Journal of Antimicrobial Stewardship Practices and Infectious diseases

JASPI

Check for updates

June 2024/ Volume 2/Issue 2

LETTER TO EDITOR

Zoonotic Diseases: Changing Epidemiology in Indian Scenario

Sai Hyndavi, Yogesh Arvind Bahurupi*, Mahendra Singh, Pradeep Aggarwal

Department of Community and Family Medicine, All India Institute of Medical Sciences, Rishikesh, Uttarakhand, India

*** Corresponding author:** Yogesh Bahurupi, Department of Community and Family Medicine, All India Institute of Medical Sciences, Rishikesh-249203, Uttarakhand, India

Email: dr.yogeshab@gmail.com

Dear Editor,

Animals have played a significant part in human evolution. Henceforth, human and animal habitat sharing expanded, paving the way for the emergence of zoonotic illnesses.[1] Zoonosis is defined as any illness or condition that can naturally spread from vertebrate animals to humans. More than 200 zoonoses are recognized in the world, which poses a severe threat to public health.[2] The epidemiology of the following six zoonotic diseases— scrub typhus, leptospirosis, cutaneous anthrax, brucellosis, Lyme disease and Crimean Congo Haemorrhagic Fever—is evolving in India.

Scrub typhus: It is caused by the bacterium *Orientia tsutsugamushi*, transmitted to humans through the bite of infected chigger mites. Rodents serve as the primary reservoir. The mites become infected when they feed on these rodents. In South India, the illness manifests usually during the winter months, while in the north, the peak occurs in post-monsoon, exhibiting seasonality.[3,4] This disease, earlier known to be restricted to rural habitats, is currently reported from a variety of habitats ranging from hills to plains, forests to desert, agricultural to dry lands, and rural to urban **areas.**[5]

Leptospirosis: It is caused by spirochete *Leptospira*, transmitted from animals to humans through primarily direct contact with the urine of infected animals, sometimes indirectly with the contact with water, soil, or food contaminated with the urine of infected animals. It is linked to substantial morbidity and mortality. Due to factors such as animal husbandry, unplanned urbanization, severe monsoons, and an agrarian lifestyle, the disease is most prevalent in southern, central, and eastern India. Many instances are recently recorded in northern and western parts such as Uttar Pradesh, Gujarat, and Maharashtra.[6]

Cutaneous anthrax: *Bacillus anthracis* is the causative agent of cutaneous anthrax, a zoonotic illness that typically appears following direct contact with animals or animal products contaminated with the disease.[7] Herbivorous animals, such as cattle, sheep, and goats, are typically infected and eventually killed by the epizootic disease anthrax. It would not take long for anthrax to become recognized entirely as an enzootic illness in a given area, where the zoonotic transmission will likely start, and human cases will likely surface, posing a severe threat to public health.[8]

Brucellosis: It is caused by bacteria of the genus *Brucella*. It primarily affects animals but can be transmitted to humans, typically through direct or indirect contact with infected animals or their

Citation:- Hyndavi S, Bahurupi YA, Singh M, Aggarwal P. Zoonotic Diseases: Changing Epidemiology in Indian Scenario. *JASPI.* 2024;2(2):60-62

products. Human brucellosis has a general incidence of 17–34% in India.[9] Both its prevalence and spread are influenced by procedures used to produce milk and milk products and animal husbandry techniques.[10]

Lyme Disease: This anthropo-zoonotic disease is transmitted by an arthropod vector and is caused by many genospecies of the pathogenic spirochete *Borrelia burgdorferi*. The primary method of human transmission is by tick (*Ixodes* spp.) bite. Reports of instances of Lyme disease in India have come from Himachal Pradesh, Haryana, Bihar, Uttarakhand, Uttar Pradesh, Maharashtra, and some regions of south India. Northeastern Indian states have reported a 13% seroprevalence of *Borrelia*-positive cases. There have also been reports of Ixodes ticks in the Himalayan region.[11]

Crimean Congo Hemorrhagic fever (CCHF): It is caused by the CCHF virus (CCHFV). It is transmitted to humans by nosocomial infection, tick (*Hyalomma*) bites, crushing ticks with bare hands, and contact with infected animals or people's blood or bodily fluids.[12]

The following factors influence the changing epidemiology of zoonotic diseases in India.

- *Urbanization and deforestation:* A higher population density encourages deforestation. There is a decline in the "recorded forest area" in the tribal districts, which account for 60% of all forests in India.[13] These factors contribute to the emergence and reemergence of zoonotic diseases originating in arthropods and rodents, including leptospirosis, dengue, and japanese encephalitis, because of the disruption of the natural habitat of wildlife and increased breeding grounds for vectors.[14]
- *Vector genetics and competence:* Viral adaptability to individual hosts and their ability to increase are caused by genetic reassortment, genetic recombination, and mutations. Influenza outbreaks are a prime example of this. The ability of diverse virus strains and mosquito species to infect, spread, and transmit viruses is known as vector competence.[15] *Aedes albopictus* can now spread the chikungunya virus within a few days of ingesting infected blood, suggesting it is a more potent vector.[14] Such attributes increase the challenge of dealing with epidemics or pandemics caused by rapidly evolving pathogens and their simultaneously adapting vectors.
- *Increased Human-Animal Interaction:* Growing human-animal interactions put human lives at constant risk by opening doors for the spread of new contagious diseases. Animals are forced to seek food in nearby human homes due to declining biodiversity, increasing conflict and interaction between humans and animals. To accommodate the need for meat, emerging nations have also begun to engage in intensive animal agriculture, mostly raising chickens and turkeys under lengthy shadows. Typically, between 15,000 and 50,000 birds are raised in this manner. The unnatural confinement of several animals indoors in a small area with restricted air flow and the generation of copious amounts of waste likely facilitate the quick selection, amplification, and spread of zoonotic infections.[16]
- *Antimicrobial Resistance (AMR):* Antimicrobial resistance in animal husbandry is mainly caused by antimicrobial usage. When a microbe no longer reacts to a medication to which it was previously sensitive, AMR emerges. Animal feed also contains antibiotics. Approximately 3% of the antimicrobials used in food animals worldwide are consumed by animals in India.[17]
- *Widespread International travel:* Globally, the number of people travelling abroad has grown dramatically, accelerating the spread of infectious diseases, including zoonotic diseases, from one continent to another.

Therefore, developing and nurturing an efficient epidemiology surveillance network and exhaustive national territorial meshing is needed to capture animal diseases, including zoonotic and emerging diseases. Understanding the evolving epidemiology with respect to agent, host and environment through focused research and availing a database for the same is required. Ultimately, the need of the hour is employing a multidisciplinary, intersectoral one-health approach to reduce this ever-increasing trend of zoonotic diseases.

CONFLICTS OF INTEREST STATEMENT

The authors declare no conflict of interest.

SOURCE OF FUNDING

None

ISSN: 3048-4510 (Online)
DOI: 10.62541/jaspi037

AUTHOR'S CONTRIBUTION

SH: Writing the draft

YAB: Conceptualization; Review & Editing

MH: Review & Editing

PA: Supervision; Review & Editing

REFERENCES

1. Kumar S, Swain S, G S P, Singh BS, Aggarwal D. Zoonotic Diseases in India. *Indian J Community Med*. 2020;45(Suppl 1):S1-S2.
2. WHO. Zoonoses. Key facts. World Health Organization. 2020. Accessed June 28, 2024. https://www.who.int/news-room/fact-sheets/detail/zoonoses
3. Devamani CS, Schmidt WP, Ariyoshi K, Anitha A, Kalaimani S, Prakash JAJ. Risk Factors for Scrub Typhus, Murine Typhus, and Spotted Fever Seropositivity in Urban Areas, Rural Plains, and Peri-Forest Hill Villages in South India: A Cross-Sectional Study. *Am J Trop Med Hyg*. 2020;103(1):238-48.
4. Jose A, Chaudhary A, Panda PK, Kalita D. Scrub typhus in the Himalayan ranges and sub-Himalayan plains: Recognizing an expanding clinical syndrome. J Med Evid 2020;1(1):8-14.
5. Devasagayam E, Dayanand D, Kundu D, Kamath MS, Kirubakaran R, Varghese GM. The burden of scrub typhus in India: A systematic review. *PLoS Negl Trop Dis*. 2021;15(7):e0009619.
6. Gupta N, Wilson W, Ravindra P. Leptospirosis in India: a systematic review and meta-analysis of clinical profile, treatment and outcomes. *Infez Med*. 2023;31(3):290-305.
7. Nayak P, Sodha SV, Laserson KF, et al. A cutaneous Anthrax outbreak in Koraput District of Odisha-India 2015. *BMC Public Health*. 2019;19(Suppl 3):470.
8. Patil RR. Anthrax: public health risk in India and socio-environmental determinants. *Indian J Community Med*. 2010;35(1):189-90.
9. Shukla JL, Husain AA, Lyngdoh SA, et al. Seroepidemiological study of human brucellosis in the Northeast region of Meghalaya, India. *J Family Med Prim Care*. 2022;11(9):5176-86.
10. Mangalgi SS, Sajjan AG, Mohite ST, Kakade SV. Serological, Clinical, and Epidemiological Profile of Human Brucellosis in Rural India. *Indian J Community Med*. 2015;40(3):163-7.
11. Mahajan VK. Lyme Disease: An Overview. *Indian Dermatol Online J*. 2023;14(5):594-604.
12. Sharma SN, Singh R, Balakrishnan N, Kumawat R, Singh SK. Vectors of Crimean-Congo Hemorrhagic Fever (CCHF): Prevention and its control. *J Commun Dis*. 2020;52(3):22–6.
13. Forest Survey of India. India State of Forest Report 2019. Ministry of Environment Forest and Climate Change. 2019. Accessed June 28, 2024. www.fsi.nic.in
14. Tazerji SS, Nardini R, Safdar M, Shehata AA, Duarte PM. An Overview of Anthropogenic Actions as Drivers for Emerging and Re-Emerging Zoonotic Diseases. *Pathogens*. 2022;11(11):1376.
15. Neelam Saba, Wahied Khawar Balwan. Potential Threat of Emerging and Re-Emerging Zoonotic Diseases. *Annals of the Romanian Society for Cell Biology*. 2021. 29–36.
16. Debnath F, Chakraborty D, Deb A, Saha M, Dutta S. Increased human-animal interface & emerging zoonotic diseases: An enigma requiring multi-sectoral efforts to address. Indian J Med Res. 2021.153: 577–84.
17. Mutua F, Sharma G, Grace D, Bandyopadhyay S, Shome B, Lindahl J. A review of animal health and drug use practices in India and their possible link to antimicrobial resistance. *Antimicrob Resist Infect Control*. 2020;9(1):103.