

# Emergence of Zoonoses: A Planet in Distress

Nandini Chatterjee

*Bengal Physician Journal* (2022): 10.5005/jp-journals-10070-7086

The world has not yet recovered from the scourge of coronavirus disease-2019 (COVID-19) and another virus is already claiming lives in 80 countries as of 2 August 2022. An outbreak of “monkeypox” was confirmed in May 2022, initially in the United Kingdom. The outbreak has one very significant characteristic: It was occurring in countries outside Central and West Africa its original birthplace. Cases were reported not only from Spain, Germany, France, and other European countries but also in the United States of America, South America, and Asia, where there had been no history or report of monkeypox in the past. On 23 July 2022, the World Health Organization (WHO) declared the outbreak a public health emergency of international concern (PHEIC), hailing this to be a to a global health emergency.

At present, there are a total of 24,864 confirmed cases in nearly 80 countries that do not typically see cases including India that has recently confirmed its first monkeypox death, a 22-year-old male who died in Thrissur, Kerala, India on 30 July 2022.

According to the National Institute of Allergy and Infectious Diseases, emerging infectious diseases are commonly defined as follows:<sup>1</sup>

- Outbreaks of previously unknown diseases.
- Known diseases that are rapidly increasing in incidence or geographic range in the last two decades.
- Persistence of infectious diseases that cannot be controlled.

It is important to note that most of the emerging infections are zoonoses.

Zoonotic disease emergence has several stages, with an early spate of spillover events, followed by repeated small outbreaks in communities, and thereafter pathogen adaptation for human-to-human transmission.

The classical example is the human immunodeficiency (HIV) virus pandemic. Initially, it was driven by bushmeat hunting and was the primary driver of its emergence. A second phase of emergence was driven by increased urbanization and road expansion in Central Africa beginning in the 1950s with small clusters of infection. Ultimately, the humans took up the baton and transmitted it all over the world by changes in sexual behavior, drug use, trade in blood derivatives, and population mobility.

The current recognition of zoonoses sweeping through human population can be attributed to easy accessibility of up-to-date diagnostic modalities for identification of specific pathogens, and better awareness among physicians. Moreover, the immunocompromised patient pool has increased due to the HIV pandemic, organ transplantation, and the improved survival of those with immunodeficiencies, leading to an enhanced susceptibility.

Department of Medicine, IPGMER SSKM Hospital, Kolkata, West Bengal, India

**Corresponding Author:** Nandini Chatterjee, Department of Medicine, IPGMER SSKM Hospital, Kolkata, West Bengal, India, Phone: +91 8145005804, e-mail: Nandinibpj21@gmail.com

**How to cite this article:** Chatterjee N. Emergence of Zoonoses: A Planet in Distress. *Bengal Physician Journal* 2022;9(2):27–28.

**Source of support:** Nil

**Conflict of interest:** None

However, it is important to note that they have the following common features:

- They are spreading like wildfire in a wide geographical distribution.
- There is rapid emergence of newer strains of viruses.
- They are persisting in the environment with a steady human to human transmission chain.

## WHY IS THIS HAPPENING?

### Population Explosion

United Nations (UN) reports that the world population doubled from the estimated 2.5 billion in 1950 to more than 6.5 billion in 2005 and with an annual average growth rate of 1.72% (UN, 2007), it will become slightly more than 9 billion by 2050. More than half of these annual increases are attributed to India, Pakistan, and Bangladesh.

This ever-expanding population needs ample food, habitat, sanitation, health infrastructure, entertainment, and travel. Each and every one of these needs is related to emergence and spread of zoonosis.

### Dietary Changes

It has been found that in the developing world, rapid population expansion and increasing incomes are leading to a change of diet from cereals to one that incorporates more animal protein, a phenomenon known as the “nutrition transition.” More demands for meat and milk production has far-reaching consequences on human and animal health. Augmentation of animal husbandry for food animals and more food products, all affect the microbial traffic resulting in emerging viral, bacterial, and parasitic zoonoses.

### Habitation

Human encroachment on wildlife habitat has increased interaction between animals and humans, resulting in increased chances for both emergence of novel or re-emergence of known infectious

diseases in wildlife and their transmission to humans. There is also cross-species pathogen transmission and the emergence of new epidemic strains that affect humans and animals alike.

After deforestation, land is converted into agricultural or grazing areas. Cleared lands and culverts that collect rainwater are ideal for larvae of mosquitos to thrive. Similarly, urbanization and overcrowding facilitate disease transmission directly while poor sanitation and built environments such as dams providing breeding sites for disease vectors such as mosquitoes, are the indirect methods of spread.

### Population Movement

After the emergence of a zoonotic disease, its dissemination in the human population is likely to be facilitated by population movements.<sup>2</sup> It is the reason why “monkeypox,” which initially emerged in Africa has spread to Europe, America, and Asia.

Human travel associated with tourism or business, have increased rapidly over the past few decades. Population displacements as a result of conflict or natural disaster are likely to produce overcrowding, poor sanitation, and breakdown of healthcare facilities that is highly conducive to the spread of infectious diseases.

### Human Behavior

Sociocultural and religious factors affect human behavior, food habits, and travel. Also pet ownership increases the chances of zoonotic infection such as salmonellosis, *Giardiasis*, *Cryptosporidium*, toxoplasmosis, and rabies. Trade in exotic animals and birds, for example, prairie dogs that carry monkeypox in the United States, is proving to be a challenge for the control of transmission.

### Climate

Lastly, climatic changes due to global warming lead to increased precipitation and a congenial environment for vectors, intermediate and reservoir hosts of water-borne (e.g., cholera) and vector-borne (e.g., malaria, yellow fever, dengue, leishmaniasis) diseases.

*To summarize, we are the architects of our own doom.* The most important way to stall these processes are better awareness, meticulous vector control measures, preventive behavior and practices by the physician and public alike. Travelers should be aware that diseases under control in one country may be rampant in another.<sup>3</sup> Vaccination guidelines and chemoprophylaxis should be followed religiously. Also, zoonotic disease surveillance, reporting, and response efforts need to be stepped up through holistic policy making for better containment of newer zoonoses.<sup>4</sup>

### REFERENCES

1. Daszak P, Cunningham AA, Hyatt AD. Emerging infectious diseases of wild-life: Threats to biodiversity and human health. *Science* 2000;287(5452):443–449. DOI: 10.1126/science.287.5452.443.
2. Marques AC. Human migration and the spread of malaria in Brazil. *Parasitol Today* 1987;3(6):166–170. DOI: 10.1016/0169-4758(87)90170-0.
3. Colwell RR. Global climate and infectious disease: The cholera paradigm. *Science* 1996;274(5295):2025–2031. DOI: 10.1126/science.274.5295.2025.
4. U.S. Centers for Disease Control and Prevention (CDC). Preventing emerging infectious diseases: A strategy for the 21st century. Overview of the updated CDC plan. *MMWR Recomm Rep* 1998; 47(RR-15):1–14. PMID: 9751113.