

Original Research Article

Clinical profile of post flood fever in a tertiary care hospital in Kerala

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Received: 12 July 2021

Revised: 06 September 2021

Accepted: 07 September 2021

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ABSTRACT

Background: Floods are an important source of infection epidemic worldwide. Analysis of different infections presenting during floods can lead us to have a unified approach during such periods.

Methods: This study describes the clinical features of fever patients presented to a tertiary care hospital in Kerala after the 2018 flood. Clinical findings of the confirmed leptospirosis cases were also compared with non-leptospirosis cases.

Results: A total of 48 patients with fever and myalgia were studied and majority of them were males (77%). 40 patients had contact with contaminated water. But only 10 of them had taken prophylactic doxycycline. Complications were seen less among those who took prophylactic doxycycline. The mean time from the first symptom to first medical care was 4.4 days. Leptospirosis was seen among 15 patients and 2 patients had dengue fever. Hepatic involvement and renal involvement were seen significantly higher among leptospirosis patients.

Conclusions: This study emphasized the importance of prophylactic doxycycline and early initiation of antibiotics during flood outbreaks. Awareness among treating doctors and patients is required for the control of outbreaks and prevention of mortality during floods.

Keywords: Flood, Post flood fever, Leptospirosis, Doxycycline

INTRODUCTION

Floods can lead to many infectious and non-infectious diseases. It can lead to many water-borne diseases like typhoid fever, cholera, leptospirosis, and hepatitis A. It can also lead to Vector-borne diseases, such as malaria, dengue and dengue haemorrhagic fever, yellow fever, and West Nile Fever. Floods cause an increase in the number and range of vector habitats and leads to increase in vector borne diseases. Flooding may initially flush out mosquito breeding, but later it comes back when the waters recede. There is an increased risk of infection of water-borne diseases contracted through direct contact with polluted waters, such as amoebiasis, wound infections, conjunctivitis, dermatitis, and ear, nose and throat infections. It is seen that the risk of infection increases when there is significant population displacement.

Contamination of drinking-water facilities is the major risk factor for outbreaks associated with flooding. Climate change is expected to bring a substantial increase in the number of infectious diseases that are transmitted through contaminated water.^{1,2}

Leptospirosis is the 'only epidemic-prone infection which can be transmitted directly from contaminated water'. Transmission occurs through contact of the skin and mucous membranes with water, damp soil or vegetation or mud contaminated with rat urine.³

The clinical features of febrile illness during post flood period can vary from non-post flood period. The aim of the study was to find the clinical profile of post flood fever patients and compare the clinical features of leptospirosis patients with that of other causes of febrile illnesses.

METHODS

This was a cross sectional observational study carried out on febrile patients in the medical wards of Government medical college, Ernakulam during the flood period (15th August to 15th October) of 2018. Details of patients admitted with fever and myalgia in the post flood period were noted. Patients aged more than 12 years and flood victims or patients with such exposure after the flood were only included in the study. Patients having fever before the onset of flood were excluded from the study. Data was coded and entered into MS excel. And analysis was done using SPSS software. Quantitative variables were summarized using mean and SD. Association between quantitative variables were tested using t test. Ethical clearance was obtained from the Institute Ethics Committee.

RESULTS

A total of 48 patients with fever and myalgia who satisfied the inclusion criteria were studied. The mean age of the patients was 40 and the majority were males (77%). 42 (87.5%) patients were from the flood-affected areas and out of them, 40 patients had contact with contaminated water. 31 patients were camp refugees. 10 patients had taken doxycycline prophylaxis before symptom onset. The mean time from the first symptom to first medical care was 4.4 days. 17 patients took therapeutic doxycycline after symptom onset. 39 patients received crystalline penicillin either from the periphery or after admission to the hospital. The mean time from symptom onset to receiving crystalline penicillin was 4.26 days. The mean duration of illness at the time of the hospital visit was 4.5 days. Headache, vomiting, oliguria/anuria, body ache were the other major symptoms among fever patients (Table 1).

The mean hemoglobin was 12.2±2.29 mg/dl. 6 patients (12.5%) had haemoglobin less than 10. The mean total count was 9774±5304 cells/mm³ with a range of 2170 to 27000 cells/mm³. 4 patients had a total count of less than 4000 and 16 patients had a total count of more than 10000. The mean neutrophil count was 72.26±18.69%. The mean platelet count was 156042±140547 cells. 27 patients had thrombocytopenia (platelet count less than 1.5 lakhs). The mean ESR was 49±13 mm/hr. 4 patients had ESR more than 100 mm/hour. The mean serum urea and creatinine levels were 56.79±69.52 mg/dl and 1.79±1.79 mg/dl respectively. The mean serum sodium and potassium levels were 134±4.27 meq/l and 3.72±0.55 meq/l respectively.

The mean total bilirubin level was 2.86±4.77 mg/dl with a minimum value of 0.3 mg/dl and a maximum value of 31.7 mg/dl. Total bilirubin >1 mg/dl was seen among 29 patients. The mean AST, ALT and ALP values were 107±259 IU/l, 71±104 IU/l and 103.85±50.84 IU/l respectively. The mean serum albumin level was

3.52±0.66 mg/dl. The Mean RBS value was 104±32 mg/dl. Urine albumin was present among 28 patients. Urine RBC was seen in 20 patients. Urine pus cells were seen in 15 patients.

7 patients had cardiac involvement. 15 patients had renal involvement and 4 of them required dialysis. 22 of them had hepatic involvement. Only one patient developed ARDS and only two patients required ventilator support during the hospital stay. 6 patients had previous comorbidities. 6 patients received platelet transfusion. They received an average of 5.5 platelet concentrates. 4 patients received fresh frozen plasma transfusions. Only one patient received inotrope support. The mean duration of stay was 6.79±4.27 days. 2 patients had dengue fever and 15 patients had leptospirosis. Hepatic complications were more common among leptospirosis patients compared to non-leptospirosis patients and it was statistically significant (Table 2).

Complications were less among the patients who took prophylactic doxycycline compared to those who didn't take doxycycline and it was statistically significant (Table 3). Headache was seen as a symptom more commonly among the patients who took prophylactic doxycycline when compared to those who didn't take doxycycline (Table 4). Icterus was seen more commonly among leptospirosis patients compared to non-leptospirosis patients and was statistically significant with a p value of 0.008.

Laboratory features with significant difference between leptospirosis and non-leptospirosis patients are shown in Table 5. There was a significant difference in mean serum urea levels between leptospirosis and non-leptospirosis patients. The average serum urea level for leptospirosis patients was 48.98 mg/dl higher than the average serum urea levels of non-leptospirosis patients. There was a significant difference in mean serum creatinine levels between leptospirosis and non-leptospirosis patients. The average serum creatinine level for leptospirosis patients was 0.96 mg/dl higher than the average serum creatinine levels of non-leptospirosis patients. There was a significant difference in mean platelet count between leptospirosis and non-leptospirosis patients. The average serum platelet count for leptospirosis patients was 102891 cells higher than the average serum urea levels of non-leptospirosis patients. There was a significant difference in mean total bilirubin levels between leptospirosis and non-leptospirosis patients. The average total bilirubin level for leptospirosis patients was 3.04 mg/dl higher than the average serum urea levels of non-leptospirosis patients.

There were 3 deaths (6.25%) in total and 1 one of them had leptospirosis. All 3 of them had hepato-renal involvement and thrombocytopenia. They were from flood-affected areas and all of them had contact with contaminated water. And none of them had taken prophylactic doxycycline.

Table 1: Clinical features of fever patients.

Clinical features	Number	Percentage (%)
Body ache	12	25
Vomiting	14	29
Headache	15	31
Convulsions	0	0
Loose stools	7	14.5
Abdominal pain	5	10.4
Hemoptysis	0	0
Oliguria/anuria	14	29
Bleeding manifestations	3	6.2
Rash	3	6.2
Icterus	11	23
Enlarged lymph nodes	1	2
Calf tenderness	9	18.75
Conjunctival congestion	7	14.5
Hepatomegaly	1	2
Bradycardia	0	0
Tachycardia	1	2
Hypotension	2	4
Chest crepitations	1	2
Splenomegaly	0	0
Neck rigidity	0	0

Table 2: Hepatic complications in leptospirosis patients.

Leptospirosis	Hepatic complications		Total
	Yes	No	
Yes	11	4	15
No	11	22	33
Total	22	26	48

Note: $\chi^2=6.646$, p value=0.01.

Table 3: Complications in patients who took prophylactic doxycycline.

Complications	Took doxycycline		Total
	Yes	No	
Yes	2	24	26
No	8	14	22
Total	10	38	48

Note: $\chi^2=5.939$, p value=0.015.

Table 4: Headache in patients who took prophylactic doxycycline.

Headache	Took doxycycline		Total
	Yes	No	
Yes	7	8	15
No	3	30	33
Total	10	38	48

Note: $\chi^2=8.828$, p value=0.003.

Table 5: Laboratory features in leptospirosis patients.

Parameters	Leptospirosis	N	Mean	SD	P value
Serum urea	Yes	15	90.47 mg/dl	111.58	<0.001
	No	33	41.48 mg/dl	29.66	

Continued.

Parameters	Leptospirosis	N	Mean	SD	P value
Serum creatinine	Yes	15	2.45 mg/dl	2.55	0.008
	No	33	1.49 mg/dl	1.26	
Platelet count	Yes	15	226780 cells/mm ³	192840	0.019
	No	33	123888 cells/mm ³	96600	
Total bilirubin	Yes	15	4.96 mg/dl	7.80	0.014
	No	33	1.91 mg/dl	1.96	

DISCUSSION

This longitudinal study was conducted in Kerala after the 2018 flood which affected millions of people. The majority of patients (77%) involved in the study were males. Males were the predominant age group affected in many other studies of post-flood illness.⁴⁻⁶ This was because males predominantly go out for work and get frequent exposure to contaminated water. The majority of the patients came from flood-affected areas and had contact with contaminated water. Only 10 patients had taken prophylactic doxycycline before symptom onset. This was mainly because of the unawareness of the public regarding this. Chemoprophylaxis with doxycycline was found to have reduced the morbidity and mortality in high-risk cases.⁷ Doxycycline is usually given at a dose of 200 mg/week but even a single dose of 200 mg doxycycline prophylaxis was found to be effective for preventing leptospirosis among flood victims.^{8,9} Complications were significantly less among the patients who took prophylactic doxycycline in our study. But headache was seen as a symptom more among those who had taken doxycycline prophylaxis. This may be because headache occurred as a side effect of doxycycline among the patients who took it. The mean time from the first symptom to first medical care was 4.4 days. So, there was a delay in getting treatment for most of the patients. It was because most of the patients were camp refugees and some of them were isolated because of flood and so had difficulty in reaching medical care on time. The mean time from symptom onset to receiving crystalline penicillin was 4.26 days. This was similar to another outbreak in Philippines where the mean days from onset of symptoms to antimicrobial therapy was 4.9 days.¹⁰ According to WHO, antimicrobial therapy should be started as soon as possible and within 5 days of symptom onset.¹¹

The clinical presentation was highly variable and ranged from mild fever to multisystem involvement. Leptospirosis was seen among 15 patients and 2 patients had dengue fever. The rest of the patient did not have any serological diagnosis in spite of detailed investigations. But many of them were suspected to have leptospirosis. 22 patients (45.83%) had hepatic involvement. Hepatic complications were significantly higher among leptospirosis patients. Icterus was significantly higher among leptospirosis patients and the average total bilirubin level for leptospirosis patients was 3.04 mg/dl higher than the average total bilirubin levels of non-leptospirosis patients. Serum urea and serum creatinine were also significantly higher among leptospirosis patients. The

mean platelet count was significantly lower among leptospirosis patients compared to non-leptospirosis patients.

Out of the 15 leptospirosis patients, one (6.66%) person died. Mortality rates were similar among other outbreaks around the world.^{6,10,12}

The study was conducted in a tertiary care hospital in a metro city and hence may not represent the actual situation in the community.

CONCLUSION

Floods are an important source of spread of infection worldwide and leptospirosis is one of the most common infections spread during flood. Hepato-renal involvement was found in all the expired patients. Early diagnosis and awareness among public are key in controlling the outbreaks and reducing the mortality. This study also emphasized that chemoprophylaxis and early initiation of antibiotics in affected people is very important in reducing the complications.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Shuman EK. Global climate change and infectious diseases. *N Engl J Med.* 2010;362(12):1061-3.
2. Lin CY, Chen TC, Dai CY, Yu ML, Lu PL, Yen JH, et al. Serological investigation to identify risk factors for post-flood infectious diseases: a longitudinal survey among people displaced by Typhoon Morakot in Taiwan. *BMJ Open.* 2015;5(5):7008.
3. WHO. Flooding and communicable diseases fact sheet. *Weekly Epidemiological Record,* 2005. Available at: <https://apps.who.int/iris/handle/10665/2>. Accessed on 01 July 2021.
4. Agampodi SB, Dahanayaka NJ, Bandaranayaka AK, Perera M, Priyankara S, Weerawansa P, et al. Regional differences of leptospirosis in Sri Lanka: observations from a flood-associated outbreak in 2011. *PLoS Negl Trop Dis.* 2014;8(1):2626.
5. Rachna P, Vipul S, Bansal RK, Pawar AB, Vandana D, Kalpana D, et al. Post-flood profile of leptospirosis cases at teaching hospital of municipal

- medical college in Surat city. *Natl J Community Med.* 2010;1(1):9-11.
6. Mendoza MT, Roxas EA, Ginete JK, Alejandria MM, Roman AD, et al. Clinical profile of patients diagnosed with leptospirosis after a typhoon: a multicenter study. *Southeast Asian J Trop Med Public Health.* 2013;44(6):1021-35.
 7. Supe A, Khetarpal M, Naik S, Keskar P. Leptospirosis following heavy rains in 2017 in Mumbai: Report of large-scale community chemoprophylaxis. *Natl Med J India.* 2018;31(1):19-21.
 8. Chusri S, Neil EB, Hortiwakul T, Charernmak B, Sritrairatchai S, Santimaleeworagun W, et al. Single dosage of doxycycline for prophylaxis against leptospiral infection and leptospirosis during urban flooding in southern Thailand: a non-randomized controlled trial. *J Infect Chemother.* 2014;20(11):709-15.
 9. Schneider MC, Hernandez J, Min KD, Leonel DG, Carrasco D, Gompper ME, et al. The Use of Chemoprophylaxis after Floods to Reduce the Occurrence and Impact of Leptospirosis Outbreaks. *Int J Environ Res Public Health.* 2017;14(6):594.
 10. Amilasan AS, Ujiie M, Suzuki M, Salva E, Belo MC, Koizumi N, et al. Outbreak of leptospirosis after flood, the Philippines, 2009. *Emerg Infect Dis.* 2012;18(1):91-4.
 11. WHO. Human leptospirosis: guidance for diagnosis, surveillance and control, 2003. Available at: <https://apps.who.int/iris/handle/106657>. Accessed on 01 July 2021.
 12. Kuriakose M, Eapen CK, Paul R. Leptospirosis in Kolenchery, Kerala, India: epidemiology, prevalent local serogroups and serovars and a new serovar. *Eur J Epidemiol.* 1997;13(6):691-7.

Cite this article as: Bhagyanath T, Joseph A, Jacob JK, Samuel S, Kurup RR, Ravindran R. Clinical profile of post flood fever in a tertiary care hospital in Kerala. *Int J Res Med Sci* 2021;9:2971-5.