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Community-Perceived Barriers and Facilitators to Leptospirosis Prevention in Rural Endemic Areas

Amrita Singh, Research Scholar, Malwanchal University, Indore

Prof.Dr Pradeep VS. Research Supervisor, Malwanchal University, Indore

Abstract

Leptospirosis is a neglected bacterial zoonosis that disproportionately affects people exposed to contaminated water, soil, rodents, livestock, and flood environments. Rural residents in endemic regions often understand that the disease is serious, yet preventive recommendations may conflict with livelihood demands, limited household resources, inadequate drainage and waste services, and deeply established social practices. This evidence-informed narrative article examines community-perceived barriers and facilitators to leptospirosis prevention, drawing on qualitative studies, community surveys, epidemiological research, and authoritative guidance. Recurrent barriers include incomplete or misleading knowledge, low perceived personal susceptibility, normalization of occupational exposure, discomfort and cost of protective equipment, dependence on paddy farming and animal care, poor sanitation, rodent infestation, delayed recognition of symptoms, and limited trust in episodic health campaigns. Knowledge alone does not reliably produce protective behaviour when structural conditions make exposure unavoidable. Facilitators include trusted communication through local health workers and community leaders, practical demonstrations, affordable and climate-appropriate protective equipment, reliable water and sanitation, coordinated rodent and waste control, early-care pathways, seasonal alerts, and community participation in locally designed interventions. Effective programmes should combine individual protection with environmental improvement and One Health coordination across human health, veterinary, agriculture, sanitation, and disaster-management sectors. Prevention messages must be specific, feasible, non-stigmatizing, and timed before monsoon, flooding, and peak agricultural activity. Community members should

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be treated as partners who possess essential knowledge of local exposure routes and workable solutions. A sustained, participatory approach can narrow the gap between awareness and practice and improve timely prevention and care in rural endemic settings.

Keywords: *leptospirosis; rural communities; prevention; barriers; facilitators; risk perception; One Health; health education*

Introduction

Leptospirosis is caused by pathogenic Leptospira bacteria and is transmitted when abraded skin or mucous membranes contact urine from infected animals or environments contaminated by that urine. Rodents are important reservoirs, but cattle, pigs, dogs, and other mammals may also contribute to transmission. Exposure commonly occurs through wet soil, paddy fields, stagnant water, drains, mud, and floodwater. The disease may resemble other acute febrile illnesses during its early stage, while severe infection can involve jaundice, kidney injury, pulmonary complications, bleeding, or death (World Health Organization [WHO], 2003).

The burden falls heavily on resource-constrained tropical regions and on working-age people whose occupations involve outdoor or animal contact. Global modelling estimated approximately 1.03 million cases and 2.90 million disability-adjusted life years annually, with the highest burden in resource-poor tropical countries (Torgerson et al., 2015). In India, outbreaks and persistent transmission have been documented in coastal and high-rainfall states, including Kerala, and national guidance emphasizes personal protection, health education, rodent control, drainage, surveillance, and early reporting (National Centre for Disease Control [NCDC], 2015).

Biomedical advice often appears straightforward: avoid contaminated water, wear boots and gloves, cover wounds, control rodents, improve sanitation, and seek care promptly for compatible fever. Rural experience makes each action more complicated. A farmer may be unable to avoid a flooded field, a household may have no protected waste-storage system, and protective equipment may be unaffordable or impractical in heat and deep mud. Prevention

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therefore depends on how communities understand risk and whether recommended actions fit their economic, environmental, and social realities.

The Community Perspective and the Knowledge-Practice Gap

Community perception is not simply a measure of whether people have heard of leptospirosis. It includes local names for the illness, beliefs about its cause, perceived severity and susceptibility, memories of earlier cases, confidence in health services, and judgements about whether prevention is possible. In Malaysia, qualitative research found that the popular label 'rat urine disease' increased recognition but also narrowed understanding of other animal reservoirs, environmental pathways, and entry through wounds (Sukeri et al., 2018). A later qualitative study found that participants regarded the disease as potentially severe but often believed that they themselves were unlikely to acquire it (Sukeri et al., 2020).

Community surveys repeatedly reveal a gap between knowledge and action. Rural Malaysian respondents demonstrated substantial deficits in knowledge, attitudes, and preventive practices (Nozmi et al., 2018). Among Sri Lankan farmers, satisfactory knowledge and attitudes coexisted with good preventive practice in only a small minority (Dhanasinghe & Gamage, 2024). Rural school adolescents also reported limited use of boots and gloves despite recognizing agricultural risk (Samarakoon & Gunawardena, 2013). These findings show why prevention programmes must examine capability, opportunity, and acceptability rather than equating message exposure with behaviour change.

Community-Perceived Barriers to Prevention

Incomplete Knowledge and Misconceptions

Residents may recognize the disease name without understanding how infection occurs, which animals are involved, how bacteria enter the body, or which early symptoms require care. Household surveys in Trinidad and Brazil documented incomplete knowledge of symptoms, transmission, and effective prevention even in exposed communities (Mohan & Chadee, 2011; Navegantes de Araujo et al., 2013). Information obtained mainly through dramatic outbreak

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reports, social media, or word of mouth may emphasize death while providing little practical guidance. Technical messages can also fail when they are delivered in unfamiliar language, use generic advice, or do not distinguish leptospirosis from dengue, influenza, or other febrile illnesses.

Low Perceived Susceptibility and Normalization of Risk

Repeated contact with mud, animals, and floodwater can become viewed as an ordinary feature of rural life. When previous exposures did not result in recognized illness, residents may conclude that they are resistant or that the risk applies only to sanitation workers, severely flooded households, or people with visible wounds. Low perceived susceptibility weakens motivation even when disease severity is acknowledged (Sukeri et al., 2020). False interpretations, limited readiness, and delayed recognition have also been identified as sociocultural barriers in rural Sri Lanka (Udayanga et al., 2024).

Livelihood, Cost, and Practicality

The strongest barrier may be that exposure is tied to income. Paddy farming, livestock care, fishing, drainage work, waste handling, and post-flood cleaning cannot simply stop during high-risk periods. Boots may fill with water, gloves may reduce grip, and heavy protective materials may be uncomfortable in humid conditions. Families may prioritize food, seed, transport, or animal feed over equipment that offers an uncertain future benefit. The association of infection with outdoor work, rural residence, poverty, untreated household water, animals, rainfall, and proximity to rivers demonstrates that risk is produced by intersecting livelihood and environmental conditions rather than by individual choice alone (Lau et al., 2016).

Environmental and Infrastructure Constraints

Household cleanliness cannot compensate fully for open drains, accumulated waste, waterlogging, unprotected water sources, damaged roads, or inadequate sewage systems. Rodent control by one family is unlikely to succeed if food waste and shelter remain available throughout the neighbourhood. Prospective evidence from a highly exposed Brazilian community linked repeated infection to poverty and proximity to open sewers, illustrating how

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infrastructure can sustain exposure despite awareness (Felzemburgh et al., 2014). Although the setting was urban, the principle applies to rural settlements with shared drainage, livestock runoff, flood-prone paths, and irregular waste collection.

Health-System and Communication Barriers

Short campaigns during outbreaks may raise alarm without building durable confidence. Residents may delay care because fever appears mild, travel is costly, daily wages will be lost, or the nearest facility is difficult to reach. Previous experiences of long waiting times, uncertain diagnosis, or conflicting instructions can reduce trust. Indian community research in the Andaman and Nicobar Islands found uneven awareness and preventive practice across rural and urban populations, supporting the need for locally differentiated communication rather than a single mass message (Anand et al., 2023). Prevention is further weakened when health, veterinary, agriculture, sanitation, and disaster-response services work separately.

Facilitators of Feasible and Sustained Prevention

Trusted, Repeated, and Locally Meaningful Communication

Rural residents are more likely to act on messages delivered by trusted local health workers, primary-care teams, farmer groups, women's groups, teachers, veterinary staff, and community leaders. Communication should explain multiple animal reservoirs, environmental transmission, wound protection, early symptoms, and where to obtain care. Pictures, demonstrations, local-language audio, and brief case scenarios are more useful than text-heavy leaflets. Messages should be repeated before the monsoon and agricultural peak, reinforced after floods, and linked to specific local locations and activities. Qualitative evidence indicates that misconceptions are best addressed through dialogue that allows questions and correction, not one-way warning (Sukeri et al., 2018; Udayanga et al., 2024).

Affordable Protection Adapted to Work

Protective measures become enabling when they are practical. Programmes can arrange subsidized boots and gloves in appropriate sizes, establish replacement mechanisms, demonstrate

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cleaning and drying, and test equipment with users in actual fields. Where full avoidance is impossible, residents can cover cuts with waterproof dressings, wash with safe water and soap after exposure, avoid touching the face with contaminated hands, and change wet clothing promptly. Such measures should be presented as layers of protection, not as guarantees. NCDC guidance supports protective footwear and gloves, wound care, health education, and focused preventive action in high-risk settings (NCDC, 2015). Any consideration of antibiotic prophylaxis must follow current public-health or clinical guidance and should never be promoted for unsupervised self-medication.

Collective Environmental Action

Community clean-up days, covered storage of food and animal feed, secure household waste containers, coordinated refuse removal, drainage maintenance, and reduction of rodent harbourage can make individual behaviour more effective. High-risk maps developed with residents can identify flooded footpaths, paddy access points, waste sites, cattle-shed runoff, and households needing additional support. Local government must respond with drainage repair, safe water, waste collection, and rodent-management resources; otherwise participation may become symbolic. Evidence that knowledge is associated with safer practice in some riverside communities also suggests that education is most useful when residents have realistic options for action (Ricardo et al., 2018).

Early Recognition and Accessible Care

A clear pathway for fever after occupational or floodwater exposure is a major facilitator. Residents should know whom to contact, which facility can assess them, and why they must report exposure history. Primary-care workers need seasonal reminders to consider leptospirosis among compatible febrile illnesses and to refer severe cases promptly. Community volunteers can reinforce danger signs and follow up with vulnerable households. The WHO guidance emphasizes integrated diagnosis, surveillance, outbreak management, and prevention, while national Indian guidance highlights early reporting as a means of preventing severe illness and death (NCDC, 2015; WHO, 2003).

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Participation and One Health Coordination

Interventions are more acceptable when residents help identify barriers, select communication channels, test equipment, schedule activities, and review outcomes. Farmers and animal keepers hold detailed knowledge of seasonal water flow, animal movement, rodent activity, and work practices. Their involvement prevents planners from recommending measures that are impossible during planting, harvesting, or flood recovery. One Health coordination should connect human surveillance with veterinary information, livestock management, environmental sanitation, and disaster preparedness. Community feedback should be used to revise the programme rather than collected only as a satisfaction measure.

Implications for Community Health Programmes

A strong rural prevention programme should combine four levels of action. At the individual level, it should build accurate risk recognition, wound protection, safe post-exposure hygiene, and timely care-seeking. At the household level, it should support food protection, waste management, rodent-risk reduction, and safe animal-care practices. At the community level, it should improve drainage, water safety, waste removal, equipment access, and seasonal preparedness. At the system level, it should coordinate surveillance, clinical readiness, veterinary action, agriculture, local government, and risk communication.

Evaluation should measure more than knowledge. Relevant indicators include use and acceptability of protective equipment, ability to identify transmission routes and danger signs, time from symptom onset to care, availability of safe water, rodent and waste conditions, exposure-specific practices, and participation in environmental action. Qualitative interviews can explain why recommended behaviours were adopted, modified, or rejected. Because local ecology and livelihoods differ, successful components should be adapted rather than copied unchanged across endemic districts.

This article synthesizes existing evidence and does not present findings from a new community sample. Its conclusions should therefore guide programme design and future research rather than be represented as original lived-experience results. Community-based qualitative and mixed-

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methods studies are needed in specific endemic regions of India to examine gender, occupation, caste and tribal context, disaster exposure, health-service trust, and the affordability of prevention.

Conclusion

Leptospirosis prevention in rural endemic areas is constrained not only by limited knowledge but also by livelihood dependence, low perceived susceptibility, impractical protective measures, poverty, environmental hazards, and fragmented services. Facilitators emerge when communication is trusted and repeated, protective options are affordable, sanitation and rodent control are collective, care is accessible, and residents participate in decisions. Sustainable prevention requires a partnership that combines personal protection, structural improvement, early clinical response, and One Health coordination.

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