and jetsam on the surface of the dirt. In the wake of mating, female grown-ups may lay upwards of 400 eggs. As a consequences of the life cycle, in which an individual nourishes on a host just once per age.

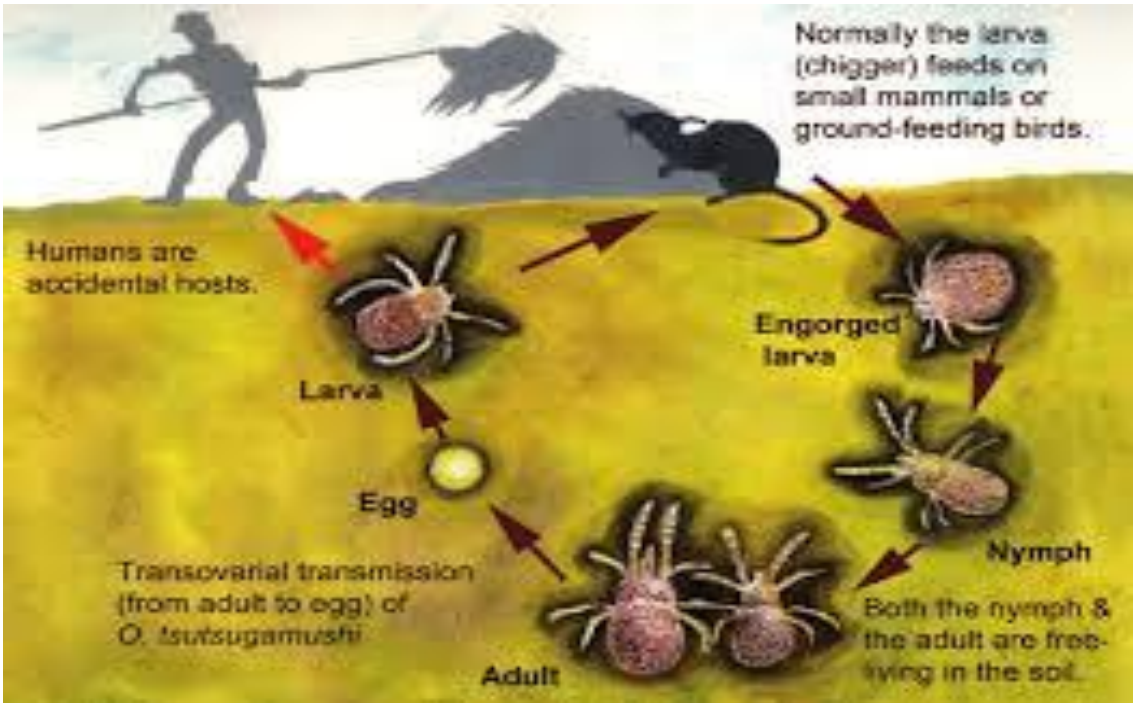


Figure 2.3: The life cycle of a Le totrombidium mite ilieong et at, 2007)

Orientia is transmitted vertically in mites (especially Leptotrombidium species) by the transovarial course, and evenly in rodents through trombiculid larval (chigger) nibbles (Lai et al., 2009). Shockingly, uninfected larvae that feast upon a contaminated host Inn

pass the disease transtadially. however never transovarially. Rickettsiae multiply in cells divene arthropod organs. Orientia can be transmitted transovarially from a tainted female to its progeny. Sexual transmission from tainted males to pninfected males does not happen, since Rickettsiae absolutely vanish from the cytoplasm of germ cells amid spermatogenesis Wrakami et al.. 1994). The disease rate of the offspring from tainted female mites may fluctuate from 20 to 100 for each penny (Roberts and. Robinson_ 1977(a)).

Vertebrates are constantly dead-end hosts for Orientia and the pathogen is as it were kept up ide contaminated maternal lines of chigger mites. People typically progress to-ward becoming, contaminated when they unintentionally intiinge 'bug islands' that t .ns infected mites. Mite islands can go in measure fro! a couple of crawls to rew meters ith extensIve variety vegetation composes from scrub (tall-developin coarse grass) and essential forest to gardens. seashore, paddy fields. bamboo patches, sandy seashore, ram Jungle high mountains and oil palm or rubber estates (Currie 2.8 SYMPTS Symptoms of scrub typhus usually begin within 1 day; s of being bitten. Signs and symptoms may include: Fever headache and muscle pain d) Black at the site o the chigger site (also known as eschar) e) Mental abnormality ranging from confusion to conia. niarge lymph nodes hey

Figure 14: Ester at site of chigger bite

2.9 PREVENTATION OF SCRUB TYPHUS

2.9.1 CHEMOPROPHYLAXIS

Chemoprophylaxis ought to be considered for people with expected extraordinary yet transient introduction to O. tsutsugamushi with weekly dosages of 200 mg of doxycycline have been proposed (Twartz et al., 1982). Warriors and street development groups are ordinarily cases, however chemoprophylaxis ought to likewise be considered

in high hazard explorers, for example, trekkers or eco-voyagers. Weekly doses of 200 mg of doxycycline can prevent Orientia disease (Twartz et al., 1982). In any case, a few inquiries concerning doxycycline chemoprophylaxis stay unanswered. It is known whether doxycycline chemoprophylaxis would be defensive against northern Thai strains of Orientia with lessened vulnerability to this antimicrobial factor. It isn't known whether the day by day doxycycline prophylaxis regimen prescribed for the chemoprophylaxis of malaria would ensure against scrub typhus, and there are hypothetical purposes behind speculating that it might not. Irregular prophylaxis would enable an invulnerable reaction to create against creatures procured between two measurements of anti-biotic though no such reaction would be permitted by every day medicine organization (Shirai et al., 1977). To be sure, weekly chloramphenicol was appeared to avoid scrub typhus; however every day chloramphenicol did not (Smadel et al., 1949).

2.9.2 VECTOR CONTROL

Control of the ailment depends on manipulate of the trombiculid mites. Focal regions can be treated with chlorinated hydrocarbons inclusive of lindane, dieldrin, or chlordane, even though these might also cause secondary environmental troubles. Insect repellants and miticides including N, N-diethyl-m-toluamide (DEET) are powerful while carried out to each garb and skin, whereas permethrin and benzyl benzoate are effective whilst implemented toapparel and bedding. Clearing of plant life and chemical remedy of the soil may additionally help. Digging out some inches of soil earlier than laying a brief camp also can save you the contraction of disease from the chigger bites.

2.9.3 RODENT CONTROL

Persistent anti-rat hygiene is of first-rate cost in lowering the chance of illnesses conveyed to man via mites. Rodent manage is a multi-dimensional activity that requires multi-sectorial cooperation. Different manipulate techniques together with trapping, poisoning and use of herbal predators are in practice. Habitat modification makes areas much less attractive to rodents thereby stopping new populations from decolonizing the habitat. Rats and mice may be advocated if weeds grow round homes creates an surroundings that is much less appropriate for rodentpopulations. Repeated boom in rodent populace even after the usage of poisons also suggests •that habitat modification is needed. 4t The essential objective ought to be to lessen ingress of rodents through right disposal of ct camp and kitchen refuse and elimination of gown flowers and rubble which manage to pay for them refuge. Rat destruction requires forethought; because if the feeding of larval mites is interrupted through the demise of rodent hosts a number of launched acarines may also reattach themselves to every other host, which: may be guy, Active rat destruction can be adopted while the first infestation is at its height Lea month or so after the rain starts off evolved. It is higher to trap after which spoil them in order that their parasites dono longer break out. When useless rats are amassed from any endemic foci, the soil below and straight away around them ought to be treated with insecticide.

2,10 JAPANESE ENCEPHALITIS

Japanese encephalitis is a viral disease caused by arthropods in humans. This di ease afibcted central nervous system and can cause death. In whole world about 19 billion people live in rural Japanese encephalitis prone areas. Hence, it is a rural disease, because the main vectors causing the Japanese encephalitis disease bread in rice-fields of those rural areas,According to WHO," Japanese encephalitis is one of the most important arbovirai childhood viral encephalitis in Asia, causing at least 50,000 clinical cases and 10,000 deaths every year,"And the are less than 5 thousand cases per year in India, But, it • a serious disease that may cause death. Japanese encephalitis caused by Japanese B encephalitis virus is a RNA virus of genus flavivirus of family flaviviridae, This was firstly identified in Japan in 1870s. It came to know that it is caused by mosquitoes as vectors about 25 years o cts identification,

2.10.1 LIFE CYCLE OF JAPANESE ENCEPHALITIS

The complex life-cycle of Japanese encephalitis consists of three components-amplifying hosts, reservoirs and vectors, Here, the pigs are amplifying hosts, ardeid birds are reservoirs and lost, mosquitoes are vectors. Japanese encephalitis virus is maintained by transovarial transmission in vector mosquitoesiE virus has been isolated from 19 mosquito species in different parts of India. The most important vectors in India are Czdex vishnui theobald and Culex tritaeniorhynchus giles. These mosquitoes mainly feed on pig and cattle bloods and, humans are the dead-end hosts. Humans and tattles are considered as dead-end host because they do not have high viraemia to transmit the virus further. After infected mosquito bites the host, the virus thought to amplify peripherally, causing a transient viraemia before invading the CNS in the host. Studies with a hamster modes of St. Louis encephalitis virus, the olfactory route has shown to play an important route for the virus transmission to theCNS in the host (Monath et al. 1983). The immuno- histochemical stainingof human had shown diffuse infection throughout the brain through haematogenous route in the human body. It has suggested that head trauma during the transient viraemia could facilitate viral entry into the central nervous system (Shiraki, 1970),

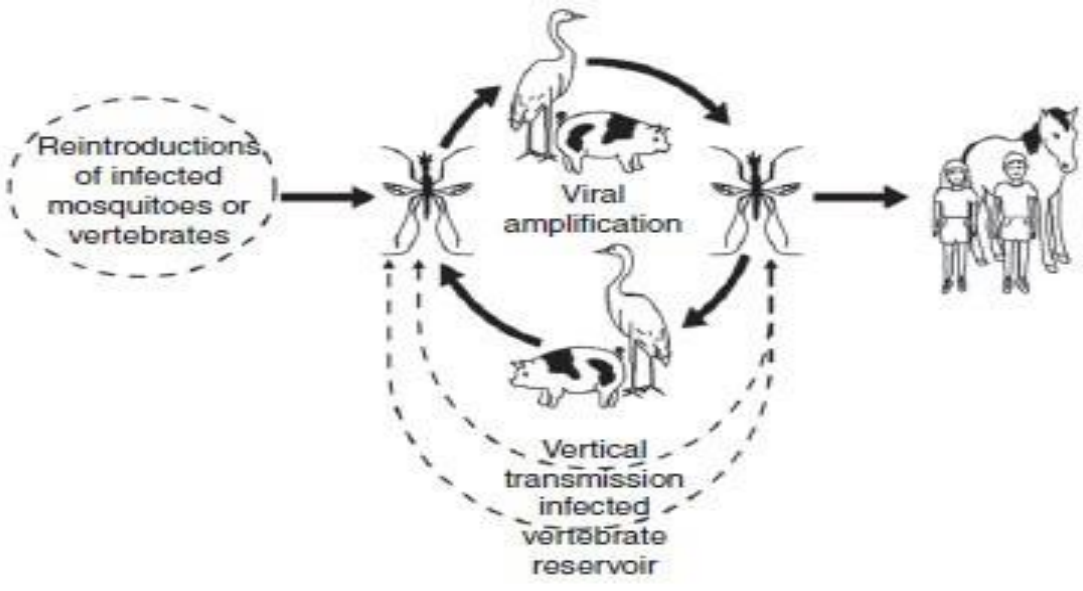


Figure 2.5: Transmission cycle of the Japanese encephalitis virus.

2.10.2 VECTORS OF JAPANESE ENCEPHALITIS

The Culex vishnui subgroups of mosquitoes are the major vectors and play an important role of the Japanese encephalitis epidemiological outbreaks in India (Mishra,1984). Other species are Culex vishnui theobald, Culex tritaemiorhynchus Giles and Culex pseudovishnui colless. They are very common and sidesperad. They breed mainly in rice fields, sunlit pools and drains. The important JE vectors in Asian and south-east Asian countries, Culex tritaeniorhynchus, Culex gelidus and Culex vishnui, have shown to feed mainly on cows in some places and pigs in other place depending on host availability (Reuban et al.1992).

Culex tritaeniorhynchus and Culex gelidus are major vectors in Kushinagar district, Uttar Pradesh. Culex tritaeniorhynchus treed mostly in fresh water relating rainfall and farming. Their population is high in monsoon (July to October) and post mansoon seasons due to availabity of paddy fields in rural areas and rainwater pools. Culex gelidus's favourable conditions for breeding are vast polluted water body with weeds therein. This species exist in periurban areas of Kushinagar district and no seasonal pattern on population density is observed, unlike for Culex tritaeniorhynchus due to availability of rain-pools, which is present throughout the year, due to urban effluents.

2.10.3 OUT BREAK OF JE DISEASE In 14 Asian countries, Je outbreaks take place frequently with about 3060 million people at risk of infection (Sabesan, 2003). This disease was also seen in non-Asian countries such as Australia. N early 3 billion people (about 60% of the world population) live in Japanese encephalitis endemic regions (Halstead and Tsai, 2004).

JE disease takes place in India, Asia regularly every year. In India, JE was clinically reported first time in Vellore, Tamil Nadu in 1955. Many JE outbreaks of different intensities are seen from different region of India. The first largest JE epidemic was reported in Bankura and Burdwan districts of West Bengal in 1973. There were more than 700 cases and 300 people died. Another was seen in 1976. The major outbreaks of this disease are seen in rural areas of India. A study showed that nearly 36.36% of cases were reported from urban cases whereas 63.6% from rural areas of Lucknow, Uttar Pradesh (Roy et•al 2006). This disease has been spread in many states of our country occurring mostly in monsoon or post monsoon period. The Uttar Pradesh state has suffered from a series of epidemics of JE and this appears to have become endemic in many of its districts. JE is one of the most important public health problems in UP, and the death list among children due to this disease is increasing every year. According to India Today, encephalitis claimed 25,000 child lives Kushinagar in the last forty years. Approximately 597,542,000 people live in Indian JE endemic regions. Annual incidence ranged between 1765 and 3428 cases and deaths ranged between 466 and 707 in India, according to the nationalvector borne disease control program of the Ministry of Health and Family Welfare. JE is mostly a disease of children as well as young adults. This mainly affected the children of 3 to 15 years old. They are fine to times higher risky than older individuals. This is all because of low background immunity in younger individuals. Mostly cases are seen in males in many outbreaks, probably due to increased exposure in areas of rice cultivation.

2.10.4 PREVENTION OF JAPANESE ENCEPHALITIS

Japanese encephalitis can be prevented by vaccine and vaccination against JE virus should be practiced in the regions of Asiawhere this virus is causing the disease. An essential component of a surveillance system should be formed for monitoring of JE virus infection in vector mosquitoes (Arunachalm et al., 2008). It is a challenge to control the vectors because of their exophagic and exophilic behavior which reduces the effects of traditional vector control methods like Indoor Residual Spray (IRS). So, it is not a recommendation for JE virus prevention. But, IRS should be considered in high risk areas where the vectors are Mansonia annulifera The mosquito repellants, nets, coils, etc are largely practiced to repel the vectors. For controlling the breeding in rice-fields as mostprone areas, two methods i.e., water management system with irregular irrigation system and incorporation of margosa (Neem) products in soil can be used. The fertilizers of margosa products in rice-fields enhance thegrain production as well as suppress the breeding of Culicine vector of Japanese encephalitis. As amplifier hosts, pigs are related to human habitations. There were 13.34 latch pigs available as per the 2012 animal census, which isquite high; pig immunization or slaughtering should be practiced as controlling this disease. Cattle do not develop enough help in reducing the spread of Japanese encephalitis virus.

111 CONCLUDING REMARKS

Scrub typhus is mite borne disease, which is caused by an obligate intracellular bacterium, orientia tsutsugamushi. This is often seen in the tropics of rural areas of Asia, forming 'tsutsugamushi triangle' inside a 13,000,000 km2 Asia-pacific area from Pakistan, India and Nepal in the west to southeastern Siberia, China, Japan and Korea in the worth to Indonesia, the Philippines, northern Australia and the interceding pacific islands in the south. Scrub typhus disease is normally happened during winter season as it happens from September to December with a crest occurrence in October. In India, the scrub typhus disease is generally happened from the month August through October. About 23% death cases due to scrub typhus are seen in the areas of the Asia- pacific region and the mortality rate up to 35%.

Orientia tsutsugamushi is the causative agent of scrub typhus which is transmitted to humans by the bite of larval stage of trombiculid mites belonging to the genus Leptotrombidium. A specific skin lesion, an eschar occurs on the proliferation of bacterium. The trombiculid mite larva can be found at the habitat of rodents. The mite vectors need ground moisture for nourishment.

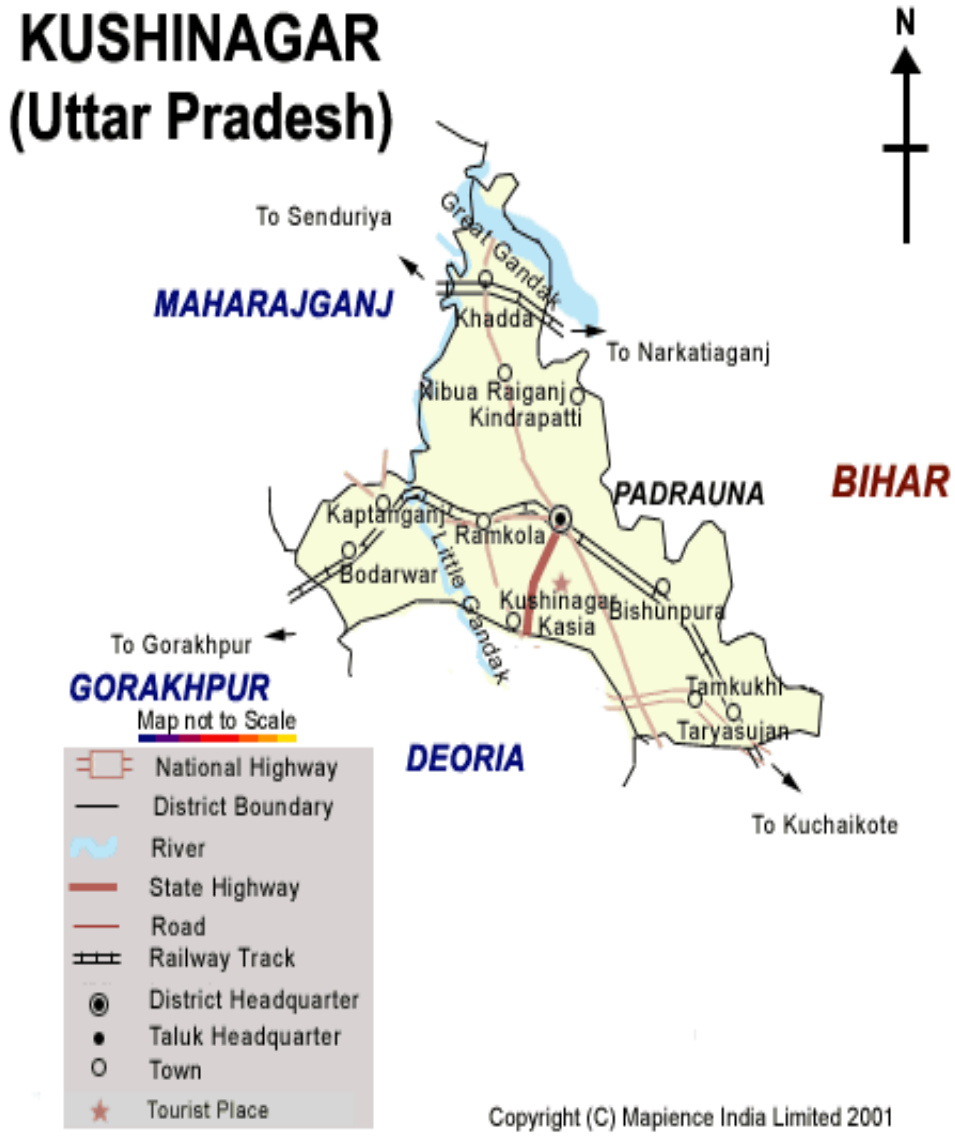
The outbreak of scrub typhus is occurring for last two years. According to India Today, encephalitis claimed 25,000 child deaths in Kushinagar district in last forty years. Approximately, 597, 542,00 people live in Indian endemic zones of encephalitis. Annual incidence ranged between 1765 and 3428 cases and death ranged between 466 and 707 in India, according to the National Vector- borne Disease Control Program of the ministry health and family welfare.

CHAPTER 3
METHODOLOGY

3.1 STUDY AREA

Kushinagar is a district of the state of Uttar Pradesh in India situated in the easternmost part of the state. It has the administrative headquarters at Ravindra Nagar Dhoos in Padrauna. The district is named such after the town Kushinagar, a Buddhist pilgrimage site where Gautama Buddha attained parinirvana in the 5th century BCE. Since the independence of India, Kushinagar district was a part of Deoria District and came into existence on 13 May 1994 as a separate district division. It was earlier known as Padrauna and thereafter was renamed Kushinagar on 19th June 1997.

Map of Kushinagar is given in (Figure 3.1)



3.2 LOCATION, BOUNDARIES, AREA AND POPULATION

3.2.1 Location and Boundaries

The present district of Kushinagar lies between Latitude 26°13' N and 27'29' and Longongitude 83° 05' E and 83° 56' E. The district occupies the north-eastern corner of the state along with the district of Deoria, and comprises a large stretch o of country lying to the north of the river rapti the deep stream of which forms its southern boa boundary with district gorakhpur he west, the boundary marches along Bagaha and the Chhoti G and on the east ad j oins andak Nadi and in further south the Mama Nala forms partly dividing line.

3.2.2 Area

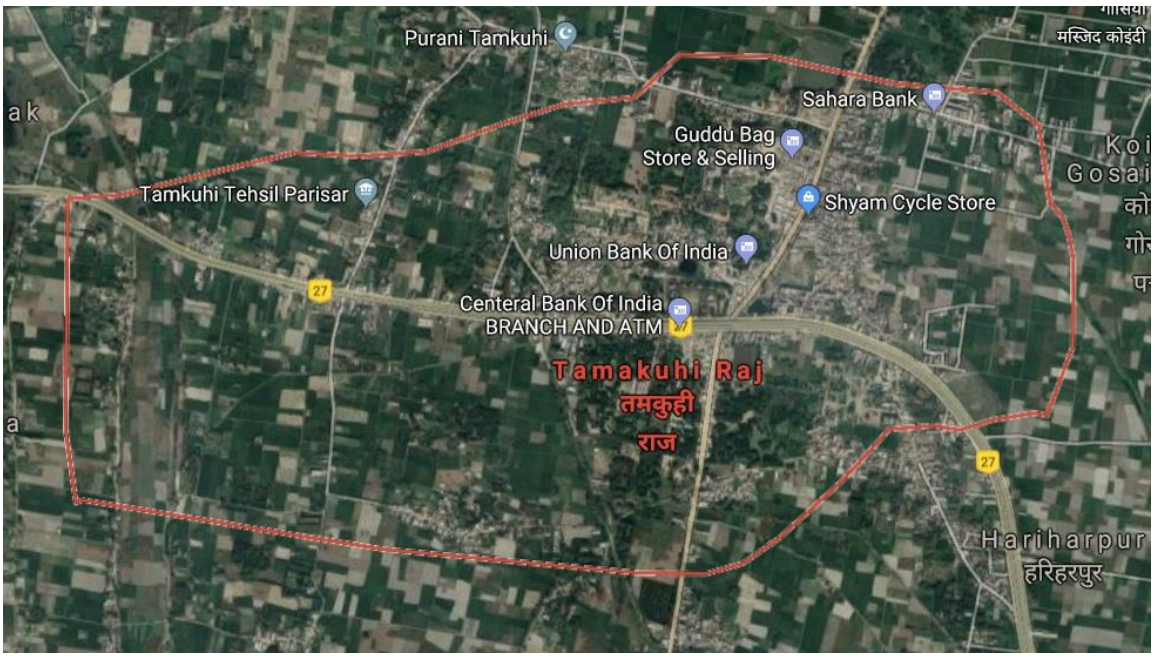
According to the Central Statistical Organization the districtt had an area 2,874 sq. , Km. on July 1, 1971 occupying the 15th position i K n the State. Area of the district is apt to change from year to year, due to fluvial action of Ghaghra. On the basis of land records it was about 1,990 sq.km. in 1971. Population a According to the census of 1971 the district occupied the 8nd position in the State in respect of Population which was 6, 00,000 (2, 50,000 females). The rural areas were inhabited by 10,00,000 persons (females 3,00,000) and the urban 2, 0,158 (females I, 06967).

3.3 SURVEY AREA

In the present study, five blocks Kubarnath, Ramkola, Tamkuhi, Hata, Fazilnagar are the bolcks Kushinagar urban area.

Location and map of the surveyrd blocks are given in fig 3.2


Central Bank Of
ndia (Bank & ATM)
730
Ramkola
रामकोला
Dharm Samda
धर्म समदा
Purvanchal Bank
Inder Senwa
इंदर सेनवा
Kasia - Ramkola Rd
Durga Mandir
Pakadi Bangar
दुर्गा मंदिर
पकड़ी बांगर
Maa Ka
Mandir, Which i
मंदिर,
Bhathahi
Khurd
भथही खर्द
Moti Pakar
मोती पकर
Dhanauji Khas
धनौजी
खास
Google


Purani Tamkuhi
मस्जिद कोइंदी
Sahara Bank
Guddu Bag
Store & Selling
Tamkuhi Tehsil Parisar
Shyam Cycle Store
Union Bank Of India
27
Centeral Bank Of India
BRANCH AND ATM
Tamakuhi Raj
तमकुही
राज
Hariharpur
हरिहरपुर

3.4 VILLAGES AND NUMBERS OF PATIENTS IN SURVEYED AREAS

Total 34 villages are surveyed in the five blocks and Kushinagar amd surveying total 101 patients are found to affected by encephalitis. Villages and number of patients in the corresponding villages are tabulated and given in table 3.1 to table 3.5.

Table 3.1: Block-Kubarnath Villages and number of Patients

	Sr.No	Village/ Tola	No. of Patients
BLOCK KUBARNATH	1	Kurmoul	1
	2	Baluchaha	1
	3	Semariya	1
	4	Khirkiya	1
	5	Haraiyabuj	1
	6	Watterder	1
	7	Parsauna	2
	8	Naharchar	1
	9	Panchrukhi	1
	10	Bahorapur	1
	11	Gangauli	1
	12	Bhatwaliya	1
	13	Sahapur	1
	14	Bahaburga	1
	15	Katowa	1
	16	Pachfedwa	1
	17	Semariya	1
	18	Khanwar	1
	19	Subhiani	1
	20	Junglekurr	1
	21	Bashiya	1
	22	Kurmaul	1
	23	Amwajung	1

TABLE 3.2 : BLOCK HATA VILLAGES AND NUMBER OF PARTIENTS

	Sr.No	Village/ Tola	No. of Patients
BLOCK HATA	1	Hata	2
	2	Urahawa	1
	3	Barahara	2
	4	Belwania	1
	5	Luxmipur	1
	6	Naryanpur	1
	7	Gothhapol	1
	8	Rampur	1
	9	Basaunaal	1
	10	Pakdi	1

TABLE 3.3 : BLOCK- TAMKUHI VILLAGES AND NUMBER OF PARTIES

	Sr.No	Village/ Tola	No. of Patients
BLOCK TAMKUHI	1	Sultanpur	**1**
	2	Patherwa	**1**
	3	Sarayamaf	**1**
	4	Patherwa	**2**
	5	Chaphukat	**1**
	6	Jararkotw	**1**
	7	Chahuturk	**1**
	8	Belaturk	**1**

TABLE 3.4 : FAZILNAGAR KUSHINAGAR AND NUMBER OF PATIENTS

	Sr.No	Village/ Tola	No. of Patients
BLOCK FAZILNAGAR	1	Bakulharka	**1**
	2	Taruwanav	**1**
	3	Sultanpur	**1**
	4	Patherdew	**1**

TABLE 3.5 : BLOCK- RAMKOLA VILLAGES AND NUMBER OF PARTIES

	Sr.No	Village/ Tola	No. of Patients
BLOCK RAMKOLA	1	Baria	**1**
	2	Jagadihpur	**1**
	3	Dhuatiker	**1**
	4	Hukaha	**1**
	5	Chandanpor	**1**
	6	Ramkola	**2**
	7	Luxmiganj	**1**
	8	Luxmipur	**1**

3.5 DATA COLLECTION

This study is approved by Department of Civil Engineering, Madan Mohan Malviya University of Technology, Kushinagar, is done in the 5 blocks anion g 19 blocks of Kushinagar district where the annual mean temperature ranges from .5 44.10°C to .5°C and the annual rainfall is 941 mm during theperiod of January 2017 to December 2017

The list of total number of encephalitis patients is collected from District Hospital Kushinagar. The scrub typhus cases include fundamental demographic and clinical da This data are based on gender] age, village, address, public health centre, religion, date of admission, date of death, source of information. The for confirming the case of scrub typhus consist of clinical manifestations (such as eshar, skin rash, fever, shock, etc.), epidemilogical exposures (for example- going to endemic area), contact with chiggers (mites), rodent and, the laboratory examination and analysis such as Immuno Fluorescence Antibody Assay (IFA), PCR or isolation methods.

After getting the data list, the contact with Medical Officer in-charge (MOT/C) of the blocks- Chargawan, Khorabar, Sardar Nagar, Bhathat and Nagar Nigam public health centre (MC) is done and provided with the list of ANMIASHA of every Villages/

Tola. The door to door survey is done with the help of ANM/ASHA and Pradhan the respective village.

The data of maximum temperature, minimum temperature, 24 hours rainfall, seasonal rainfall, monthly rainfall,MSLP (mean sea level pressure), minimum humidity, maximum humidity etc. for year 2017 is collected from the Meteorological Department of Kushinagar district.

3.6 DOOR TO DOOR SURVEY

The survey is conducted in four blocks among all the blocks of Kushinagar district. The blocks are Chargawan, Khorabar, Sardar nagar, Bhathat and Nagar Nigam. The age and sex matched list is choosen for the random survey in different villages were the cases were located.

The first survey was done in Chargawan block. Using the pre design the proforma, including the criteria of the name, age, sex, occupation, Diet of the patient his/her, source of drinking water, nature and floor of house (kaccha/ pakka). The cases were questired and analyzed the symptons and signs for howmany days, date of hospitalized. The information on living environmental, sanitation practises, drainage of water, leisure activity, exposure to rodants, shrub and bushes near patients house. As per the survey conducted in Chargawan block 40 people were suffering from AES. The number of patients is much more as surveyed. Among 40 cases there were 10 cases of scrub typhus.

The age group 0-5 is mainly suffering from AES disease among 40 cases to be surveyed, 16 patients were from age group 0-5; 10 from age group 5-10; 8 from age group 10-15 and 6 from age more than 15 years. There were 25 males and 15 females. 9 Patients are died from this disease. Along with the main cause of encephalitis in this area, the dirty and unhygienic conditions were also responsible for this.

Figure 33: Some of pictures white taking information in Kubarnath block

The second survey was done in the repon of NagarNigam. With the help of pre designed preforma, the name, age, sex, diet, sorce of drinking water, sanitation, about house, etc. Of a concerned patients was reported. The sympotms and sips were mentioned with the ata. Only one sases was conducted by this region as the patients thereby were very less in number. A girl of 14 years named baby was examined. She is cured and alive.

Figure: 3.4: picture while taking information with a patient in Hata

The next destination for survey was Khorabar where 23 encephalitis patients were surveyed. 10 children were suffering from this disease in the age group of 0-5. 7 were in the age group of 5-10, 5 in between 10-15 age group & only one was of the age of >15. There were 13 males and 10 females. Two people were died due to this disease.

Figure 3.5: Some of pictures while taking information in Ramkola block

The second last survey was conducted in the block of Sardar nagar. Total no. Of patients surveyed was 10. Three were males and seven were females. One was died dueto this dise-ase. Three were of age group between 0-18., 4 from the age group of 5-10 & 3 from the the of 18 30. No one was fi-on the age group <50 only one was died.

Figure 3.6: Some of pictures while taking information Fazilnagar block

The last survey was conducted in the block hat at. Seventeen case-patients were surveyed. Ten were males and seven were females. The number of patients in the age raToup of G-5 were ei of 5-1 0 were six_ of 0- 3 5 were three and of >I5 age group none. Three were dead because of this disease.

Figure 3.7: Some of pictures while taking information in Tamkuhi block

3.7 SURVEY FORM

Name of Distt.		**Name of block**	
Name of Area		Panchayat/nigam	
Name of PHC		PHC Contact No.	
Acute Encephalitis syndrome Affected Patient Detail			
Name of Patient		Age	
Sex		Caste/Religion	
Occupation		Literate	
Diet		Source of Drinking water	
Nature of House(Kaccha / Pakka)		Floor of House(Kaccha / Pakka)	
Shrub vegetation near house		Cattles near house	
Symptoms		Sign(From how many days)	
Date of Hospitalized		Fever Range	
Child activity Area		Prevalence of rats/Shrews in house or near by area	
School in which pt study (Govt./Pvt)		Any previous H/o of Kmf. Admission or sickness	
Wt. of patient		Sickness Reason	
Economic Conditin			
Sanitation		Drainage of Water	

CHAPTER 4

RESULT AND DISCUSSION

The result of Acute Encephalitis Syndrome is relating to scrub typhus along with total number of cases with respect to environmental and socio economic factors. The average temperature, relative humidity, and rainfall is considered with reference to age group, month and relating number of cases from January 2018 to December 2018.

Table 4.1: Monthly Details Of AES Cases With Environmental Parameters

Seasonal patterns in reported encephalitis cases of 2018 in kushinagar district					
Month	**Avg. Temp. (^{0}C)**	**Avg. atm pressure (mb)**	**Relatie humidity (%)**	**Total rainfall (mm)**	**Totoal AES case**
JAN	19	1016.2	62	5.6	4
FAB	20	1015.3	55	0	7
MAR	22	1011.0	53	4.8	9
APR	30	1008.8	41	3.0	5
MAY	32	1005.4	46	18.5	7
JUN	31	0999.5	64	128.6	6
JUL	33	0998.4	74	480.1	12
AUG	32	1000.3	78	335	19
SEP	32	1006.5	68	138.2	10
OCT	32	1013.3	70	0.6	5
NOV	24	1016.2	60	0	10
DEC	18	1018.2	68	0	1

Table 4.2: Details of AES Cases and Scrub typhus cases respect to age group

AGE GROUP	NO OF SCRUB TYPHUS CASES	TOTAL AES CASES
0-18	17	70
18-30	1	3
30-50	2	4
<50	0	4
TOTAL	**20**	**81**

Table 4.3: Details of AES cases and Scrub typhus cases respect to block wise and Kushinagar

BLOCK	NO OF SCRUB TYPHUS CASES	TOTAL AES CASES
Kubarnath	8	23
Hata	5	10
Tamkuhi	6	8
Ramkola	4	8
Fazilnagar	1	4
TOTAL	**24**	**53**

Environmental factors included the effect of temperature, humidity and rainfall were as socio economic factors included gender, nature of house, floor of house, source of drinking water, scrub vegetation near house, cattle's near house, prevalence of rat and shrews, economic condition, sanitation, literate.

GOOD

VERY POOR

POOR

8. SANITATION

YES

NO

9. DRAINGE OF WATER

YES

NO

10. LITERATURE

YES

NO

11. SOURCE OF DRINKING WATER

SH

IM

RO

BW

4.1 SOCIO- ECONOMIC FACTORS

Scrub typhus has become a major public threat in Kushinagar district of Uttar Pradesh due to its complexity and lack of any specific treatments, even there is no vaccine is available.

The influence of socio-economic status on health is considered to be continued throughout

Status is more likely to suffer from disease such as Acute Encephalitis Syndrome and to experience high mortality.

In my study, the total number of male individuals is significantly higher 56.04% than that of females 43.95%. This observation is in flow with earlier observations. Although scrub typhus cases have been observed from all the age groups, the highest number of scrub typhus positive cases has been recorded in the age group of 0-5 years, followed by the age group 6-10 years, in both males and females. The highest number of cases in 0-5 age group is possibly due to low immunity in them. Usually, the vector needs ground moisture for its nourishment and the majority of this age group gets exposed to the vector directly.

It is interestingly noted that during the survey period, number of the scrub typhus positive cases i.e., 23 out of 38 cases belonged to the illiterates and was found to be significantly higher than the 15 cases of literate group of community. And, among 91 AES cases, 62 (68.13%) patients were illiterate which was also greater than the literate group of 29 (31.86%) cases. It is worthy mention that the rural illiterate people or literates with less education were unaware of the disease and its preventive measures. Therefore, illiteracy or short of education play a very important role to manifest this disease in Kushinagar district.

The economy of Kushinagar is mainly dependent on agriculture and animal husbandry, and the villagers have mostly taken up these occupations as the source of income. My study also reveals that all the scrub typhus positive cases, i.e., 38(100%) belonged to the low income group (income level < 5000/ month). Among 91 AES surveyed cases, 89 (97.80 %) belonged to low income group and only 2 (2.19%) belonged to high income group, which is very much less in comparison to former. To raise their economic status, villagers usually take up cattles in their own hut; commonly share the habitat with human population. The number of scrub typhus case patients i.e., 35 (92.1%) among the total number had cattle near their house, and 78 (85.71%) AES patients had sharing their habitat with the cattles. Thus, the low economic group people become directly or indirectly exposed to scrub typhus infection and this kind of data also satisfies that low economic status is one of the important risk factors is relation to scrub typhus incidences. According to my study, 26 number of scrub typhus positive cases (68.43%) originated from the kaccha house was significantly higher than that 12 number of scrub typhus positive cases (31.57%) from the pakka houses. The AES cases having kaccha house was 68(74.72%) and pakka houses were 23 (25.27%). In the house, 31 number of scrub typhus positive cases 31 (81.57%) have kaccha floor even some having brick walls and 7(18.42%) had pakka floor. In addition to this, 74 AES patients had kaccha floor (81.31%) which was much higher than the AES patients i.e.; 17(18.68%) having pakka floor. The study pointed out that the house type (i.e.; pakka or kaccha) is another socio-economic risk factor in relation to scrub typhus and AES cases. This factor is very much depended on the economic status. People living in pakka houses belonged to high income group whereas the low income group lives in un-hygienic conditions in kaccha houses with household crowding and lack of good ventilation which is considered to be the risk factor for the disease. The houses of the scrub typhus victimized people being in the close proximity to shrub vegetation. In this context, I

came across a good number of scrub typhus positivity cases i.e.; 34 (89.47%) belonging to those patients whose residences were much closer to the shrub vegetation. These cases were significantly higher than those of the 4 (10.52%) of such patients whose residences were far away from the shrub vegetation. The number of AES patients whose houses close to shrub vegetation were 83 (91.2%) among 91 cases to be surveyed which was much more in comparison to the patients whose houses were far away from shrub vegetation. In scrub typhus case, the prevalence of vector rodents was (38%) 100% while in AES cases, (89) 97.8% patients had the vector rodents in or near their residents, which was very much more than those AES patients who were not in close proximity to vector rodents.

Sanitation hygiene practices keep a very important role to be not under the disease trap. Hygiene practices include the drainage of water, drinking of clean water, etc. The source of drinking water is another context.18 (47.36%) scrub typhus patients had the toilet among 91 cases which is slightly less than the number of AES patients i.e.;48 (52.73%) did not have the toilet. The houses having drainage of water keep another important role; in this study the number of scrub typhus patients whose, houses did not contain the drainage system were 28 (90.32%) among 38 surveyed cases which is much more than those of 10 (26.31%). 62 (68.13%) number of AES patients houses contain the drainage system which were more than the number of patients i.e.; 29 (31.86%) whose houses contain that. In scrub typhus case, 20 patients had shallow hand pump (SH), 14 patients had India marka (IM), 3 patients had reverse osmosis (RO) and one patient had bore well (BW) and AES case, 58 patients had SH, 22 patients had IM, 7 patients had RO and rest 2 patients had BW.

4.2: ENVIRONMENTAL FACTORS

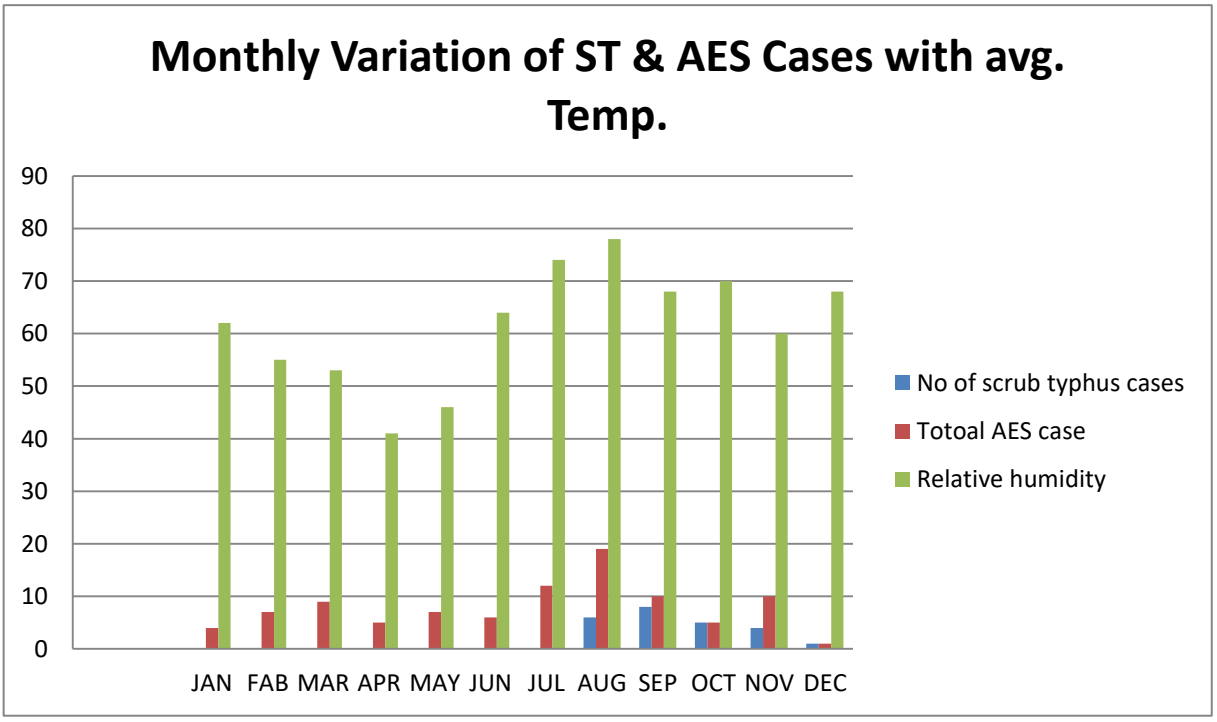


Figure 4.1: monthly variation of scrub typhus and AES cases with avg. temp.

An important factor of environment i.e. temperature influence the health of any person. In my study, this factor played a very important role in categorizing and comparing the monthly variation of scrub typhus and AES cases. The avg. temperature at which the maximum number of scrub typhus patients i.e. 11 was at 30°C in the month of September and that of AES patients i.e. 78 was at 32°C in the months August to September (figure 4.1). There were no scrub typhus patients i.e. minimum was at 19°C, 20°C, 22°C and 30°C increased to 32°C, the maximum average temperature, January to July respectively. And, in the 101 AES surveyed cases, the number of patients was at its minimum point in the month of February at avg. temperature 20°C, March at 22°C and June at 31°C. the study also reveals that at a certain temperature i.e. 32°C there was variation in the number of scrub typhus and AES case patients as there were 0,8,10 and **11** scrub typhus patients at only 32°C, while 4,7,8 and 17 AES patients at that particular temperature. So, we can say that the variation and incidence of scrub typhus patients do not depend only on temperature; there are other environmental cases which influence the number of cases drastically.

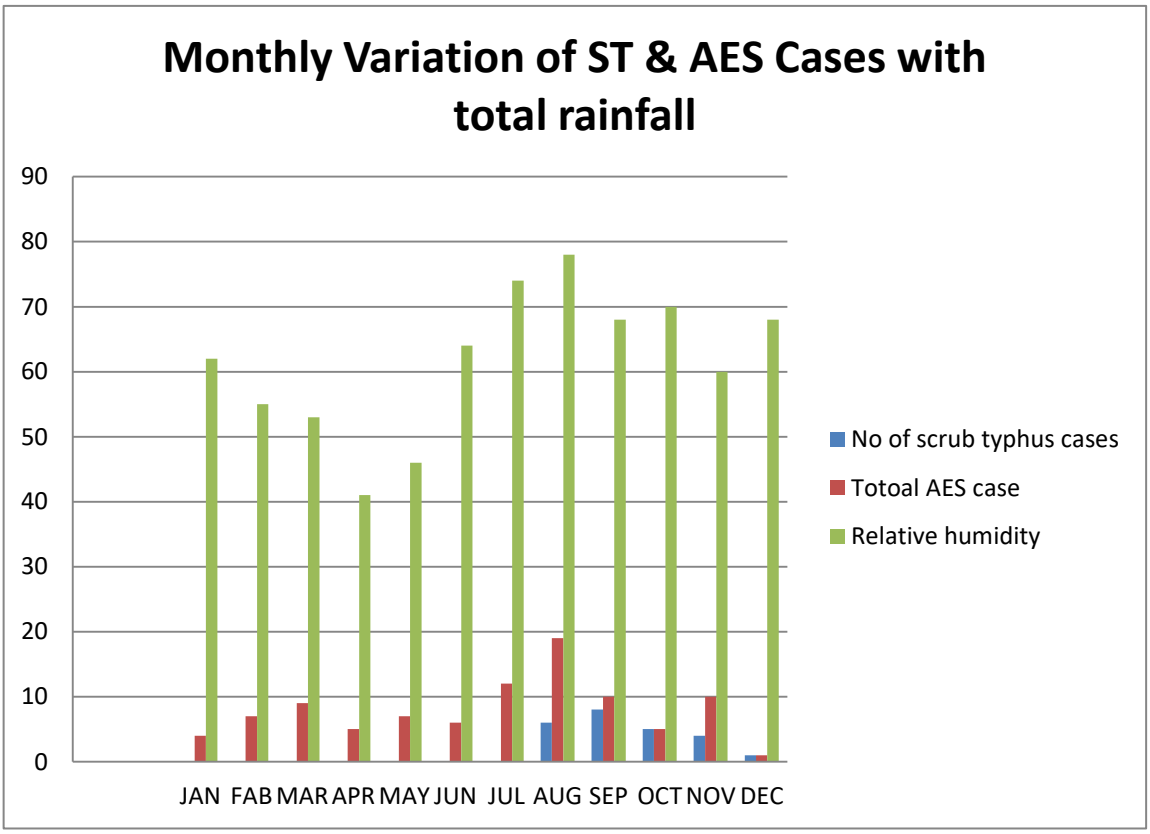


Figure 4.2: Monthly variation of scrub typhus &AES cases with total rainfall

Total rainfall is another environmental factor on which basis the monthly variation of scrub typhus and AES cases can be shown figure 4.2. The maximum number of scrub typhus patients i.e. 11 among 38 was observed in the total rainfall of 138 mm in the month of September while the maximum number of AES patients i.e. 22 was at total rainfall of two months August and September i.e. 335 mm and 138 mm respectively. So, we can see that at same total rainfall 138 mm, there were maximum number *of* patients in both scrub typhus and AES cases. There was no scrub typhus patient in the months from January to July at total rainfall 4.8 mm, 0 mm, 3.5 mm, 4.6 mm, 48.4 mm 138 mm and 423 mm Respectively. There was minimum number of AES cases i.e. zero at total rainfall 0 mm, 5.4 min and 130 min. In my study, a fact is revealed that it is not compulsory that there will be no patients at 0 mm as in the month of February, while there can be number of scrub

typhus and AES patients even at 0 mm. this shows that another environmental fact workors.

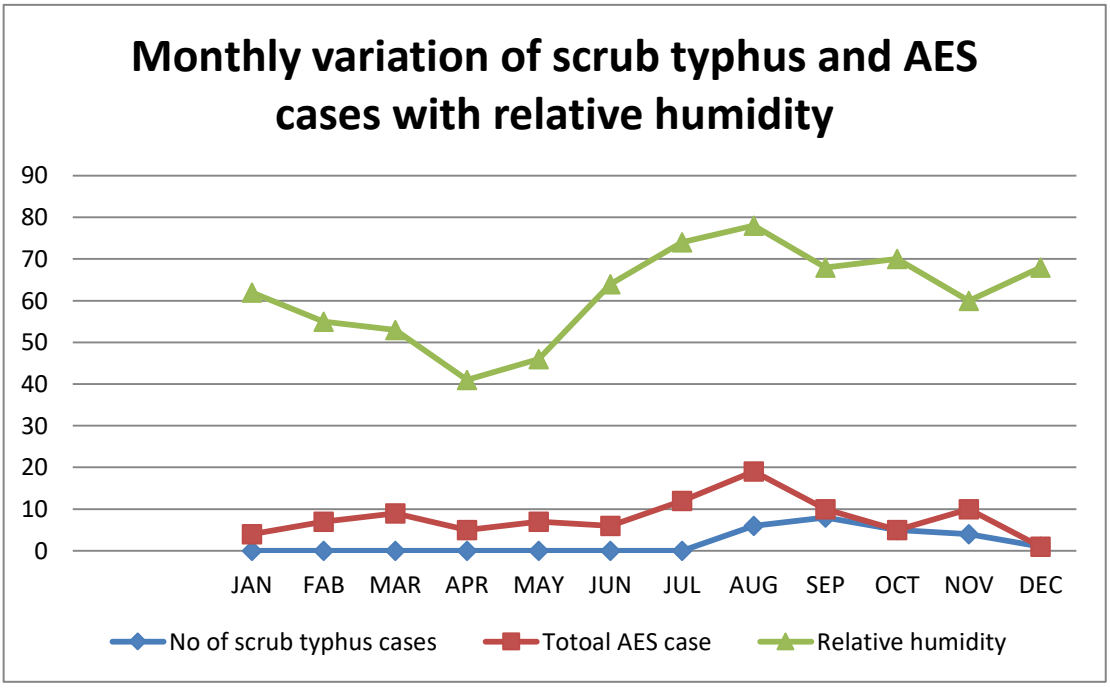


Figure 4.3: Monthly variation of scrub typhus and AES Relative humidity (%)cases with relative humidity

The third environmental factor which influence i.e. increases or decrease the number of cases of Scrub typhus and AES is relative humidity. It is measured in %. Maximum number of scrub typhus patients i.e. 11 among 38 was at relative humidity 70% and that of AES patients i.e., 22 were at relative humidity 64% and 78% in months August and September respectively. The relative humidity at which minimum number of scrub typhus patients i.e., zero found was 62%, 55%, 53%, 41%, 46%, 64%, and 75% from January to July respectively. While minimum number of AES case patients were at 74% in February, 52% in March, and 63% in June.

According to figure 4.3, same number of AES patients i.e., 2 was found at different relative humidity such as 68% in January and 48% in May. Similarly, 8 scrub typhus patients were observed at two different relative humidity of 74 and 68 in the months August and November respectively.

4.3 MORTALITY IN AES

In Kushinagar district, total number of AES cases was 423 in the survey year of 2018. The number of deaths in AES was 81 among 423. There were 400 cases observed in the age group 0-18 year among which 17 died. 223 were belonged to the age group of 18-30 year and 120 were to the age group of 30-50 year. The number of AES patients who belonged to the age group more than 15 years was 83 in which 17 died. From the age group 5-10 and 1015 year, 19 and 9 patients were died respectively, as shown in figure no 4.4.

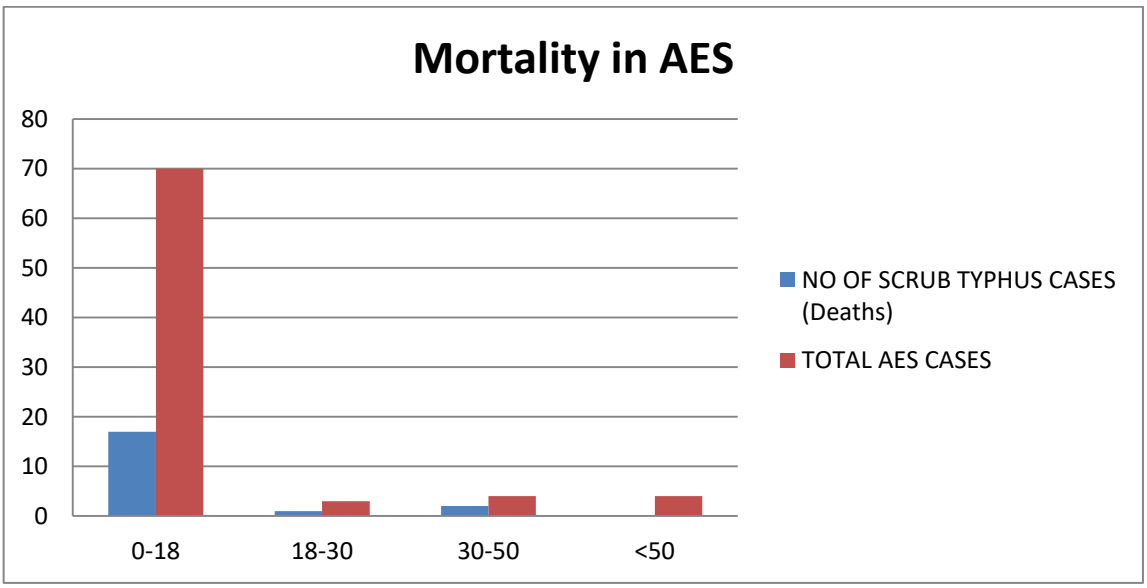


Figure 4.4: Mortality regarding AES in Kushinagar district in 2018

In my study 2017, total number of AES and Scrub typhus surveyed cases were 91 and 38 respectively. Total number of deaths in AES was 10 and that in Scrub typhus was 5. Only one AES patient died from the age group 0-5 year, 5 AES patients were died from the age : group 5-10 year, 2 AES patient were died through both the age groups of 10-15 and >15 ; years. No one died from both the age group of 10-15 and > 15 years in the case of Scrubq typhus. Two and three Scrub typhus patients were died under the age group of 0-5 and 5-10 |

4.4 Monthly variations in the AES cases and climatologic conditions

Combine analysis of the relative humidity, average temperature, and total monthly rainfall to the total number of the AES cases identified in the Kushinagar, signifies that number of cases increases in monsoon season in high rainfall month July. August, September andOctober. Monsoon season is favorable season for AES.

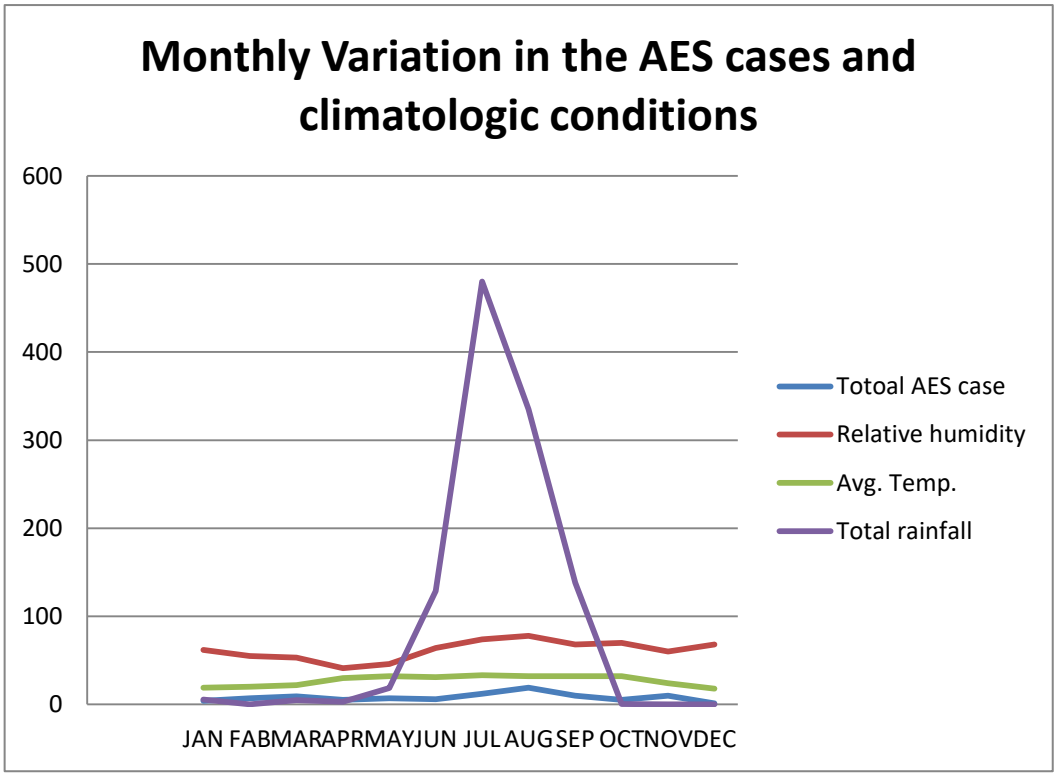


Figure 4.5 Monthly various of the AES cases

PROPER CONCLUSION REQUIRED

The scale runs from 0 to 6, running from perfect health without symptoms to death. Rankin scale is as follows:

0. No symptoms.

1. No significant disability, able to carry out all usual activities, despite some symptoms.

2. Mild disability, able to look after own affairs without assistance, but unable to carry out all previous activities.

3. Moderate disability, requires some help, but able to walk unassisted.

4. Moderately severe disability, unable to attend to own bodily needs without assistance, and unable to walk unassisted,
5. Severe disability, requires constant nursing care and attention, bedridden, incontinent.
6. Dead.

CHAPTER 5
CONCLUSION

The people of Kushinagar district are suffering from AES disease since 1998. The cause of AES is revealed as scrub typhus for last two years. So, the misconception is removal that JE is the cause. Earlier researches had done in same village under same environmental conditions while my survey is done including different patients from different villages of Kushinagar district. I surveyed 38 scrub typhus case and 101 among 423 AES cases. Some similarities and high proportionality are seen in the case-patients and their nearby surroundings. The disease is relating with all unhygienic so seen in the people living at dirty places, in mud houses, and nearby poor drainage system. Its prevalence is seen near shrub vegetation. A surprising note is that rodents are found in the houses of all the case-patients (100%). The rodents act as reservoir for the infected mites. It may be opined that patients admit to the hospital for 7-8 days of delay because of illiteracy and low income.

The age group of 0-18 was mostly affected by this disease, probably because of low immunity in them. Environmental factors such as temperature, rainfall, humidity, etc. play important role in influencing this disease. There were maximum number of patients- 11 at average temperature 30°C, total rainfall 142.8 mm and relative humidity 70%. Only one environmental factor does not control the increment of patients due to scrub typhus, other factors also influence the disease. So there are other controlling factors.

Some remedies can be adopted for reducing its widespread influence on people-

I. Consult doctor as soon as possible on getting symptoms and signs as high fever, vomiting, headache. II. Clean the surroundings at living place. III. Keep well-planned and neat drainage system in/near house. IV. Use insect-repellents. V. Use prescribed antibiotics- doxycline, tetracycline, azithromycine. VI. Be careful during scrub typhus causing months i.e., monsoon and post monsoon time. Spread public awareness against this disease. VII. Get away from causative factors rodents and shrub vegetation.

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