

LETTER TO EDITOR

Boundaries Divided, Diseases Unbound: Zoonotic Threats Crossing Borders

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Dear Sir,

Countries are often delineated by borders, establishing distinct geographical and political demarcations; however, pathogens exist beyond such constraints. They traverse these artificial separations, disseminating across continents and nations with no regard for the boundaries represented on cartographic representations. This occurrence underscores the interdependence of global health, highlighting that a virus or pathogen can seamlessly transition from one nation to another, impacting populations irrespective of their national affiliations. One may have encountered an unparalleled crisis manifested in the zoonotic disease referred to as COVID-19, which has exerted a profoundly detrimental influence on public health worldwide. Notwithstanding progress in global health initiatives, the international community continues to contend with a spectrum of zoonotic infections.

Zoonotic diseases, or zoonoses, represent infections capable of being transmitted naturally between vertebrate animals and humans, encompassing a diverse array of pathogens, including bacteria, viruses, fungi, and parasites (1). The propagation of zoonotic diseases occurs through various intricate mechanisms that involve interactions among

humans, animals, and the environment. Transmission pathways encompass direct contact with infected animals, ingestion of contaminated food, and vector-borne transmission routes, such as bites from ticks or mosquitoes (2). Environmental determinants, including climate change and urbanization, exacerbate these interactions by increasing human encroachment into wildlife habitats, thereby heightening the risk of exposure to emergent pathogens (3). Furthermore, the global exchange of goods and individuals facilitates the rapid dissemination of diseases, as evidenced by outbreaks such as SARS, which swiftly traversed borders due to international travel infrastructures (4). Wild avian species also serve a pivotal role as vectors of zoonotic pathogens, contributing to the spread of diseases through migratory patterns and fecal contamination (5).

Global patterns in zoonotic diseases reveal a notable escalation in both the frequency and severity of spillover events, with an annual reported increase of 4.98% in spillover occurrences and 8.7% in associated fatalities (6). Emerging infectious diseases (EIDs), predominantly of zoonotic origin, constitute over 60% of total human infections, with wildlife acting as essential reservoirs (7). Prominent zoonotic diseases encompass

COVID-19, severe acute respiratory syndrome (SARS), Middle East respiratory syndrome (MERS), Ebola, Rift Valley fever, leptospirosis, brucellosis, scrub typhus, Lyme disease, and Mpox (Monkeypox) (8). Recently, the World Health Organization (WHO) has classified Mpox as a Public Health Emergency of International Concern.

Zoonotic diseases manifest a broad spectrum of symptoms contingent upon the specific pathogen involved. Common clinical manifestations encompass flu-like symptoms such as fever, myalgia, and fatigue, which may escalate to severe complications, including respiratory distress or neurological disorders, as observed in Hantavirus Pulmonary Syndrome and Lymphocytic Choriomeningitis (9). Other zoonoses, such as Salmonellosis, are characterized by gastrointestinal symptoms, including diarrhoea, abdominal cramps, and vomiting (10). The clinical presentation can vary considerably, with certain infections leading to acute conditions or chronic health complications, thereby underscoring the necessity for heightened awareness and early diagnosis, particularly in vulnerable demographics such as children and immunocompromised individuals (11).

In an increasingly interconnected global landscape, the dissemination of infectious diseases functions as a poignant reminder that health constitutes a universal imperative, thereby necessitating cooperative endeavours transcending national boundaries to effectively address and manage outbreaks. To address zoonotic diseases and achieve sustainable development goal 3: "Ensure healthy lives and promote well-being for all at all ages" requires a holistic One Health framework that synthesizes initiatives across human, animal, and environmental health domains. This paradigm underscores the importance of collaboration among diverse stakeholders, including public health authorities, veterinary practitioners, and environmental researchers, to advance disease prevention, monitoring, and control strategies (12). Essential elements of this framework entail the establishment of resilient surveillance systems, the regulation of antibiotic utilization, and the development of a

zoonotic disease registry to promote data sharing and coordination among various agencies (13). Furthermore, tackling the challenges presented by wildlife reservoirs, including the consumption of bushmeat and habitat encroachment, is imperative; public awareness campaigns, vaccination initiatives, and stringent wildlife management policies are critical to diminish the risks associated with zoonotic transmission (14,15). By promoting interdisciplinary dialogue and executing organized frameworks, the One Health paradigm has the potential to substantially enhance global health outcomes pertaining to zoonotic diseases (16).

CONCLUSION

To conclude, the initiation of the National One Health Programme by the Ministry of Health and Family Welfare, alongside institutions such as the National Centre for Disease Control and the Indian Council of Medical Research, underscores a critical progression in managing the growing issue of zoonotic diseases in India. By promoting synergistic collaboration across the sectors of human, animal, and environmental health, this initiative aspires to establish a holistic framework for the prevention and management of zoonoses. The recent "Vishanu Yudh Abhyas" (Virus war exercise) a mock drill exemplifies this dedication, permitting stakeholders to assess and refine their preparedness and response capabilities in the context of zoonotic disease outbreaks. As zoonotic diseases persist in presenting challenges on a global scale, the strategic measures implemented under this program are essential for protecting public health and ensuring a coordinated approach to impending health threats.

DECLARATION OF GENERATIVE AI AND AI ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

The authors haven't used any generative AI/AI assisted technologies in the writing process.

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