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ORIGINAL RESEARCH

Prevalence of Dengue and Leptospirosis coinfection at a tertiary care hospital in Tirupati

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ABSTRACT

Introduction: Dengue is a mosquito transmitted arboviral infection and leading cause of arthropod borne viral disease in the world. Leptospirosis is a zoonotic disease distributed worldwide affecting almost 160 mammalian species. The similarity in their clinical presentation, may result in the possibility of coinfection going undetected. **Aim:** To determine the prevalence of dengue and leptospirosis coinfection at a tertiary care hospital. **Materials and Methods:** Serum samples were received from the clinically suspected cases of dengue fever for a period of 4 months. These samples were tested Dengue Immunoglobulin M (Ig M) antibodies using National Institute of Virology (NIV) IgM ELISA Kit and Dengue positive samples were further tested by Leptospira Ig M ELISA kit (RecombiLISA). Results were interpreted according to the manufacturer instructions. **Results:** Among 749 samples, 79 (10.54%) samples were positive for dengue IgM antibody. Among these dengue positive cases 3 (3.8%) were positive for leptospirosis and dengue co infection. Among which 2 (66.6%) were males and 1 (33.3%) was female. The common age group of people affected with coinfection belongs to 20-30 years. **Conclusion:** This study emphasizes the possibility of coinfection of leptospirosis and dengue in fever cases. Therefore, high index of clinical suspicion is required so as to constitute appropriate therapy to reduce the mortality and morbidity rate.

Key words: Dengue, Leptospirosis, Coinfection, ELISA.

INTRODUCTION

Dengue is a mosquito transmitted arboviral infection and the leading cause of arthropod borne viral disease in the world, caused by one of the four serological related viruses DENV-1, DENV-2, DENV-3 and DENV-4[(1)]. Dengue is the 10th leading cause of death and there are approximately 80-100 million new cases annually worldwide. About 40% of the world's population lives in area at risk for dengue[(2)].

Leptospirosis is a zoonotic disease distributed worldwide affecting almost 160 mammalian species[(3)]. The annual incidence of leptospirosis found to be ranging from 0.1 to 1.0 per 1,00,000 to 10-100 per 1,00,000 in the humid tropics and incidences greater 10-1,00,0000 are encountered during outbreaks[(4)].

Dengue and Leptospirosis are significant global infectious diseases that commonly present as undifferentiated febrile illnesses, particularly prevalent in tropical and subtropical regions [(5).] The extensive overlap in symptoms between these two diseases poses a considerable challenge for healthcare providers when diagnosing co-infections [(6).] Clinical manifestations can range from mild, self-limiting fevers to severe and potentially fatal conditions marked by jaundice, renal failure, thrombocytopenia, and haemorrhage [(7).] The emergence of dual infections further complicates treatment strategies and patient outcomes. Research indicates that in endemic areas, Leptospirosis is frequently misdiagnosed as Dengue, contributing to its under recognition and potentially delaying appropriate management [(8)]

In recent times, cases of coinfection involving both dengue and leptospirosis have been increasingly documented, with reported frequencies ranging from 0.9% to 8% [(9)]. In India, studies have identified a prevalence of 3.4%, while in South India specifically, it has been reported as 4.1% [(10).] Other countries

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where coinfections of dengue and leptospirosis have been observed include Sri Lanka, Thailand, Brazil, Jamaica, and Mexico, with prevalence rates of 1.7%, 19%, 1%, 5%, and 12% respectively. These findings underscore the global nature of these co infections and highlight the importance of recognizing and managing such complex cases in clinical practice[11].

This present study was conducted to determine the prevalence of coinfection of dengue and leptospirosis in a tertiary care hospital, South India.

Aim of the study: To estimate the prevalence of Dengue and Leptospirosis coinfection in a tertiary care hospital

Objectives of the study: To estimate the prevalence of Dengue and Leptospirosis coinfection and to determine the age and gender predisposition in dengue and leptospirosis coinfection.

MATERIALS AND METHODS

Study Design: A Cross-sectional, hospital-based study.

Study period: Four months (March 2024 -June 2024) from the date of approval from the Scientific and Institutional ethics committee (Lr.No.09/2024).

Study settings: Department of Microbiology, tertiary care hospital, South India.

Study population: This study encompassing samples from the Department of Microbiology that were positive for dengue.

Inclusion criteria: Serum samples positive for Dengue Ig M by ELISA.

Exclusion criteria: Haemolyzed samples, Inadequate samples and Dengue Ig M negative samples.

Study Methods: The study was conducted from March 2024-June 2024 at tertiary care hospital, by the department of Microbiology. Serum samples were collected from clinically suspected cases of dengue after taking written consent. All samples were processed for Dengue Immunoglobulin M (Ig M) antibodies using National Institute of Virology (NIV) IgM ELISA Kit. And dengue positive samples were tested by leptospiraIgM ELISA Kit (Recombi LISA). Results were interpreted according to the manufacturer instructions

Sample size: As per Iranian journal of Microbiology, study done in a tertiary care centre in South India has found the prevalence rate of coinfection of Dengue and Leptospirosis is to be 4.1% the sample size is estimate at 95% confidence interval.

The sample size of the study subjects is calculated using the formula below:

N=Z2x P x(100-P)/L2

Where, N is the sample size

Z=1.96 for 95% confidence interval

L=Absolute precision (10% of prevalence)

L=10 x 4.1/100=0.41.

By substituting the values, we get

$$N = \frac{(\mathbf{1.96})^{\mathbf{2}} \mathbf{x\, 4.1\, x\, (100-4.1)}}{(\mathbf{0.4})^{\mathbf{2}}} = \frac{1510}{(0.4)^2} = 9437.5$$

As the estimated samples that was sent to the department of microbiology is found to be around 20 per month (for 4 months) finite correction applied.

$$N=\frac{SS}{1+\left(\frac{SS-1}{POP}\right)}$$

$$N=\frac{9437}{1+\frac{9437}{80}}=\frac{9437}{119}=79$$

N= 79.

Were,

SS = Sample size

POP = Population.

Ethical Consideration

- Before collection of data, all subjects were briefed about the purpose of the study and informed written consent was obtained.
- Subjects were given the right to withdraw consent at any stage.
- Any investigations done during study were of free of cost.

The study did not cause any financial burden to the patient.

Statistical Analysis

The study data was analysed using IBM SPSS software version 21.0.

RESULTS

This study was conducted for a period of 4 months including a total of 749 dengue suspected cases. Among those 749, 79 (10.54%) samples were positive for dengue IgM by ELISA. Among 3 (3.8%) were positive for leptospirosis Ig M by ELISA. Among 3 cases, 2 (66.6%) were males and 1 (33.3%) was female. The common age group of people affected with coinfection belongs to 20-30 years.

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Figure i: Gender wise distribution for dengue IgM positive cases:

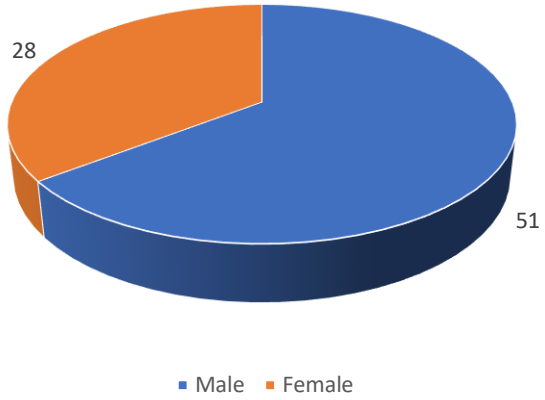

Table i: Age-wise Distribution among dengue IgM positive cases:

S.No	Age Group	Number	Percentage
1.	0-10 years	19	24%
2.	11-20 years	13	16.4%
3.	21-30 years	21	26.5%
4.	31-40 years	11	13.9%
5.	41-50 years	3	3.8%
6.	51-60 years	6	7.6%
7.	61-70 years	6	7.6%

Figure ii: Age wise distribution among dengue IgM positive cases:

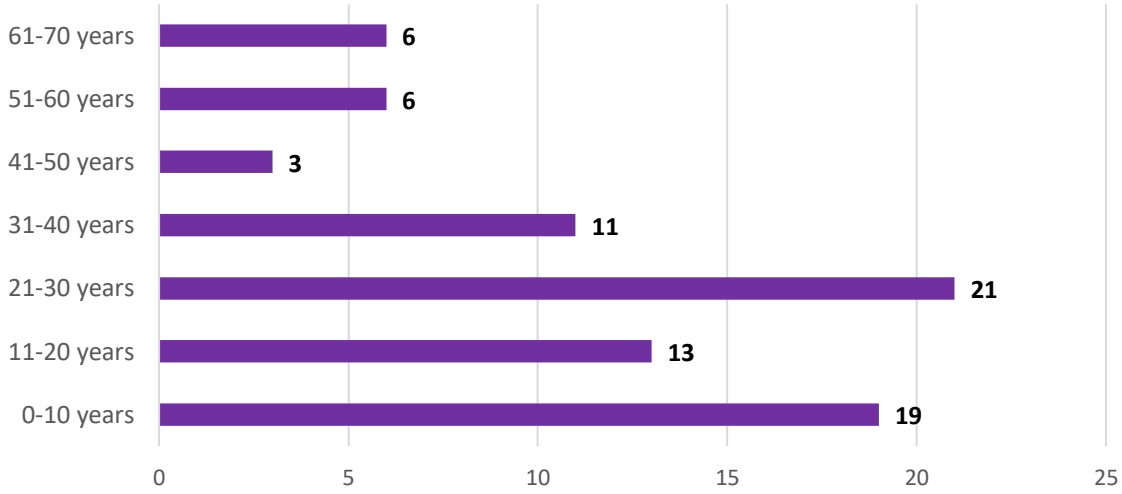

Table ii: Monthly Dengue Ig M positive cases:

S. No	Month	Total cases	Positive cases	Percentage
1.	March	132	15	11.4%
2.	April	146	18	12.3%
3.	May	225	21	9.3%
4.	June	246	25	10.2%
Grand total		**749**	**79**	**10.5%**

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Figure iii: Coinfection of Dengue and leptospirosis with gender distribution:

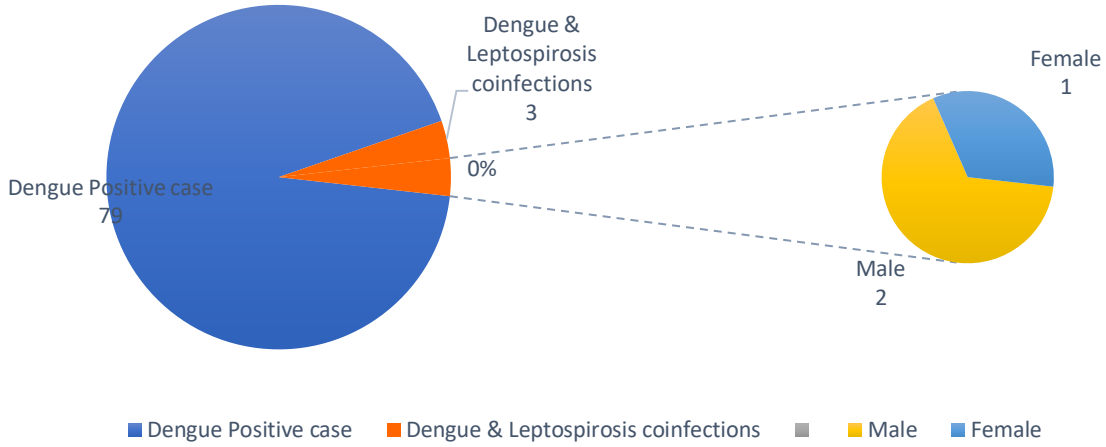

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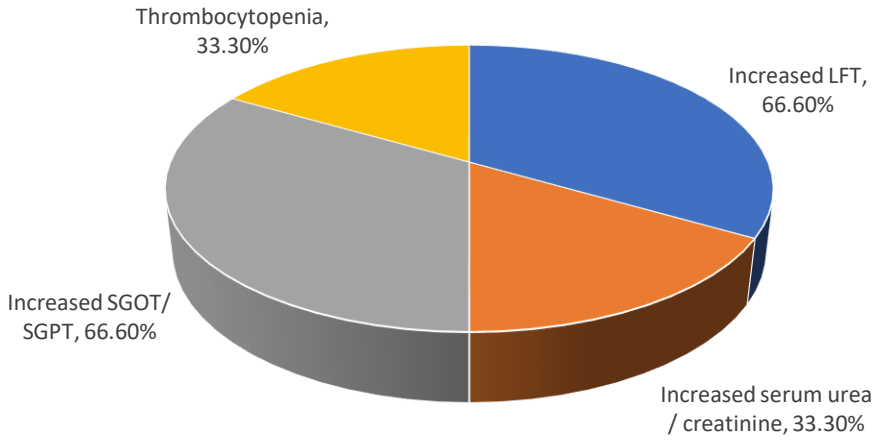
Figure iv: Laboratory values of Co infection cases of Leptospirosis and dengue virus:



According to the current study, both dengue and leptospirosis frequently result in abnormal hepatorenal function. Furthermore, 33.3% of leptospirosis cases have also been linked to thrombocytopenia, the defining feature of dengue infection.

DISCUSSION

Leptospirosis and dengue are two of the numerous infectious diseases that are prevalent throughout the world, particularly in areas that are tropical or subtropical and are also among the numerous medical ailments that cause fever illness that is not distinguishable [12].

In areas with low socioeconomic status, leptospirosis and dengue are more common. Leptospirosis and dengue fever are two diseases that are commonly spread by rats and mosquitoes, respectively [12].

Leptospirosis is differentially diagnosed with dengue, malaria, typhoid fever, viral hepatitis, and HIV seroconversion. In the early stages of the disease, it could be difficult to distinguish between dengue and leptospirosis based solely on clinical criteria. Therefore, leptospirosis and dengue fever are frequently confused by doctors, epidemiologists, and public health officials [12].

Since leptospirosis and dengue fever have many similar clinical symptoms, they are frequently misdiagnosed in areas where both diseases are endemic.

In our investigation, we observed a male predominance of 66.6%, consistent with findings reported by Kumar et al [13], Arun Sachu et al [14], and Sharma et al [12], who reported male prevalences of 70%, 54.5%, and 57.14% respectively. The most frequently affected age group in our study was 20-30 years, mirroring the findings of Md Lasim et al [15], where individuals aged 20-44 years were similarly commonly affected. These parallels underscore the demographic patterns observed across different studies, highlighting the predominance of males and the specific age groups most susceptible to the conditions under investigation.

Based on the latest research, both dengue and leptospirosis commonly lead to abnormalities in liver and kidney function. Additionally, 33.3% of cases of

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leptospirosis have been associated with thrombocytopenia, a hallmark feature of dengue infection. This correlation aligns with findings from Sharma et al [12], who reported thrombocytopenia in 47.6% of leptospirosis cases. These observations underscore the overlapping clinical manifestations between dengue and leptospirosis, emphasizing the complexity in diagnosis and management of these conditions.

In our current investigation, we observed a coinfection rate of dengue and leptospirosis at 3.8% (n=3). This finding is consistent with previous studies by Sharma et al [12] and Arun Sachu et al [14], who reported similar coinfection rates of 3.6% and 3.4% respectively. These studies collectively highlight the occurrence of concurrent dengue and leptospirosis infections, underscoring the need for vigilance in recognizing and managing such dual infections in clinical settings.

The primary sources of organic matter that serve as a conducive breeding environment for rodents and mosquitoes are dead leaves, woody debris, animal leftovers, sewage, etc. Temporary population growth in and around Tirupati due to tourism and rapid urbanization has stretched natural resources and imposed anthropogenic stress, forcing sylvatic mosquitoes like Aedes albopictus to find new breeding habitats close to human habitation and facilitating transmission.

Walking in stagnant water where leptospires are known to proliferate can expose one's legs to the water's surface, so causing leptospirosis. A study conducted at Tirupati in 2015 on willing blood donors tested positive for detecting IgM antibody for leptospirosis, its positive rate was 11.8% as it could be due to occupational activity [12].

Therefore, improved capacity to differentiate dengue from leptospirosis and detect coinfection in endemic populations will undoubtedly direct public health workers and clinicians to start an appropriate antibiotic therapy, thereby lowering the death rate.

Furthermore, when acute fever signs and symptoms are present, physician are advised to utilize diagnostic modalities to identify IgM to dengue and leptospirosis in spite of empirical therapy.

LIMITATIONS

- This study is based on data from a solitary tertiary care facility.
- Only symptomatic patients who came to the hospital for assessment were included in our study. The range of diseases that do not come to the hospital and may have various clinical and laboratory signs cannot have its conclusions applied to it.
- Molecular method like PCR is not done

CONCLUSION

Due to the fact that dengue and leptospirosis are the two major infectious diseases that are common in this region of south India and that also share a similar clinical presentation, clinicians should be highly suspicious of these two infectious diseases in order to recommend and start the appropriate treatment in a timely manner to reduce morbidity and mortality before the disease worsens.

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Conflict of Interest: None.

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