



Seroprevalence and Socio-demographic Risk Factors of Leptospirosis in Aligarh Region of North India

Nadeem Ahmad ^{a*}, Kirti Nirmal ^a and Indu Shukla ^b

^a Department of Microbiology, University College of Medical Sciences and Guru Tag Bahadur Hospital, Dilshad Garden, Delhi, 110095, India.

^b Department of Microbiology, Jawahar Lal Nehru Medical College, Aligarh Muslim University, Aligarh, India.

Authors' contributions

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

Article Information

DOI: 10.9734/IJTDH/2021/v42i2430573

Open Peer Review History:

This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: <https://www.sdiarticle5.com/review-history/83112>

Original Research Article

Received 25 October 2021
Accepted 27 December 2021
Published 28 December 2021

ABSTRACT

Background: Leptospirosis, a zoonosis, is a worldwide public health problem. The incidences ranges from 0.1–10 per 100 000 per year globally and may reach over 50 per 100 000 during outbreaks. It's reported in a number of countries of the South-East Asia Region from time to time. The magnitude of the leptospirosis problem differs from country to country and depends on awareness and attitude of public health care decision makers

Materials and Methods: A prospective study was carried out to study the seroprevalence, various demographical and socioeconomic factors associated with leptospirosis in Aligarh region during January 2013 to May 2014. Blood samples collected from 171 suspected cases of leptospirosis were subjected to IgM ELISA as per manufacturer's instructions.

Statistical Analysis: The Socioeconomic status was determined by Kuppuswamy scale on the basis of education, occupation and per capita income and classified as lower (score below 10), middle (score between 11-25), upper (score >25).

Results: The study consisted of 171 suspected patients of leptospirosis, 14% (24 cases) were positive by ELISA. In case of 24 positive cases, 20 cases (p value 0.0125) had history of contact with wet & dirty environment.

*Corresponding author: Email: nadeemahmad411@gmail.com;

Conclusion: The study highlights the disease burden in different age groups, gender, socioeconomic strata and in varied geographical locations.

Keywords: leptospirosis; PanBiogM ELISA; kuppuswamy index.

1. INTRODUCTION

Leptospirosis is a worldwide public health problem. It is a potentially serious but treatable disease. Symptoms of leptospirosis may mimic those of unrelated infections such as influenza, meningitis, hepatitis, dengue, malaria or viral hemorrhagic fever. It is important to distinguish leptospirosis in patient acquiring infection in countries where these diseases are endemic since it can cause large outbreaks if the diagnosis is initially overlooked. Leptospirosis is a worldwide zoonosis. The icteric form of leptospirosis characterized by renal failure, splenomegaly and jaundice was first reported over 100 years ago by Adolf Weil in Heidelberg. It is commonly referred as Weil's syndrome [1]. According to the occupational groups involved and the nature of the disease presentations, different names have been used, e.g. seven-day fever found commonly in Japan, Cane cutter's disease in Australia, Rice field leptospirosis in Indonesia and Fort Bragg fever, which appeared as an outbreak in the US.

Leptospirosis is reported in a number of countries of the South-East Asia Region from time to time. The magnitude of the leptospirosis problem differs from country to country and depends on awareness and attitude of public health care decision makers. Most human cases have been reported from India, Indonesia, Thailand and Sri Lanka during the rainy season. Major outbreaks in South-East Asia were reported in the past in Jakarta (2003), Mumbai (2005) and Sri Lanka (2008). Seasonal outbreaks are reported in northern Thailand and in Gujarat, India following heavy rainfall and flooding. According to currently available reports, incidences range from g.

Leptospirosis has been recognized as one of the foremost causes of acute febrile illness in southern, central, eastern and western India where heavy monsoon, animal rearing practices, unplanned urbanization and agricultural way of life predisposes to this infection [2]. Several wild and domestic animals may serve as reservoirs for to the *leptospira* species; some of these include rodents, dogs, cattle, pigs and horses. Live stock farming is a major occupational risk factor throughout the world. Also at higher risk of contracting the disease are people who enter

contaminated waters barefooted. Wet environmental conditions like wet surroundings, presence of a stream nearby, use of public bathing facility like ponds plays an important role in disease transmission. The disease is more common in people residing in rat infested houses making them more prone to exposure to rat's urine [2].

Leptospirosis is mostly under reported due to lack of proper diagnostic facilities. Sociodemography plays an important role in leptospirosis and poor sociodemographic factors are one of the risk factor for leptospirosis as outlined in Modified Faine's criteria. The sociodemographic condition has improved in extensive manner from the condition at the time of research.

This study was undertaken with the aim to see the seroprevalence and sociodemographic risk factors associated with leptospirosis at a tertiary care centre of Aligarh, North India.

2. MATERIAL AND METHODS

A cross-sectional, prospective study with 171 clinically suspected cases of leptospiral disease during a period from January 2013 to May 2014 was conducted in the Serology division of Department of Microbiology at Jawaharlal Nehru Medical College and hospital, Aligarh Muslim University, Aligarh, North India.

2.1 Selection of Cases

The patients presenting with acute febrile illness or pyrexia of unknown origin (PUO) and clinical features suggestive of leptospirosis were included in this study. Patients who presented with dengue, malaria, enteric fever or any other known cause of fever, patients positive for HBsAg or Anti HCV antibody, patients with autoimmune hepatitis, alcoholic hepatitis and drug induced hepatitis and with pulmonary disorders were excluded from the study.

2.2 Methodology

Blood was withdrawn by venipuncture technique and the vein from which the blood is to be withdrawn was chosen before the skin is disinfected. If a patient had an existing

Intravenous (IV) line; blood was withdrawn below the existing IV line. 5 to 8 ml of blood was withdrawn aseptically. The blood was allowed to clot and serum was separated by centrifugation, then it was stored in sterile vials at -20° C. The serum sample was tested for Leptospirosis IgM antibody using PanBio IgM ELISA (PanBio Diagnostics, Brisbane, Australia) as per manufacturer's instructions.

2.3 Statistical Analysis

The Socioeconomic status was determined by Kuppaswamy scale on the basis of education, occupation and per capita income and classified as lower (score below 10), middle (score between 11-25), upper (score >25). All the statistical calculations were done using MEDCALC software version 14.12.0 (Med Calc Software bvba, Med Calc Ostend, Belgium). P value less than 0.05 were taken as statistically significant from.

3. RESULTS

Out of 171 suspected cases of Leptospirosis, 24 (14.03%) were positive by ELISA. Of the 24 positive cases, the most common 19 (79.16%) age group was 21-60 years and the mean age was 33.5 years..

Majority of the suspected cases were males 107 (62.57%) as compared to 64 (37.42%) females. Out of 24 positive cases, 16 (66.67 %) were males and 08 (33.34%) were females (Fig. 1).

Month wise distribution of suspected and positive cases.(Table 1) It can be seen from the table that out of 24 positive cases, 17 (70.83%) were seen between the months of June and September. This period also coincides with the rainfall season in India, an important epidemiological determinant of leptospirosis.

Major epidemiological risk factors noted in 171 suspected cases included animal contact in 136 (79.53%) cases, living in wet & dirty environmental conditions in 101 (59.06%),working barefoot in field in 79 (46.19% cases) (Table 2).

In case of 24 positive cases, 20 cases (significant p value 0.0125) had contact with wet & dirty environment, 19 cases (significant p value 0.0016) had history of animal contact and 11 cases had history of work in field.

In this study, the patients were divided into three socioeconomic groups using Kuppaswamy's socioeconomic status scale- revised according to income parameter for 2014. According to this index out of total 171 patients, 87 (50.87%) belonged to low economic status, 72 (42.10%) cases to mid economic status and 12 (7.01%) to high socioeconomic status. (Table 3) Out of total 24 positive cases, 17 (70.83%) (Significant p value 0.0468) cases were in low socioeconomic strata and 7(29.16%) (p value 0.187) belonged to mid socioeconomic group. However, there was no positive case in high socioeconomic group.

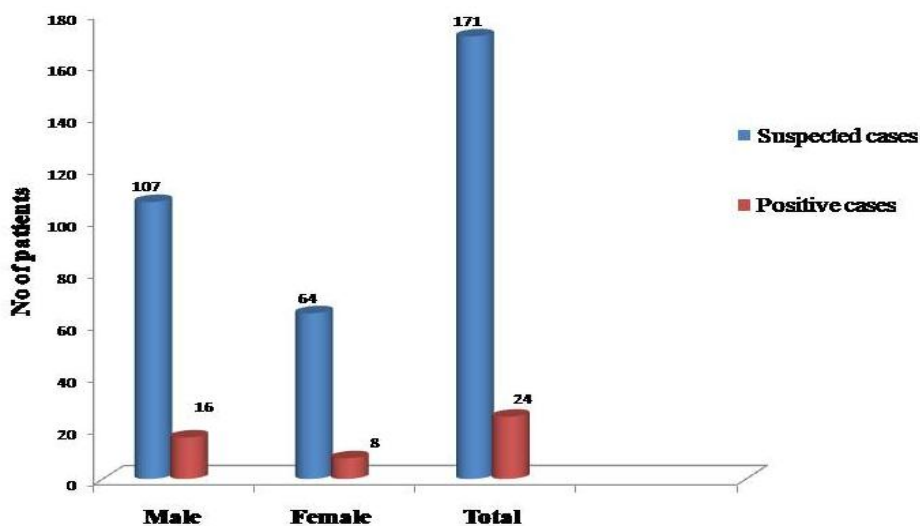


Fig. 1. Gender wise distribution of leptospirosis cases in the study group (N=171)

Table 1. Month wise distribution of Leptospirosis cases (N=171)

Month	Number of Suspected cases (N=171)	Number of positive cases (N=24)
January	08	02
February	09	01
March	11	00
April	10	02
May	20	01
June	22	02
July	20	04
August	21	08
September	19	03
October	15	01
November	09	00
December	08	00
Total	171	24

Table 2. Epidemiological risk factors found in Leptospirosis cases in the study group (N=171)

S. no	Risk factor	Suspected cases (N=171)	Positive cases (N=24)
1.	Wet & dirty surroundings Streams nearby Entered water logged area barefoot	101	20
2.	Works in fields & barefooted	79	11
3.	Animal contact (Total)	136	19
	• Cattle	39	06
	• Sheep	29	03
	• Dogs	41	03
	• Goat	10	02
	• Rodent	17	05

Table 3. Socioeconomic status of Leptospirosis suspected and positive cases in the study group. (N=171)

Socioeconomic Status	Score	Number of suspected cases (N=171)	Number of positive cases (N=24)
Low	<10	87	17
Mid	11-25	72	07
High	>25	12	0

4. DISCUSSION

Leptospirosis is an acute bacterial infection caused by spirochetes belonging to the genus *Leptospira*. It has wide geographical distribution and occurs in tropical, subtropical and temperate zones and has the dubious distinction of being both an occupational hazard and an anthroozoonosis. Out of 171 patients tested for leptospirosis by IgM ELISA, 24 (14.03 %) were reactive and 147 (85.96 %) were non reactive. In our study we found the association between leptospirosis and age of occurrence of disease. In case of positive cases,

the mean age was 33.5 years. The age group 21-60 years comprises of 19 (79.16%) out of 24 positive cases. This data support the hypothesis that continuous exposure throughout life may result in an age dependent increase in Leptospiral seropositivity. Similar results were seen in study done by Klement-Frutos et al. [3] where most affected population subgroup was the males aged 10–39 years with a mean annual incidence above 50/100,000 population. In a study done by Thipmontree et al. [4] the median age was 41 (range 18 to 75 years).

In our study, the prevalence of leptospirosis was more in males (66.67%) as compared to females (33.33%). This is mainly due to the outdoor occupation of males making them more prone to risk factors like contaminated environment, animal contact etc. This finding correlates with a study by Udomask Narkkul et al. [5] in which 82.0% cases were males and 18 per cent were females. Similar results were seen in study done by Edmond Puca et al. [6]. In this study, out of 24 positive cases, in 17 association with heavy rainfall (between the period of June to September) was seen with p value > 0.05 but it was not found to be statistically significant. Our study revealed a seasonal peak in leptospirosis from June to September during rainy seasons in warm-climate regions, where rapid desiccation would otherwise prevent survival of *leptospira*. Our findings are well supported in a study done by Premdas AK et al and Schneider et al. [7,8] in which leptospirosis shows a seasonal trend with more cases in June to October and correlates with change in meteorological factors of the region.

In this study, out of 24 positive cases, 20 (83.84%) (Significant p value 0.0125) had history of contact with contaminated environment and 19 (79.16%) (Significant p value 0.0016) had history of animal contact namely contact with rat, cattle, sheep, dog, and goat. There are various studies documenting the presence of the presenting of leptospirosis microorganism in the renal tubules of cattle, sheep, goat and rat etc. However, no such study has been conducted in the particular geographical region.

Contact with farming animals, rodents (some of them could be Leptospiral carriers) and contaminated wet humid environmental conditions for leptospira survival, thus forming the core determinants of *leptospira* transmission. The results of our study correlates with a study done by Eithne Leahy et al. [9] who reported similar findings in their cross sectional survey from North Eastern India. In our study the 171 suspected patients of leptospirosis were categorized into low 87 (50.87%), mid 72 (42.10%) and high 12 (7.01%) group on the basis of socioeconomic status using Kuppaswamy Index (Gururaj, Maheshwaran 2014) [10].

We found that out of total 24 positive cases, 17 (70.83%) (Significant P value 0.0468) cases were from low socioeconomic strata and 7 (29.16%) (P value 0.187) belonged to mid socioeconomic group. However, no positive case

of leptospirosis was seen in high socioeconomic group. Majority of peoples with low socioeconomic status were field labours working in fields, and having frequent exposure with domestic animals. The findings of our study correlates with the study done by S K Aggarwal et al. [11] in which during a period of 2014-2018 they observed a decreasing trend in leptospirosis and attributed it to improvement in socioeconomic status of people. Study done by B. Garba et al. [12] shows occupation as one of the key determinant of leptospirosis.

5. CONCLUSIONS

Our study will help in understanding the various epidemiological and demographical factors associated with leptospirosis. The study highlights the disease burden in different age groups, gender, socioeconomic strata and in varied geographical locations. This will in turn be very helpful in planning and improving the public health facilities to tackle the disease.

ETHICAL APPROVAL

The present study has been approved from Institutional Ethic Committee.

CONSENT

As per international standard or university standard, patients' written consent has been collected and preserved by the author(s).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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