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(CASE REPORT)

Leptospirosis and Scrub Typhus Coinfection of a 50-year-old male: A Case study

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Abstract

The bacterial diseases, leptospirosis and scrub typhus are important causes of acute febrile illness in India and are responsible for high morbidity and mortality. The common epidemiology of the zoonotic diseases creates an opportunity of dual infection. In this study, we describe a medical case of a 50-year-old male who was reported to have high grade fever for 10 days along with chills and coughs and was admitted to the RG Kar Medical College and Hospital on November last year. He was reported to suffer from conjunctival congestion, episode of pr bleeding, bowel and bladder incontinence, abdominal distension and pedal edema. Enzyme linked immunosorbent assay (ELISA) detected IgM antibodies to both leptospirosis and scrub typhus in the serum of the patient indicating dual infection with both bacterial diseases. Timely diagnosis of the patient followed by treatment with the antibiotics and associated medication resulted in complete recovery from both the diseases. As both leptospirosis and scrub typhus present with similar clinical features, co-infection of these two diseases is not uncommon. Cases of dual infections must be therefore considered seriously and choice of therapy should include those drugs that cover for both the infections.

Keywords: Leptospirosis; Scrub typhus; Coinfection; High grade fever; Antibiotics; ELISA

1. Introduction

Leptospirosis is a bacterial zoonotic disease, caused by infection with pathogenic spirochetes of the genus Leptospira. Leptospirosis is recognized as a common cause of febrile illness in tropical environments world-wide [1, 2]. Mammals (wild/domestic) harbour the bacteria and shed these in the urine; they may disseminate the organism to a water source (streams and springs). In India outbreaks have been reported especially after heavy rains [3]. The organism enters the human body through cuts or abrasions on the skin or through intact mucosa of the mouth, nose or conjunctiva. The clinical symptoms of leptospirosis range from fever, chills, nausea, muscle aches to icteric disease such as Weil's syndrome, characterized by renal failure, liver impairments and hemorrhages. As clinical symptoms of the infection resemble those of many other infectious diseases, clinical findings need to be confirmed by laboratory diagnostic techniques.

Scrub Typhus, or tsutsugamushi fever, is a zoonotic disease that is accidentally transmitted to humans. It is frequently found in people with outdoor exposure in tropical and subtropical Asian regions [4]. The causative organism, Orientia tsutsugamushi, belongs to family Rickettsiaceae and is transmitted to humans by the bite of larval trombiculid mite or chigger. The bite from an infected chigger may be followed by a systemic illness ranging in severity from inapparent to fatal. Scrub typhus presents as an acute undifferentiated fever. The incubation period for symptoms is between six and twenty-one days from exposure [5]. The clinical picture is characterized by sudden onset fever with chills, headache, backache and myalgia, profuse sweating, vomiting and enlarged lymph nodes [5]. In some patients, an eschar may develop at the site of chigger feeding, usually at sites where the skin surfaces meet, such as axilla, groin and inguinal areas [6]. The clinical symptoms and signs are similar to those of many other febrile diseases, such as murine typhus,

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leptospirosis, and dengue virus infection. The diagnosis of scrub typhus infection has relied on the detection of Orientia tsutsugamushi antibodies during the acute phase of the disease.

The clinical manifestations of leptospirosis largely overlap scrub typhus; fever, headache, conjunctival suffusion, myalgia, meningism, meningoencephalitis, acute respiratory distress syndrome, hepatorenal dysfunction, rash and multi-organ dysfunction syndrome. Because outdoor activity is a shared risk factor for acquisition of leptospirosis and scrub typhus, coinfection with these two diseases is not uncommon [7, 8]. Most laboratories in India diagnose both scrub typhus and leptospirosis using IgM ELISA. Their common epidemiology creates an opportunity of dual infections with these diseases [7]. They also have a common seasonal pattern. Dual infection has been reported from Thailand and Taiwan [7, 9]. Case reports of serological dual infection have been reported from India as well [10-12]. In a recent study, we reported a case of leptospirosis and scrub typhus coinfection in a 68-year-old male with associated kidney infection and jaundice [13]. The mortality rate for both scrub typhus and leptospirosis is up to 30%, if effective treatment is not given timely and appropriately [14, 15].

Most laboratories in India diagnose both scrub typhus and leptospirosis using IgM ELISA. In this study, we present a medical case report of a 50-year-old male patient diagnosed with leptospirosis and scrub typhus dual infection. He was reported to have high grade fever for 10 days with chills and coughs along with associated symptoms and was admitted to the RG Kar Medical College and Hospital on November last year. The patient showed gradual recovery on treatment with suitable medication and antibiotics and was discharged once hemodynamically stable.

2. Materials and methods

A 50-year-old male with high grade fever for 10 days associated with chills and coughs was admitted to R.G. Kar Medical college and hospital, Kolkata, on early November 2022. He was extremely fatigue and suffered from conjunctival congestion, episode of pr bleeding, bowel and bladder incontinence, abdominal distension and pedal edema. As recorded on 06.11.2022, he had blood pressure=90/70 mm Hg, oxygen saturation (SpO2) =96%, pulse rate= 80/min, hemoglobin content=9.3 g/dl, total leukocyte count= 21,700/mm3, platelet count= 2.4 lakh/mm3 and chest b/l vbs positive. Other additional parameters included urea=62 mg/dl, creatinine=1.5 mg/dl, total bilirubin=0.8 mg/dl, direct bilirubin=0.2 mg/dl, sodium content=139 mmol/l and potassium content=3.7 mmol/l.

Serum of the patient was tested for leptospirosis and scrub typhus infection at Virus Research & Diagnostic Laboratory (VRDL), Department of Microbiology, RG Kar Medical College and Hospital, Kolkata, after obtaining ethical clearance from the institution and informed consent. Serum IgM antibodies to leptospirosis or scrub typhus were detected by ELISA method following standard kit protocol (J. Mitra & Co. Pvt. Ltd.) according to the manufacturer's instructions. Calculations were done as per kit instructions as follows:

Sample O.D. ratio = Sample O.D. ÷ Cut off Value [Cut off Value =0.569 for Leptospira IgM, and 0.372 for Scrub Typhus IgM, respectively] (Calculation of Leptospira or Scrub Typhus IgM units=sample O.D. ratio×10)

3. Results

ELISA results indicated the patient was positive with dual infection for both scrub typhus and leptospirosis.

Different physiological parameters of the patient recorded from 08.11.2022-12.11.2022 are shown in Table 1.

Table 1 Different parameters of the patient as recorded from 08.11.2022-12.11.2022.

Date	Blood Pressure (mm Hg)	Capillary Blood Glucose (mg/dl)	Oxygen Saturation (%)	Chest	CVS
08.11.2022	90/60	194	98	b/l clear	S1S2 +
09.11.2022	120/80	187	98	b/l clear	S1S2 +
10.11.2022	130/70	155	97	b/l clear	S1S2 +
11.11.2022	120/80	180	97	b/l clear	S1S2 +
12.11.2022	120/80	175	97	b/l clear	S1S2 +

Complete Blood Count (CBC) test of the patient with differential as recorded on 06.11.2022 is shown in Table 2.

Table 2 CBC test of the patient with differential as recorded on 06.11.2022

	Results	**Flags**	**Units**	**Normal Limits**
WBC	21.7	H	$\times 10^3/\mu L$	4.0/12.0
LYM%	10.4	L	%	25.0/50.0
MON%	8.9		%	2.0/10.0
NEU%	79.1		%	50.0/80.0
EOS%	1.4		%	0.0/5.0
BAS%	0.2		%	0.0/2.0
ALY%	6.5		%	0.0/100.0
IMM%	0.5		%	0.0/100.0
LYM#	2.3		$\times 10^3/\mu L$	1.0/5.0
MON#	1.9	H	$\times 10^3/\mu L$	0.1/1.0
NEU#	17.2	H	$\times 10^3/\mu L$	2.0/8.0
EOS#	0.3		$\times 10^3/\mu L$	0.0/0.4
BAS#	0.0		$\times 10^3/\mu L$	0.0/0.2
ALY#	0.1		$\times 10^3/\mu L$	0.0/150.0
IMM#	0.1		$\times 10^3/\mu L$	0.0/150.0
RBC	3.01	l	$\times 10^6/\mu L$	4.00/6.20
HGB	9.3	l	g/dL	11.0/17.0
HCT	27.3	l	%	35.0/55.0
MCV	90.6		fL	80.0/100.0
MCH	30.9		pg	26.0/34.0
MCHC	34.1		g/dL	31.0/35.5
RDW-CV	11.7		%	10.0/16.0
RDW-SD	40.4		fL	37.0/46.0
PLT	240		$\times 10^3/\mu L$	150/400
MPV	8.8		fL	7.0/11.0
PCT	0.212		%	0.200/0.500
PDW	17.3		%	10.0/18.0
PLCR	18.8		%	12.0/42.0

The CBC test report of the patient recorded on 11.11.2022 is shown in Table 3A, B.

Table 3A Report of Examination of Blood

Hemoglobin (g/dl)	Packed Cell Volume (%)	WBC (/mm^3)	Platelets (/mm^3)
8.1 g/dl	24.5	9600	464000

Table 3B Differential WBC Count%

Neutrophil	Lymphocyte	Eosinophil	Monocyte	Basophil
67%	30%	2%	1%	0%

The laboratory investigation report of patient sample recorded on 08.11.2022 is shown in **Table 4**.

Table 4 Laboratory investigation of patient sample recorded on 08.11.2022

Laboratory investigations	Patient history (recorded on 08.11.2022)
Laboratory parameters (with reference values in parenthesis)	
Hemoglobin (12.0-15.0 g/dl)	7.6
Total leucocyte count (4000-11000/mm^3)	19,200
Platelet count (150,000-400,000/mm^3)	320000
Triglyceride (30-150 mg/dl)	140
Total Cholesterol (<200 mg/dl)	150
HDL Cholesterol (>40 mg/dl)	41
Total Protein (6-8 g/dl)	5.4
Albumin (3.2-5.0 g/dl)	2.5
Total bilirubin (0.1-1.0 mg/dl)	0.7
Direct bilirubin (0-0.3 mg/dl)	0.2
Serum urea (10-40 mg/dl)	41
Serum creatinine (0.5-1.5 mg/dl)	0.9
Alanine Transaminase (5-35 IU/L)	37
Aspartate Transaminase (5-35 IU/L)	44
Alkaline Phosphatase (adult 110-310 IU/L)	140
Sodium (135-145 mmol/l)	136
Potassium (3.5-5.0 mmol/l)	3.3
(b) Differential WBC Count %	
Neutrophil	82
Lymphocyte	10
Eosinophil	04
Monocyte	04
Basophil	00
(b) Other investigations	

MPDA	Negative
Dengue NS1	Negative
HBsAG	Non-reactive
Anti-HCV antibody	Non-reactive

*MPDA=Microarray pooled DNA analyzer; Dengue NS1=Dengue non-structural protein 1; HBsAG= Hepatitis B surface antigen; HCV= Hepatitis C virus

4. Discussion

In this study, we report a case of leptospirosis and scrub typhus co-infection in a 50-year-old male who was admitted to the RG Kar Medical College and Hospital on November last year. Cases of leptospirosis and scrub typhus co-infection have been reported in some earlier studies [16-18]. Our laboratory recently reported cases of dual infection of both bacterial diseases in separate studies [13, 19]. Co-infection of leptospirosis and scrub typhus were reported in 11 patients by ELISA in a recent study [20]. Borkakoty et al. found scrub typhus IgM and leptospira IgM positive simultaneously in 25% cases of patients with pyrexia of unknown origin [12].

The patient was treated with antibiotics DoxT-SL and Pipzo (4.5 gm injection) along with NS IV fluid. As O. tsutsugamushi lacks a proper cell wall, the cephalosporin group of antibiotics is virtually ineffective against scrub typhus [21, 22]. It was also reported that doxycycline is an effective therapy for patients with leptospirosis [23]. Rifampicin and azithromycin are alternatives in cases resistant to doxycycline [24]. The treatment of choice for severe leptospirosis is I.V penicillin or I.V ceftriaxone [25, 26] while that for scrub typhus is doxycycline. Azithromycin and doxycycline have both been shown to be effective in the treatment of scrub typhus, but the resolution of symptoms has shown to be faster in doxycycline compared to azithromycin [27]. Recent trials have demonstrated that the broad-spectrum third generation cephalosporins cefotaxime and ceftriaxone are also acceptable agents for patients with severe leptospirosis.

Early diagnosis is important because there is usually an excellent response to treatment and timely anti-microbial therapy may prevent complications. Scrub typhus infection may be prevented by wearing proper dresses and use of insect repellent cream containing N, N-diethyl-m-toluamide to minimise exposure to infected mites [28]. Simultaneously, animal exposure may be avoided which harbour leptospires and use boiled water for drinking.

5. Conclusion

Since both leptospirosis and scrub typhus present with similar clinical features, co-infection of these two diseases may occur and it requires different methods for confirmation of these cases. The overlapping clinical features of both the infections sometimes cause underreporting of such cases. Overlooking of co-infection of these diseases or delay in diagnosis and treatment may lead to increased mortality rate among patients. As a result, it is very crucial to properly diagnose for such coinfections of the zoonotic diseases during the post-monsoon season so that timely administration of antibiotic therapy may save lives. Accordingly, choice of therapy should include those drugs that cover for both the infections.

Compliance with ethical standards

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Statement of ethical approval

The studies on patient samples were carried out after obtaining ethical clearance from the institution and informed consent.

Statement of informed consent

Informed consent was obtained from the patient and his families included in the study.

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