Pandemics & Pestilences: Emerging Viral Zoonoses

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The genesis of life on earth and evolution marked by the passage of time resulted in the descent of humans. In this biosphere, another life form shares our history as a molecular tool that shaped our genetics, and as a disease agent, it could well be our nemesis. These are minuscule organisms called Viruses; the study of these agents is hardly a hundred years old. And yet viruses dominate today’s disease landscape from Monkeypox to COVID-19 from Nipah to Viral Hemorrhagic Fevers (Ebola, Marburg, KFD).

With more than 6.6 million deaths reported due to SARS CoV-2 alone, these emerging threats are usually poorly forecast. The advancement in space exploration, deep-sea investigations, and silica-based technological prowess has instilled a sense of complacency in the arena of disease control. While interplanetary travel, space colonization, and artificial intelligence invoke robust responses in people's minds, zoonotic diseases often remain neglected.

Zoonotic diseases are a cluster of diseases that could be transmitted to us from lower animals. Animals are host to several viruses and over the years they have learned to adapt and co-exist with such microorganisms. Nearly 75% of all infectious diseases in the world today are of animal origin and 40% of them are due to viruses. WHO estimates that zoonoses account for 2.5 billion cases and 2.7 million deaths annually. Even by the most conservative estimates, zoonotic diseases account for the major portion of infectious diseases universally. Worldwide deaths, significant disease sequelae, and the cumulative economic burden are preventable catastrophes. Once an outbreak metamorphoses into a pandemic, it is an arduous task to design a biological (vaccine, antisera, monoclonals) or a drug (antivirals, steroids). Most of the zoonotic viruses are RNA viruses (HIV, Ebola, SARS CoV-1&2, MERS, Rabies), they possess high mutation rates and can evade therapeutic interventions. These viruses remain refractory to vaccination, escape human immunity and resist even the best of antivirals. Further, close association with exotic pet animals increased contact with wildlife, and the bush meat trade ensures viruses jump their reservoir species to the human host.

In the Indian subcontinent, the jungles of Mysore report annual outbreaks of Kyasanur Forest Disease from primates. West Nile and Crimean Congo viruses are making inroads in Uttar Pradesh and Rajasthan. Chandipura an emerging neurotropic virus produces high fatalities in children in India’s rural pockets in Andhra Pradesh and Gujarat.
Bat-borne Nipah virus transmitted through contaminated palm sap caused severe disruption in Kerala before it could be contained. These emergent viruses add to the collective burden of traditional viral zoonoses like Rabies and Japanese Encephalitis.

Continents with an abundance of animal diversity and a pool of viruses are perfect hotspots for disease emergence. Southeast Asia and Sub-Saharan Africa record many disease incursions from animal populations every year. However, with climate change, this traditional pattern is likely to transpose as warming non-tropical countries may report more zoonotic outbreaks. Worldwide interconnectedness through travel compounds the problem further. Wet markets trading live animals pose a unique problem as they are breeding grounds for previously unknown viruses entering the human population. War and refugee migration are other factors that can facilitate or amplify human-animal contact and thereby increase the possibility of zoonotic infections. Breakdown of housing and shelter in these conflict zones increases one’s exposure to foraging animals that can transmit zoonotic diseases. The current global milieu is congenial for the emergence of previously unknown viruses.

Avoidance of exotic pets, reducing human-animal contact, stopping bush meat trade, regulating research on zoonotic pathogens, reducing deforestation, and closure of wet markets are some of the widely recognized options. The ‘One World-One Health’ approach encourages increased intersectoral collaboration between practitioners of human and animal medicine. The positive outcome of such an endeavour would be rapid recognition of epizootics (epidemics in animals), which could act as an early warning system. Apart from viral disease surveillance, infectious disease modelling, information exchange, and mutually collaborative research could gain momentum. Viral forecasting can be the first step in a chain of preventive measures that serve as a barricade against looming threats.

In the years to come, some exotic virus lurking in bats roosting among thick jungle foliage’s or lying dormant in a caged pet in wet markets or residing in a safari park wildlife, is waiting for that moment to spillover to the human host and unleash a pandemic. Although it would be impossible to foretell such an event, we can deploy pre-emptive measures to contain such outbreaks. Unless nations prioritize global wellness and reallocate resources to control zoonotic disease emergence, we would be reversing milestones attained in global health!