Leptospirosis an emerging infectious disease and preventive measures in Pakistan.

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Abstract:
Leptospirosis is a zoonotic bacterial disease that poses an epidemic risk, especially following significant rainfall, and is caused by different serovars of the genus Leptospira. This infection impacts both humans and animals, primarily spreading through contact with soil, water, or food that has been contaminated by the urine of infected animals, notably rodents, domestic pets, cattle, and various wild species. Leptospirosis is prevalent in Pakistan, as various environmental, sociocultural, and socioeconomic factors facilitate its spread and persistence. As reported by the Pakistan Bureau of Statistics, the population of Pakistan stands at 241.49 million, with 62.27% residing in rural areas. The literacy rate in Pakistan is 58%, but it drops significantly in rural regions to an overall 51%, and even lower to 42% among females' population. These statistics are sufficient to understand the overall impact of Leptospirosis in Pakistani population.

Keywords: : Bacterial Infections, Leptospirosis, prevention, Pakistan, Health care.

Leptospirosis is a zoonotic bacterial infection with epidemic potential, particularly after a heavy rainfall, caused by various serovars of genus Leptospira.[1] It affects both humans and animals and is typically transmitted through the contact with soil, water or food contaminated with the urine of infected animals, particularly rodents, pets, cattle and other wild animals. Leptospirosis is more prevalent in tropical and subtropical regions, including many developing countries such as Pakistan, where environmental, sociocultural and socioeconomic factors contribute to its transmission and persistence. In humans, the disease is typically characterized by various symptoms viz., fever, headache, cough, vomiting, muscle cramps and joint pain. Its incubation period is 7-12 days, and its range varies between 2-30 days.[1-3] Many multi-systemic disorders involving hepatic damage, abrupt renal failure, pancreatitis, meningitis, sporadic pulmonary hemorrhage, and respiratory distress syndrome are among the deadly life effects that have been linked to leptospirosis, according to studies.[3-5] According to Pakistan Bureau of Statistics, the population of Pakistan is 241.49 million and 62.27% of the population is living in the rural areas.[6] The literacy rate of the Pakistan is 58%, however, it is much lower in rural areas with overall 51%, which is further lower (42%) in females, because of various factors i.e., poor policy implementation, shortage of teachers, early age marriages, lack of awareness, long distance, lack of facilities and security issues.[6-8] A significant number of rural agricultural workers are women, who often bring their young infants and children with them while they labor in the farmland.

Prevalence and Incidence: Leptospirosis is endemic in many developing countries, particularly in regions with warm and humid climates, such as Southeast Asia, South America and parts of Africa. Its prevalence varies in different geographic regions, reaching between 11% to 30%.[9] Sri Lanka has the highest incidence of leptospirosis in the world, with over 700 deaths per annum, which is almost double the dengue fever incidence around the globe.[3] In Sri Lanka, the estimated annual incidence for hospital admission is approximately 52.1 patients per 100,000 population.[3] However, the global average incidence is reported as around 1.9 cases per 100,000 population.[9] The incidence of leptospirosis tends to be higher in rural areas where there is close contact between humans and animals due to sociocultural reasons and limited access to clean water and sanitation facilities.

Environmental Factors: Environmental conditions, such as flooding, heavy rainfall, and poor sanitation infrastructure, contribute to the transmission of leptospirosis in developing countries. Flooding increases vector populations and favorable conditions, and can lead to contamination of water sources with Leptospira bacteria, increasing the risk of exposure for humans and animals.[3]

Occupational risk: Certain occupations, such as farming, fishing, and sewage work, pose a higher risk of leptospirosis infection due to frequent contact with contaminated water and soil.[10] Workers in these industries, many of whom are from low-income backgrounds, are more susceptible to infection in developing countries where lifestyle of people is somewhat favorable for infection and the occupational health and safety standards may be inadequate.

Limited Awareness and Healthcare Resources: Awareness and education of the community, especially in rural areas, about the disease and its dispersal and the access to healthcare services and diagnostic facilities, may be limited in many developing countries. This can also result in underreporting and underdiagnosis of leptospirosis cases, leading to delays in treatment and increased morbidity and mortality rates.

Diagnostic Challenges: Diagnosing leptospirosis can be challenging, as its symptoms are non-specific and may resemble those of other febrile illnesses, such as dengue fever and malaria.[11] In developing countries like Pakistan, with limited laboratory infrastructure and diagnostic capabilities, and the "inaccurate" rather misleading diagnosis of leptospirosis may further be complicated.[12]

Public Health Interventions: Preventive measures, such as; improving sanitation including infrastructure and its maintenance, implementing rodent control programs, immunization of dogs and livestock, and promoting education and awareness among the community about the risk of

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leptospirosis and its link with sociocultural practices, are essential for reducing the burden of this disease in developing countries.[13] These actions would also contribute towards achieving the United Nations sustainable development goals (SDGs) No. 3, 4, 5, 6, 8 and 10.[14] Preventive measures such as vaccination for high-risk populations, including agricultural workers and military personnel, may also be considered in the endemic areas.

One Health Approach: Given the zoonotic nature of leptospirosis, a One Health approach that integrates human, animals, and environmental health is crucial for its prevention and control in developing countries.[15,16] Collaborative efforts between health authorities, veterinary services, environmental agencies, and community stakeholders, are much needed to address the complex factors contributing to leptospirosis transmission. In particular, the Farmers' Field Schools (FFS), can play a significant role to provide information and preventive measures guidelines to the people living in rural areas of Pakistan.[17]

To conclude, leptospirosis is a considerable public health concern in many developing countries, including Pakistan, where its impact is intensified by various factors such as environmental conditions, sociocultural influences, socioeconomic challenges, educational gaps, and healthcare limitations. It is imperative to focus on enhancing public education and awareness, bolstering surveillance and diagnostic resources, and implementing effective prevention and control measures to alleviate its effects on human and animal health while promoting sustainable development. Additionally, advanced preventive strategies are essential to address the anticipated rainy season in Pakistan and its subsequent effects in rural regions, where access to education and healthcare is often limited.

Declaration of Competing Interest

None.

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