Leptospirosis on the Horizon

Leptospirosis is one of the commonest zoonoses[1] and almost all animals can spread it to humans. In India, where large herds of animals live in close proximity with the human population, the disease must be occurring frequently. However, most instances of leptospiral infection go unnoticed and it has not been accorded any priority in the national health programmes. The disease has a wide variety of clinical presentations and is difficult to diagnose clinically. Laboratory diagnosis is not easy and only a few institutions have the facilities for it. Awareness of the disease is low among the general population as well as the medical community. The repercussions of ignoring this infection are now becoming apparent.

In the last few years, there have been outbreaks of a mysterious febrile illness presenting with haemorrhage, sometimes associated with pulmonary involvement. Perhaps the first instance was in 1988 in the Andaman Islands. It continued as a mysterious disease until 1993, when the leptospiral aetiology was confirmed.[2] Similar outbreaks occurred subsequently in Surat, Cochin, Chennai, Orissa, Mumbai and Thane. In all these cases, the aetiological agent was *Leptospira*.

Leptospira was discovered by Inada *et al.* in 1915,[3] although one of the syndromes caused by it—Weil's disease—was described in the previous century itself. In 1929, Taylor and Goyle isolated *Leptospira* from 24 patients in the Andaman Islands[4] and proved the existence of the disease in India. During 1930–1960, there were a few scattered reports from different parts of the country.[5,6] These reports became infrequent and little information is available regarding the status of the disease during this period.

During the 1980s, several outbreaks occurred in various parts of the country. In 1988, it started in the Andaman Islands and was called the Andaman haemorrhagic fever.[2] The disease affected the pulmonary system and the fatality rate was very high.[7] The aetiology remained elusive till 1993 because of unusual or uncommon presentations. When the aetiology was finally established, it was the first report from India of leptospirosis presenting with pulmonary haemorrhage. This presentation has been reported from other parts of the country also. Similar outbreaks have been reported from other countries as well.[8]

Around the late 1980s, the disease started appearing in many places, where it had not been known to occur earlier. Outbreaks were reported from Tamil Nadu, Mysore and Nagpur. In the 1997 outbreak in Surat, thousands of people were affected. In 1999, after the super-cyclone in Orissa, outbreaks of fever with pulmonary haemorrhage started appearing in many of the flooded villages.[9] In July 2000, following heavy rains and floods, outbreaks occurred in Mumbai and Thane. Several hundred people were affected and about 40 died. Recently, outbreaks have been reported from Kerala. All these point to leptospirosis having emerged as a major public health problem in India. We can no longer afford to ignore it. Because of the low priority given to it, we did not develop the infrastructure and expertise needed to identify and control the disease.

In 1997, Indian leptospirologists met at Port Blair during the National Symposium on Leptospirosis and formed the Indian Leptospirosis Society. In 1998, the Ranbaxy Foundation organized a Round Table Meeting on Leptospirosis.[10] Expert groups and a Task Force were set up by agencies such as the Department of Biotechnology and Indian Council of Medical Research. A National Leptospirosis Reference Centre has been set up at Port Blair. A nationwide assessment of the disease burden is to be launched soon.

Availability of facilities for laboratory diagnosis is still a major problem. Conventional dark field microscopy is an unreliable method. Culture is slow and yields low positive rates. The microscopic agglutination test (MAT) is still the test of choice. This test is cumbersome and requires live bacteria as antigens. Though there is only one species of pathogenic *Leptospira*, there are more than 240 serovars of it. A panel of all possible serovars has to be included in the MAT. Maintaining large numbers of serovars in culture is expensive and tedious. However, some of the new developments in rapid diagnostics are promising. A sensitive IgM ELISA system has been

developed.[11] Still simpler tests such as a Lepto-Dipstick[12] are available commercially. A few other tests such as the dry dot and lateral flow are under evaluation. However, all these new test systems need to be imported and there is no indigenous alternative as yet.

The association between rats and leptospirosis is so strong in the minds of people that it is often called rat fever. However, the role of rats as the immediate source of infection in the existing epidemiological situation needs to be proved. In fact, any mammal and sometimes other animals such as frogs and even platypuses can be carriers of leptospires. Studies have shown that exposure to wet and waterlogged fields has the strongest association with leptospiral infection.[13] No association was seen with rat infestation of houses and leptospirosis. Curiously, mud flooring of houses was also a factor favouring leptospiral infection.

Renal tubules of animals are the natural habitat of leptospires. They are discharged in the urine and survive for prolonged periods of time in favourable conditions such as dampness, a neutral or slightly alkaline pH and absence of salinity. Most agricultural land fulfils these criteria. Once people get exposed to such environments for prolonged periods of time, leptospires enter the body through sodden skin or abrasions and initiate infection. In a developing country like India, where conventional agricultural techniques are commonly used, a large number of people are constantly exposed to environments that are capable of transmitting the infection.

In recent years, two distinct epidemiological patterns have evolved—the rural and the urban patterns. In cities, rodents that infest the sewage systems and free-living animals act as carriers. Poorly maintained drainage systems and damp, dirty and often waterlogged roads act as the environmental vehicle. A pair of sandals does not protect a pedestrian from invasion by these bacteria that contaminate the ditches on the roads and the overflowing sewage drains. A mild rainfall often chokes the city drainage systems flooding the roads. Predictably, upsurges of leptospirosis occur during the monsoons.

In the rural form, the upsurges have a more direct association with crop cycles. Rodents and domestic animals act as carriers. Farmland, particularly paddy fields, which are damp or waterlogged during most of the crop cycle, offer an ideal breeding place for the bacteria. Exposure of people to agricultural land is inevitable in communities that subsist on cultivation. Outbreaks occur associated with agricultural events such as seeding, planting or harvesting.

Successful transmission of the infection depends upon the concurrent existence of several factors. These include the carrier state in the animal population, an environment favourable for survival of the bacteria and exposure of the individual to the environment. Seasonal upsurges in the occurrence of the disease are typical instances of all the necessary factors converging at a specific period of time. The severe epidemics that occur in North Andaman are classic examples. The three factors—rodent activity in the fields, dampness of the soil and exposure of the people to the environment—converge during the harvest period in October and the disease occurs in an epidemic form.

Although leptospirosis is a zoonosis and rodents are the primary carriers of the bacteria, direct contact with rat urine is not the only way by which the infection is contracted. Free-grazing cattle, swine, stray dogs and cats are equally important carriers. Direct contact with animal urine is a possible risk factor. However, contact with contaminated environment is a far more important factor epidemiologically, as it is more frequently encountered than direct contact with animal urine. In this sense, leptospirosis is an environmentally acquired infection.

We have one of the largest animal populations in the world and an environment that supports the survival of the bacteria. Leptospirosis is a natural health hazard of the lifestyle of our people due to the close and continuous interaction between people, environment and animals.

Research on human leptospirosis in India is almost negligible and poorly coordinated. The controversy regarding the occurrence of the disease in Delhi was chaotic. The need of the hour was an inter-institutionally coordinated investigation

involving established research institutions. Strengthening facilities for the diagnosis and creating awareness enhancement programmes are urgent necessities. The effectiveness of our campaign against this ubiquitous infection depends upon our success in pooling our resources, coordinating the activities of different sectors and institutions, and establishing a proper network.

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