Outbreak of leptospirosis after the cyclone in Orissa

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ABSTRACT

Background. Two weeks after the cyclone during October–November 1999, several persons in Orissa suffered from a febrile illness with haemorrhagic manifestations. Serum samples from a few such patients tested positive for anti-leptospiral IgM antibodies. We conducted a study in four villages that were flooded after the cyclone to examine the possibility of leptospirosis being the cause of the outbreak.

Methods. One hundred forty-two persons living in four flooded villages in the Jajpur district of Orissa were interviewed for their disease history and possible risk factors after the cyclone. Blood samples were collected and tested for anti-leptospiral antibodies using the microscopic agglutination test, IgM ELISA and lepto-dipstick. Follow up samples were collected from those who had inconclusive results on the first test and the microscopic agglutination test was repeated on these samples.

Results. Eighty-four of the 142 study subjects had suffered a febrile illness and 40 of them had positive results in one or more IgM-based tests and 28 had a positive microscopic agglutination test result as well. Thus, 19.2% of the study subjects (28/142) had serological evidence of symptomatic leptospirosis. Hence, a study was conducted in the affected villages to examine the possibility of leptospirosis being the cause of the outbreak.

METHODS

Investigations were conducted between 10 and 15 December 1999, i.e. 6 weeks after the cyclone and 4 weeks after the outbreak. Blood samples were collected from 142 persons residing in the affected villages. Follow up samples were collected after an interval of 1 month from 24 cases because of equivocal test results in the first samples. These samples were tested by IgM ELISA,^1,2 lepto-dipstick^3 and the microscopic agglutination test (MAT).^4

Eight serogroups commonly circulating in India—*australis*, *canicola*, *grippotyphosa*, *icterohaemorrhagia*, *javacana*, *pomona*, *autumnalis* and *sejroe*—were used as antigens.

A titre of 1:400 in MAT, ≥1:80 in IgM ELISA and a positive dipstick test were considered as evidence of recent leptospiral infection. Attempts were made to obtain a follow up sample from those with lower titres on MAT but positive results with dipstick and IgM ELISA. The MAT was performed on the second samples and seroconversion or a four-fold rise in titre with a titre of at least 1:400 in the second sample was considered as evidence of leptospiral infection. Based on the results of the three tests and a history of febrile illness after the cyclone, the study subjects were categorized as: (i) confirmed cases of symptomatic leptospirosis; (ii) suspects (history of fever, positive ELISA and dipstick but negative MAT); (iii) asymptomatic infection (confirmed recent infection without any history of symptoms); and (iv) cases of past infection (negative ELISA and dipstick tests and a titre ≤1:200 in MAT).

RESULTS

Eighty-four of the 142 study subjects (59.2%) reported that they had suffered a febrile illness after the cyclone. The results of MAT titres and IgM-based tests are summarized in Table I. Among these 84 persons with a history of fever, 40 had positive results in the IgM-based tests. Of these 40, 15 had MAT titres in the range 1:400 to 1:1600 and were considered as having evidence of recent infection.
The results of the serological tests are summarized in Table II. Twenty-eight persons (19.7%) had evidence of recent MAT titres representing seroprevalence. Among the 28 confirmed patients, 6 each had titres of 1:400 and 1:800, 9 had 1:1600, 4 had 1:3200 and 5 had a titre of 1:6400 in MAT. In 25 of the 28 confirmed cases, the highest titre obtained was against the serogroup canicola and in the remaining 3 it was against icterohaemorrhagiae. Low titres were observed against serovars grippotyphosa and australis also.

Twelve persons (8.5%) showed low antibody titres in MAT, indicating past exposure to leptospires. In these persons also, canicola was the predominant serovar encountered. The nature of activities of most of the study subjects during the post-cyclone period was similar and no factor was found to be significantly associated with leptospirosis infection.

DISCUSSION

The results of the serological studies indicate that 19% of the study subjects had symptomatic leptospirosis after the cyclone and floods. Although the study subjects were not selected by any sampling procedure because of the lack of a proper sampling frame and the operational difficulties in these villages after the cyclone, the attack rate observed in the sample would be an indicator of the actual attack rate among the population of the flooded villages. Leptospirosis has the potential to cause widespread epidemics, when large numbers of the population are exposed to wet conditions for prolonged periods. Continuous exposure to flood waters was unavoidable as entire villages were submerged under water for several days.

The seroprevalence of 8.5%, indicated by the proportion of the study subjects with low titres of antibodies, is less than that in many other places in India. During normal times, the transmission of the infection might be low due to environmental conditions unfavourable to the survival of the bacteria. This seroprevalence in the population also indicates that there is a carrier state existing in the animal population. The study villages were under water for several days after the cyclone and the entire population was continuously exposed to flood waters. Thus, conditions became conducive for transmission of leptospirosis.

Pulmonary involvement, although seen in China, Korea and Australia, is not a common mode of presentation of leptospirosis. Outbreaks of leptospirosis with such clinical presentations have been reported from the Andaman Islands and Nicaragua. In China, pulmonary haemorrhage is associated with infection with the serovar lai of the icterohaemorrhagiae serogroup. The serogroup canicola was responsible for the outbreak reported from Nicaragua as well as in the present study. In the Andaman Islands, the predominant serogroup is grippotyphosa. It appears that the potential to cause severe and fatal pulmonary haemorrhage is not confined to any particular serovar or serogroup.

Large quantities of antibiotics including doxycycline and tetracycline were distributed by the relief team as part of a preventive measure against diarrhoeal diseases including cholera. The use of antibiotics for prophylaxis is effective in controlling outbreaks of leptospirosis. The use of antibiotics during the outbreak period might have reduced the magnitude of the outbreak and severity of the disease.

Natural disasters cause sudden changes in the environment and also in human and animal behaviour. Whereas widespread transmission is checked at normal times due to a subtle balance between the determining factors, sudden changes in the environment and human behaviour create a situation conducive for the rapid transmission of leptospirosis resulting in outbreaks.

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