EPIDEMIOLOGICAL PATTERNS OF LEPTOSPIROSI S

SC Sehgal

Leptospires are ubiquitous spirochetes. While the saprophytic species is a usual contaminant of surface waters, the primary habitat of the pathogenic species is the distal tubules of the kidneys of rodents, the reservoir hosts and various other animal species. The pathogenic leptospires shed in the urine of the carrier animals contaminate the environment and cause human and animal infection throughout the world. Leptospirosis, the infection caused by leptospires, is the most widespread zoonosis in the world. The core determinants of transmission of leptospiral infection are the presence of carrier animals, suitability of the environment for the survival of leptospires and interaction between man, animals and environment. From this simplified model, it might appear that the epidemiology of leptospirosis is simple and straightforward, though in reality, the core determinants are often influenced by various socio-cultural, occupational, behavioral and environmental factors prevailing in a community and hence the epidemiology of the disease could be quite complex and dynamic.

Core determinants and influencing factors

The source of infection in an area is determined by factors such as rodent density, population size of the farm and other domestic animals, sanitization of animal habitats, availability of veterinary services for prompt detection and treatment of animal leptospirosis, control programs for animal leptospirosis etc. The important human behavioral, socio-cultural and occupational factors that influence the transmission are levels of personal hygiene; personal practices such as bathing in unprotected water bodies, water associated recreational activities, use of protective gear, agricultural and other occupational practices, animal rearing practices, level of hygiene in milking and slaughtering places etc. Various physico-chemical characteristics of the environment and climatic factors also influence the transmission of leptospirosis. These factors include rainfall, humidity, ambient temperature, water retaining capacity of the soil, pH and salinity of the soil and surface waters, forest cover etc.

Mode of transmission and risk factors

The mode of transmission of leptospirosis is often categorized as direct or indirect depending upon the immediate source of infection. When the immediate source of infection is animal tissue, body fluids or urine, the transmission is termed as direct. Cattle and pig farmers, veterinarians, butchers, laboratory personnel who handle laboratory animals etc. are at high risk for contracting leptospirosis by direct transmission. When the immediate source of infection is environment contaminated with the urine of carrier animals, the transmission is termed as indirect. Agricultural workers, sewage workers, people walking barefoot in water-logged areas, sportspersons who participate in water-related sports such as rafting, canoeing, swimming etc. are at high risk of contracting the disease through indirect transmission.

The specific risk factors of infection vary from one epidemiological setting to another. In a typical rural agrarian community, agricultural activities, other activities in farm land or outdoor environment, forestry, fresh-water fishing, frequent wading through stagnant water-bodies and use of unprotected water sources for bathing and washing are often implicated as risk factors for transmission of infection. In a typical urban community in developing countries, where the level of environmental sanitation is poor and the population density is high, exposure to sewage water, bare-foot walking, contact with garbage, rat infestation of houses etc. are found to be associated with leptospirosis. In developed countries, leptospirosis usually occurs as small common-source outbreaks or occasionally among travelers who visit endemic tropical areas. In such situations, exposure to specific contaminated water-source is usually the risk factor.

In the recent years, leptospirosis, either as outbreaks or as sporadic cases, has been occurring in increasing frequency, both in developing as well as in the developed world. The epidemiology of leptospirosis occurring in different socio-cultural settings can be categorized into several distinct patterns.

Rural leptospirosis

The rural epidemiological pattern, which occurs often in agrarian communities in the developing world, is usually associated with cultivation cycles, which, in turn, depends on meteorological phenomena such as monsoons. What triggers off a burst of intense transmission of infection is the co-existence of all the core determinants of transmission. In the case of the rural epidemiological form, it is the presence of farming animals as well as rodents, some of which might be leptospiral carriers, in the farm land, warm, wet and humid condition of the environment facilitating survival of leptospires and frequent human activity in the environment for various agricultural activities. The transmission reaches a peak during sowing and harvesting seasons. Such epidemiological patters is often seen in various countries in Southeast and South Asia including rural areas in Indian peninsula, north-eastern Thailand, Southern provinces of China, Philippines etc.

*Corresponding author (email: <pblicmr@sancharnet.in>)
Regional Medical Research Center (ICMR), WHO Collaborating Center for Diagnosis, Reference, Research and Training in Leptospirosis, Port Blair, Andaman and Nicobar Islands - 744 101, India

www.ijmm.org
Urban leptospirosis

The urban epidemiological form is often seen in overcrowded cities and towns of developing countries, where the environmental sanitation and the personal hygiene of the people are poor. The drains are often over-loaded and choked resulting in the over-flow of wastewater into roads, which are usually full of potholes, filled with water and wet mud. Hygienic practices such as wearing of protective footwear are not common among people. The sewage canals are swarmed with rats, bandicoots and other rodents. Domestic animals graze freely on the roads. Upsurges in the number of cases usually occur during rainy season. This epidemiological pattern is frequently seen in cities like Chennai and Mumbai in India, El Salvador in Brazil and Hawaii in USA.

Two other epidemiological forms, though less frequent than the rural and urban forms, are the recreational leptospirosis and leptospirosis associated with natural disasters. Several water-sports related outbreaks of leptospirosis have been documented in various countries. Outbreak among school children who bathed in Cimarron Channel, Moron, Cuba in 1986, outbreak among military personnel who went for fresh-water swimming in Oahu Island in Hawaii in 1992, outbreak among white-water rafters in flooded rivers of Costa Rica in 1996 and the outbreak among the participants of a multi-sport racing expedition in Malaysia in 2000 are examples of recreation-associated leptospirosis. In recent years, outbreaks of leptospirosis associated with natural calamities such as floods and cyclones are being reported in increasing frequency. Such calamities result in a change in the environment that facilitates the survival of leptospires, prolonged exposure of people to wet and waterlogged conditions and a closer interaction between animals and humans. Outbreaks have been reported from Nicaragua in 1995 following floods, from Orissa in 1999 following the Super-Cyclone and floods, from Mumbai in 2000 and 2005 following heavy rainfall and flooding and on several occasions in countries like Philippines and Thailand.

Leptospirosis associated with recreation and natural disasters

Almost every country in South and Southeast Asia, South and Central America and several Island nations across the world are endemic to leptospirosis. Agricultural workers constitute a major portion of the risk group. In South and Southeast Asia alone, more than 900 million people engaged in agriculture, out of a total population of about 2.8 billion are at risk of leptospirosis. The total pool of people at risk worldwide is much bigger with a considerable population of other developing countries particularly in South and Central America. The epidemiology of leptospirosis, though depending upon a few core determinants, is extremely complex and dynamic with unique characteristics specific for each socio-cultural and ecological setting. However, a few broad categories of epidemiological patterns could be distinguished, that could form the framework for the detailed analysis of the specific epidemiology of the disease in each community and thus might aid the development of public health strategies for the control of the disease.

Source of Support: Nil. Conflict of Interest: None declared.