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Incidence of Leptospirosis Infections among Acute Febrile Patients in Lakhimpur and Dhemaji Districts, India

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Authors' contributions

This work was carried out in collaboration between all authors. All authors read and approved the final manuscript.

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ABSTRACT

Leptospirosis is a disease condition of infected wild or domestic animals. Humans get this infection when they come in touch with the contaminated soil or water in the infected animal's urine/excreta of animal reservoirs directly or indirectly. Water logging during rainy session, traditional cultivation with animals and water flow to the rivers are common in Assam. Those events may increase the risk of infection and that is why Lakhimpur and Dhemaji districts were choose for our study area as both districts are neighboring of hilly area (Arunachal Pradesh) and found maximum water logging. Blood samples were collected from the acute febrile patients reported to the laboratory for different tests like typhoid, japanese encephalitis (JE), dengue, malaria etc. Serums were obtained from the whole blood and selected only the JE, dengue, malaria, typhoid negative samples for our studys,

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after the consent from the patients or attendance of the patients. The test results showed that 2.13% (16/750) patients were positive for leptospirosis. Where 12.5% (2/16) positive patients were from Dhemaji district and races were from Lakhimpur. Clinical finding represented fever 100% (16/16), headache 68.75% (11/16), myalgia 50% (8/16), conjunctival suffusion 6.25% (1/16), jaundice 12.5% (2/16), cardiac arrhythmia 12.5%(2/16), skin rash 6.25% (1/16), haemorrhage 6.25% (1/16), unconsciousness/semiconsciousness 12.5% (2/16), nausea/vomiting 6.25% (1/16), and abdominal pain 6.25% (1/16) in the positive patients. This proves the prevalence of leptospirosis in the study districts of Assam. An awareness of disease transmission could minimize the disease risk.

Keywords: Animal; urine; transmission; infection.

1. INTRODUCTION

Leptospirosis is zoonotic disease and represents the symptoms of acute febrile illness with headache, myalgia and prostration [1]. In addition with these symptoms it may represent conjunctival suffusion, meningeal irritation, jaundice, cardiac arrhythmia, skin rash, haemorrhages (from the intestine / lungs etc.), anuria/oliguria etc. Some of the other symptoms like diarrhea, nausea, vomiting, joint pains, abdominal pain etc may also be present in some patients [1,2]. The symptoms could be confirmed as leptospirosis only after laboratory test result. The first case of leptospirosis was reported in 1886 by Weil, who was Professor of Medicine at Heidelberg [3]. In India, outbreaks of leptospirosis had been reported from various states as Gujarat, Maharashtra, Kerala, Tamil Nadu, Andaman & Nicobar Islands, Goa, Karnataka, Orissa, Andhra Pradesh etc [4]. From Assam, first leptospirosis case was reported in 2008 and patient was with pyrexia [5]. This was 79 years after the first case of leptospirosis in India that was reported from Andaman Islands in 1929 [6]. The disease spreads to human through contaminated animal urine [7]. There are risk groups for leptospirosis as cultivators, veterinary workers, fishers etc. that are frequently exposed to infected animals. People who walk with barefoot are also in high risk [8-10]. The bacteria infect the human host through mucous membranes, skin abrasions or conjunctiva during the contact with the contaminations. Incubation period of this disease is 10-12 days approximately but varies from 02 to 21 days.

1.1 Study Area

Lakhimpur and Dhemaji, the neighboring, border districts of Assam were selected as the study areas for our study. The total population of

Lakhimpur district is 1,040,644 (as per 2011 census) with 2,277 km² areas and total population of Dhemaji district is 686,133 (as per 2011 census) with 3,237 km² areas. Common communities of both districts are Ahom, Miching, Bodo, Kachari, Brahmin, Muslim, Rabha, Bengali, Kalita, Kayastha etc. as well as both districts are the flood affecting districts of Assam and main income source of both districts are cultivation. People of both districts are lives with domestic animals in their daily life. Some of the people of both districts use rivers for drinking source, bathing, washing cloth, cleaning of kitchen pots, and sometimes for bathing of domestic animals too. When the people take their animals within the river, this increases the risks of contamination of water. The rivers of the districts are *Bramhaputra, Subansiri, Ronganodi, Dikrong, Jiadhal, Dimow, Moridhal, Gainadi, Korha, Nonoi, Charikaria, Samparasuti* etc. Because of these mentioned above districts were selected for our study.

2. METHODOLOGY

After getting the approval of work from ethical board the works were started in the laboratory. The details of the works were informed to the patients or the attendance of the patients and requested for consent. Blood samples were collected in plain vials (after consent and labeling) from the acute febrile cases reported to the district hospitals of Lakhimpur and Dhemaji. Both indoor and outdoor patients reported to the hospital were included in our study. The labeled samples were allowed to clot for 15-20 minutes and then centrifuged for serum separation. Separated serum (in another screw cap tubes) were labeled and tested for typhoid, JE, malaria and dengue and negative samples were selected for the *Leptospira* IgM Microwell serum ELISA tests and stored at - 20°C.

Scimedx Leptospira IgM Microwell serum ELISA kits (USA) were used for the study. The kits contained test strips, enzyme conjugate, positive control, negative control, chromogen, RF absorbent, wash concentrate, dilute buffer and stop solution. The positive agreement of the kit was 100% and negative agreement of the kit was 89.7% as per the manufacturer (Scimedx Leptospira, USA). The microwells were coated with purified *Leptospira patoc 1* antigen, and during the addition of serum or during the time of incubation antigen-antibody binds. Unbound were removed by washing with the help of washing machine (Robonik, Navi Mumbai, India). Binding of antigen-antibody were again bind by enzyme conjugate. These binds turned clear to blue after adding chromogen. Stop solution changes the blue colour to bright yellow [Fig. 1]. The end colours were readed with ELISA reader (Robonik, Navi Mumbai, India) against 450 nm.

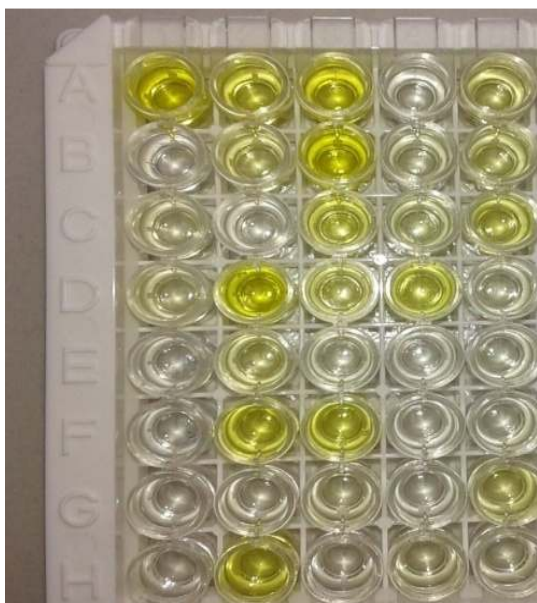


Fig. 1. Visual ELISA results

3. RESULTS AND DISCUSSION

The test results showed that out of 750 numbers serum samples 16 samples were positive for leptospirosis by visually as well as ELISA reader which is 2.13 in percentage. From these, 16 numbers of positive patients 12.5% (2/16) positive patients were from Dhemaji district and others were from Lakhimpur. This proves the prevalence of leptospirosis in the study districts i.e. Lakhimpur and Dhemaji. Again, clinical diagnosis of patients showed fever 100%

(16/16), headache 68.75% (11/16), myalgia 50% (8/16), conjunctival suffusion 6.25% (1/16), jaundice 12.5% (2/16), cardiac arrhythmia 12.5% (2/16), skin rash 6.25% (1/16), haemorrhage 6.25% (1/16), unconsciousness/semiconsciousness 12.5% (2/16), nausea/vomiting 6.25% (1/16), and abdominal pain 6.25% (1/16) in the positive patients (Table 1). During comparison with some other studies the clinical findings were found different [1,5,11]. In a ten year study from New Delhi by Chaudhry R et al. [12] reported clinical symptoms were behavioural changes in 29.8%, arthralgia in 27.5%, nuchal rigidity in 11.5%, sore throat in 17.2% and renal failure in 54% in addition with other symptoms which were not found by us [12]. This proves the difficulty to diagnose the disease clinically. As this disease is a treatable disease and untreated leads the mortality rate, the diagnosis of disease is very important in the area. In our study it was observed that 50% (8/16) patients were either cultivator or daily worker, who had directly relation with paddy field or domestic animals. In a study from west bengal by Jayashree Konar et al. [13] in 2013 also found maximum positive patients (58.33%) as farmer by profession who had directly relation with paddy field or domestic animals. The same information also provided by some other authors during their study [14]. These indicate that farmers are the high risk group for this disease. Other distributions in our study showed three of the patients (18.75%) were house wife and having history of touch with domestic animals. Five of the patients (31.25%) were either service holder, student or unemployed and also having history of either touch with domestic animals or bathing in river. All the patients had history of walking barefoot. Walking barefoot may also the cause of the infection in prevailing area which was suspected in different studies [8,9,10]. In 2011, one study from northern India showed 26.5% positivity of housewives [15]. Generally housewives have the history of come in touch with domestic animals which was observed in our study. All the positive patients age ranges were from 15-60 years, which was found in some different study too [16]. Awareness about the disease transmission could minimize the disease risk as it was found that patients were unaware about the disease. Due to limitation of the facility available in the district laboratory further study is required in higher/developed microbiology laboratory. Because it was proved by some studies that the trends may increase time to time [17].

Table 1. Symptoms reported by the positive patients

Clinical findings	Patients reported (in %)
Fever	100
Headache	68.75
Myalgia	50
Conjunctival suffusion	6.25
Jaundice	12.5
Cardiac arrhythmia	12.5
Skin rash	6.25
Haemorrhages (from the intestine / lungs etc.)	6.25
Unconsciousness/ Semiconsciousness	12.5
Nausea/ vomiting	6.25
Abdominal pain	6.25

4. CONCLUSION

As the disease showed prevalence, treating physician must advice for the leptospirosis test to avoid missed diagnosis for treatment of the acute febrile cases in addition with other tests if the patient has history of exposure. Veterinary department may also play an important role to control the disease or minimize the transmission by vaccination of animals, because the residents of Assam have direct socioeconomic, cultural and other relation with animals. Further study is requiring controlling or minimizing the disease. Government may introduce the diagnostic facility at each laboratory of district hospital. Our study recommends for surveillance system of leptospirosis which must include both government and private health institution to gather all the cases. Another recommendation is for the test (leptospirosis) of all the acute febrile patients or fever with more than seven days (IgM ELISA) if having history. Government must take initiative to control the disease as in near future the incidence rate may increase.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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