



# Epidemiological Trends of Leptospirosis in Madhya Pradesh: A Retrospective Study

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## ABSTRACT

### Introduction

Leptospirosis is an infection caused by the bacterium *Leptospira*, which has a corkscrew structure. It is a bacterial illness that causes high fever, chills, muscle pains, vomiting, jaundice, red eyes, abdominal discomfort, diarrhoea, and rash, among other things. Symptoms can range from minor to severe, including headaches, muscular discomfort, and fever, as well as pleural haemorrhage and meningitis. If it also causes bleeding into the lungs, then it is known as severe pulmonary haemorrhage syndrome. It is transmitted by both wild and domestic animals. Rodents are the most prevalent animal carriers of the illness. Animal urine or infected water or dirt that comes into touch with a break in the skin, eyes, mouth, or nose is commonly the route of transmission. The aim of this study is to find out the trend of leptospirosis cases from 2018 to 2020 in various divisions of Madhya Pradesh and to find out the cross-correlation of the number of cases of leptospirosis with seasonal variation in the region.

### Methods

It is a retrospective cross-sectional study conducted among all lab-confirmed IgM ELISA patients positive for Leptospirosis in Madhya Pradesh. Data was collected from the Integrated Disease Surveillance Program (IDSP) database on zoonotic diseases.

### Result

The positive cases of leptospirosis of 40 % male & 60 % female in 2018 and 60 % male, 40 % female cases were reported in 2019. Whereas, 46% male, 54% female cases were reported in the year 2020. Cumulatively, there was predominance of male cases, 30 (51.73%) over female cases, 28 (48.27%).

### Conclusion

The authors suggest that disease trends be used extensively not only for leptospirosis but also for other communicable diseases, at both state and national levels to improve the health system's ability to handle epidemics in the future

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## INTRODUCTION

Leptospirosis is an infection caused by the bacterium *Leptospira*, which has a corkscrew structure. It is a bacterial illness that causes high fever, chills, muscle pains, vomiting, jaundice, red eyes, abdominal discomfort, diarrhoea, and rash, among other things. Symptoms can range from minor to severe, including headaches, muscular discomfort, and fever, as well as pleural haemorrhage and meningitis. [1] Weil's disease is a more severe version of the illness with extensive liver and kidney damage. If it also causes bleeding into the lungs, then it is known as severe pulmonary haemorrhage syndrome. It is transmitted by both wild and domestic animals. Rodents are the most prevalent animal carriers of the illness. Animal urine or infected water or dirt that comes into touch with a break in the skin, eyes, mouth, or nose is commonly the route of transmission. [2] It is especially prevalent in southern, central, eastern, and western India, where heavy monsoons, animal husbandry practices, unplanned urbanization, and a pastoral way of life predispose to the infection. Leptospirosis has long been recognized as one of the leading causes of acute febrile illness in these parts of the country. Due to a lack of knowledge of the disease and a lack of suitable laboratory diagnostic capabilities in most regions of the nation, leptospirosis has been under-reported and under-diagnosed in India. When clinical knowledge and awareness are combined with confirmatory laboratory support, patients with leptospirosis are far more likely to be identified. Leptospirosis can manifest itself in a variety of ways, ranging from a simple disease to a life-threatening condition. [3]

In locations, where poor agriculture and waste disposal methods lead to contact with *Leptospira*-contaminated environments, leptospirosis is a public health hazard. Because of the similarities in clinical appearance, it is commonly misdiagnosed and underreported as a dengue epidemic [4]. The existence of carrier animals, environmental conditions, and the interplay between man, carrier, and the environment are the main determinants of the disease. In most countries, leptospirosis has a seasonal pattern, and climatic conditions play an essential role in its etiology. Temperature, humidity, and rainfall are the most important environmental elements linked to leptospirosis in the region. [5] Understanding the sort of relationship between these

elements and leptospirosis can help communities control the leptospirosis threat. If we can forecast the incidence of cases early enough, it will be much easier for health officials to take the necessary steps to manage and avoid future outbreaks. [6] The current study intends to find out the trend of leptospirosis cases from 2018 to 2020 in various divisions of Madhya Pradesh and to find out the cross-correlation of the number of cases of leptospirosis with seasonal variation in the region.

### Leptospirosis Case Definition

A confirmed case of leptospirosis was defined as a suspected case with a positive RT-PCR assay for pathogenic *Leptospira* spp. in blood and/or a positive MAT, a minimum 4 weeks after the onset of symptoms. A positive MAT was defined as one that displayed an infective serogroup with a 4-fold seroconversion in paired sera or acute sera with a serogroup displaying a minimum titre of 1:400. The presumptive infective serogroup in sera that had co-agglutinating titres were the serogroup displaying two titre orders more than the rest of infecting serogroups. [7] The aim of this study is to find out the trend of leptospirosis cases from 2018 to 2020 in various divisions of Madhya Pradesh and to find out the cross-correlation of the number of cases of leptospirosis with seasonal variation in the region

### Methodology

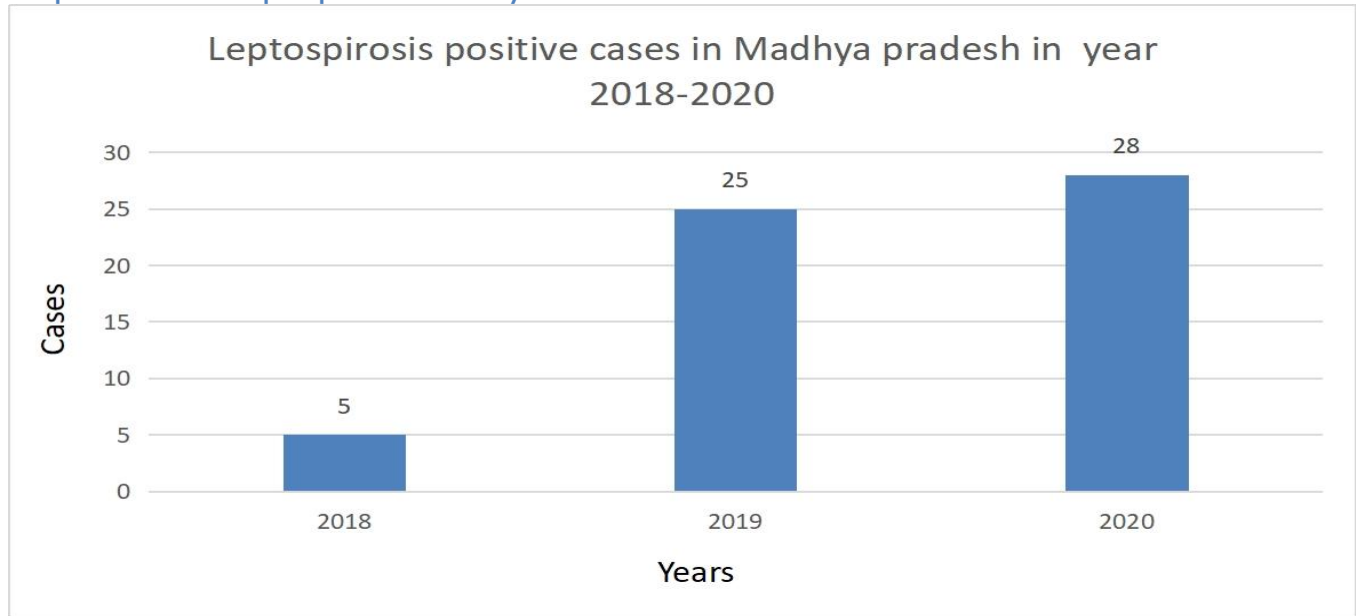
It is a retrospective observational study conducted among all lab-confirmed IgM ELISA patients positive for Leptospirosis in Madhya Pradesh. Data was collected from the Integrated Disease Surveillance Program (IDSP) database on zoonotic diseases. At first, the data were arranged year-wise to reflect the yearly incidence of Scrub Typhus cases in the state from 2018 to 2020. This data was analysed to draw out trends of disease occurrence in the state. The data was then broken down into the number of cases reported from each division throughout different months of the year, allowing for geographical and seasonal fluctuations. Research was approved by the Director from Directorate Health Services and Deputy Director Integrated Disease Surveillance Program (IDSP), Bhopal (M.P) after due submission of proposal.

## Results

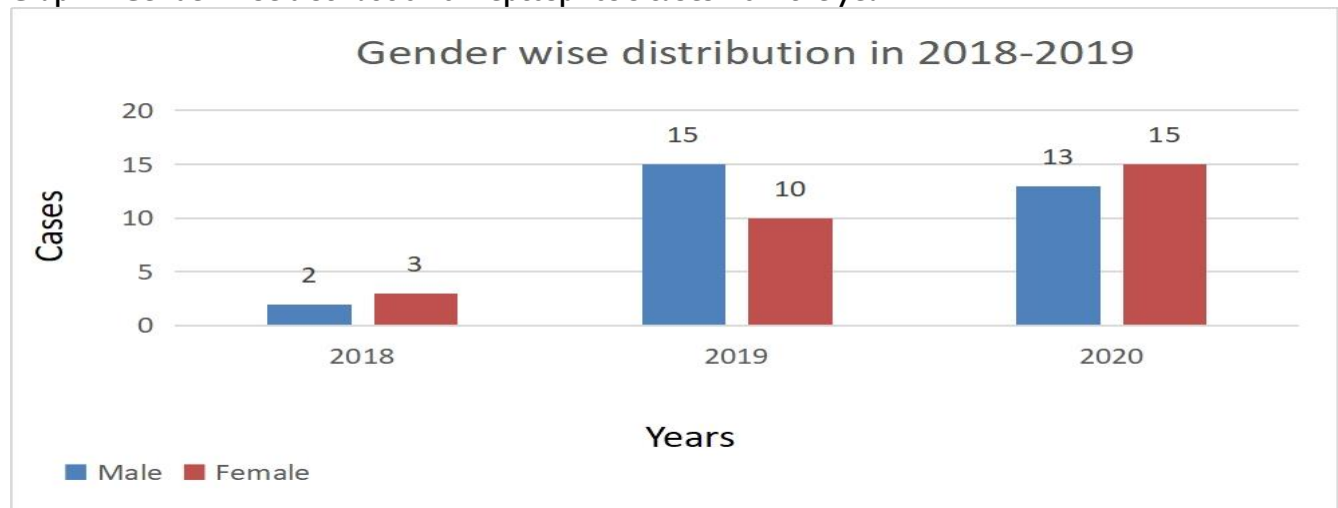
Total number of leptospirosis cases reported in Madhya Pradesh state from 2018 to June 2020 was 58. A maximum number of cases was reported in the year 2020 (28 cases) followed by 2019 (25 cases). The

least number of cases were reported in 2018 (5 cases). Graph 1 depicts the year wise distribution of scrub typhus cases with majority of cases being reported in the year 2019.

**Graph 1: Cases of Leptospirosis in Madhya Pradesh**



**Graph 2: Gender-wise distribution of Leptospirosis cases from the year 2018-2020**



## Gender distribution

The positive cases of leptospirosis of 40 % male & 60 % female in 2018 and 60 % male, 40 % female cases were reported in 2019. Whereas, 46% male, 54%

female cases were reported in the year 2020. Cumulatively, there was predominance of male cases, 30 (51.73%) over female cases, 28 (48.27%).

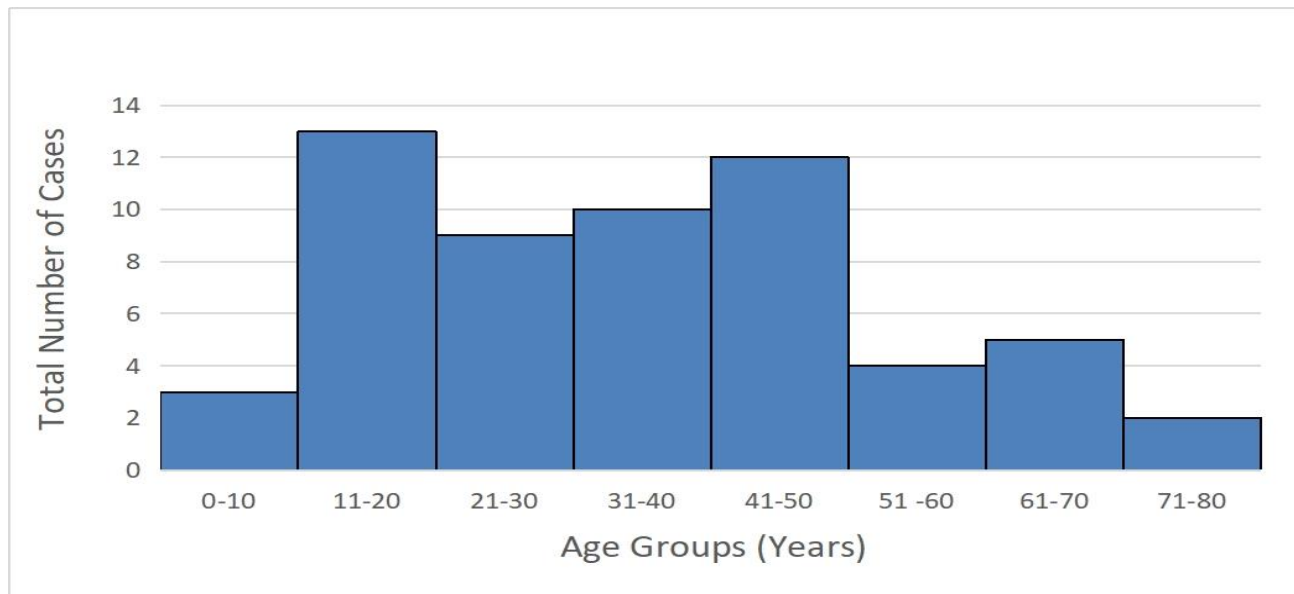
### Distribution of Age group

Table 1: Distribution of age groups throughout 2018-2020

Age Group	2018	2019	2020
0-10 year	0	1	2
11-20 year	2	6	5
21-30 year	1	6	2
31-40 year	1	4	5
41-50 year	1	3	8
51-60 year	0	1	3
61-70 year	0	1	1
71-80 year	0	0	2

Based on data, a total of 13 cases were reported in the age group of 11-20 years during the year 2018-2020.

Graph 3: Histogram depicting number of cases for age groups



### Division wise Leptospirosis cases in the year 2018-2020

Leptospirosis cases were reported from 01 district (Sagar-5) in Sagar Division in the year 2018. Subsequently, three districts (Anuppur-1, Shahdol-2, Satna-6) from Rewa division, 6 districts (Chhindwara-1, Dindori-1, Jabalpur-4, Katni-1, Narsinghpur-4, Seoni-1) from Jabalpur division and 2 districts (Damoh-3, Panna-1) from Sagar division reported

cases in the year 2019. Four districts (Shahdol-1, Satna-3, Umariya-1, Singrauli-1) from the Rewa division, three districts (Katni-9, Jabalpur-8, Narsinghpur-1, Seoni-2) from Jabalpur division, and two districts (Damoh-1, Panna-1) from Sagar division reported cases of leptospirosis in the year 2020.

**Fig 1: District wise distribution of cases of leptospirosis**

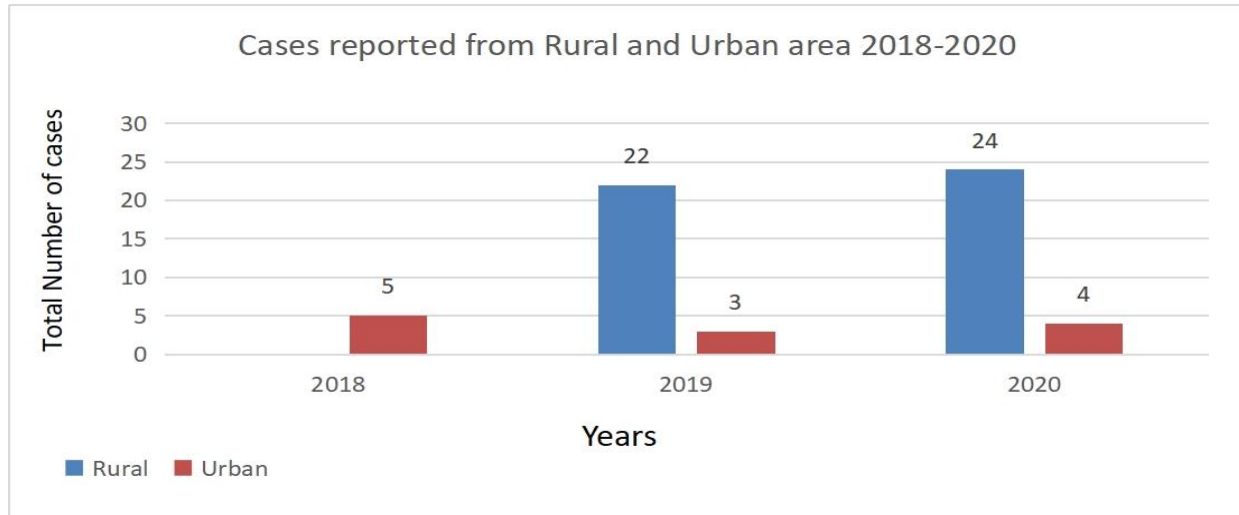


### Status of Rural and Urban area

Based on the available data, 100% cases were reported from urban areas in the year 2018. Further, 88% of total cases were reported from rural and 12%

from urban area in 2019 while 86% & 14% from rural and urban areas respectively in 2020.

Graph 4: Urban-Rural distribution of cases from 2018-2020

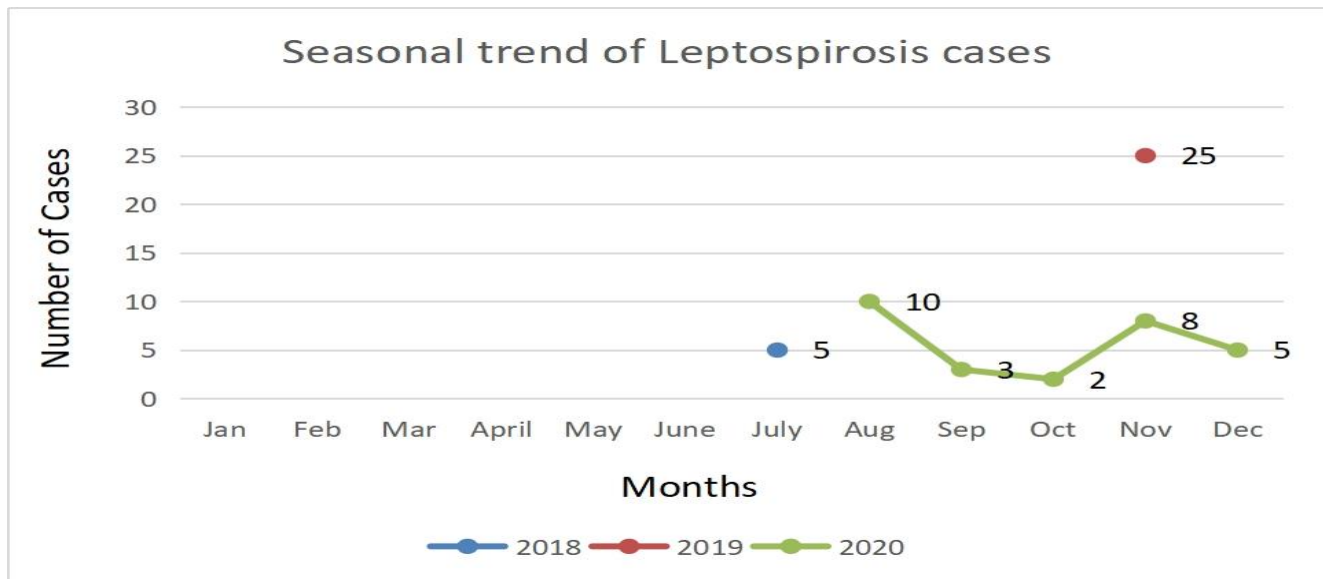


### Seasonal trend

When comparing monthly data of leptospirosis cases, from 2018-2020, it clearly showed that the number of cases starts to increase every year from the month of July, reaches its peak during the months of August to

November, and subsequently comes down to basal levels by the month of January. Every year, this duration, coincides with the states rainy and winter seasons.

Graph 5: Seasonal Trend of Leptospirosis during 2018-2020



## DISCUSSION

According to the available data from the state's IDSP unit, Directorate Health Services, Madhya Pradesh, for the duration from 2018 to 2020, the state of Madhya Pradesh has recorded a total of 58 cases of leptospirosis, along with the increasing trend from 2018 to 2020. The data revealed that the number of

cases of leptospirosis peaked between July and December. Similarly, this observation is comparable to research undertaken in North India by Sethi et al., which found an increase in leptospirosis infections from June to October [8] Pawar et al. found that Leptospirosis was most prevalent from July to

November in Ratnagiri, Maharashtra [9]. The seasonality of leptospirosis, particularly between June and November, can be explained by its link with rainfall, floods, and temperature fluctuations. From 2013 to 2018, another study in the Thrissur district found 373 cases of leptospirosis. According to DHS Kerala statistics, the number of incidents increased from 814 in the year 2013 to 2078 in 2018. Monthly data revealed that the number of cases peaked between June and October. [10]

Research conducted in the southern region of India to investigate the shifting patterns of leptospirosis patients found that, persons of all ages were affected, which was a similar finding in our study as well. In our study a total of 13 cases were observed most commonly from the age group of 11-20 years. Contrary to this, a study in South India reported the majority of cases in adulthood due to their work schedule [11]. The predominance of male 30(51.73%) over female 28(48.27%) among leptospirosis cases in our study was observed. Similarly, studies conducted in Ludhiana [12], Thirupathi [13], Mangaluru [14], and Chennai [15], showed men are predominant over women in leptospirosis cases.

Based on our data, all cases were reported from urban areas in the year 2018. 88% rural and 12% urban areas in the year 2019 and 86% rural & 14% cases from

urban areas were reported in 2020. Cumulatively 79.31% of cases were reported from rural areas and 20.68% cases from urban areas. Other studies, found that urban environments are optimal for leptospirosis transmission, impacting low-income communities living near streams and in areas with poor health infrastructure, inadequate sanitation, and rat infestation.[16][17] Rodent management actions, which might involve modifying the environment to minimize rodent populations, are one of the preventive methods against leptospirosis, especially in urban environments.[18] Agriculture and livestock rearing have long been known to be risk factors for leptospirosis and have been recognized as the most common source of infection in rural regions. The goal of disease prevention and control in both urban and rural regions should be to reduce the risk of disease transmission. [19]

## CONCLUSION

Leptospirosis is a major public health issue that mostly affects people in their working years. The endemic character of the illness in the research context is reflected in the high proportion of cases. The authors suggest that disease trends be used extensively not only for leptospirosis but also for other communicable diseases, at both state and national levels to improve the health system's ability to handle epidemics in the future.

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