Original Research Article

Seroprevalence and socio-demographic risk factors of Leptospirosis in Aligarh region of North India.

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

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

Keywords: Leptospirosis, PanBio IgM ELISA, Kuppuswamy Index

Manuscript

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. 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 approximately 0.1–10 per 100 000 per year globally. During outbreaks and in high-exposure risk groups, disease incidence may reach over 50 per 100 000.[1]

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]

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.

Material & 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.

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.

Methodology Blood was withdrawn by venepuncture 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 with wearing gloves. 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.

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). All the statistical calculations were done using MEDCALC software version 14.12.0 (Med Calc Software bvba, MedCalc Ostend, Belgium). P-value less than 0.05 were taken as statistically significant using Fischer 2X2 contingency table.

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. (Table 1)

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. (Figure 1)

Table 2 shows month wise distribution of suspected and positive cases. 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 3).

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 on the basis of socioeconomic groups using Kuppuswamy's Socio-economic 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 4)

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.

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 anthropozoonosis. Out of 171 patients tested for Leptospirosis by IgM ELISA, 24 (14.03 %) were reactive and 147 (85.96 %) were non reactive. Age is an important factor in Leptospirosis. 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.,* where most affected population subgroup was the males aged 10–39 years with a mean annual incidence above 50/100,000 population.[3] In a study done by Thipmontree *et al.*, the median age was 41 (range 18 to 75 years).[4]

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.,* in which 82.0% cases were males and 18 per cent were females.[5] 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.,* in which Leptospirosis shows a seasonal trend with more cases in June to October and correlates with change in meteorological factors of the region.[7] Schneider *et al.,* also reported similar findings.[8]

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, goat. 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* who reported similar findings in their cross sectional survey from North Eastern India.[9] 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 Kuppuswamy 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. Thus, our study showed that people from low and mid socioeconomic strata are more prone to Leptospirosis as compared to people from high socioeconomic group. The findings of our study correlates with the study done by S K Agrawal et al 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.[11] Study done by B. Garba et al shows occupation as one of the key determinant of leptospirosis.[12]

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.

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Table 1 Age wise distribution of Leptospirosis cases in the study group (N=171).

Age Group (in years)	Number of suspected patients	Number of Positive patients
0-10	08	0
11-20	44	3
21-30	41	5

31-40	27	8
41-50	17	3
51-60	14	3
61-70	16	2
71-80	04	0
Total	**171**	**24**

Table 2 Month wise distribution of Leptospirosis cases.

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

Risk factor	**Suspected Cases (N=171)**	**Positive Cases (N=24)**

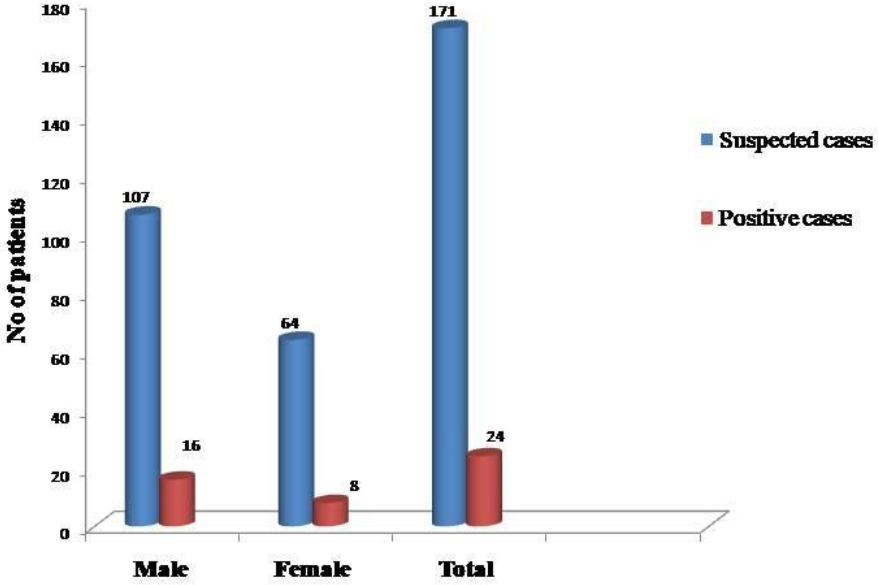
-Wet & dirty surroundings -Streams nearby -Entered water logged area barefoot	101	20
-Works in fields & barefooted	79	11
Animal contact (Total) - Cattle - Sheep - Dogs - Goat - Rodent	136 - 39 - 29 - 41 - 10 - 17	19 - 06 - 03 -03 -02 -05

Table 4 : Socioeconomic status of Leptospirosis suspected and positive cases in the study group.

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

Legends of figures

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


180
160
140
120
100
80
60
40
20
0
No of patients
107
16
64
8
171
24
Male
Female
Total
Suspected cases
Positive cases