



Review on Emerging and Reemerging Infectious Diseases and Their Origins

M. S. Abdallah^{1*}

¹Research Assistant, Desert Research, Monitoring and Control Centre, Yobe State University, Damaturu, Nigeria.

Author's contribution

The sole author designed, analyzed and interpreted and prepared the manuscript.

Article Information

DOI: 10.9734/MRJI/2018/39953

Editor(s):

- (1) Dr. Eggehard Holler, Cedars-Sinai Medical Center, Department of Neurosurgery, Los Angeles, USA and University of Regensburg, Germany.
(2) Dr. Gyanendra Singh, Gene Therapy & Louisiana Vaccine Center, School of Medicine, LSU Health Sciences Center, Louisiana, USA.

Reviewers:

- (1) Ariful Basher, Bangobandhu Sheikh Mujib Medical University, Bangladesh.
(2) Luciana de Barros Correia Fontes, Federal University of Pernambuco (UFPE), Brazil.
(3) Muhammad Yusuf Hafiz, The Aga Khan University, Pakistan.

Complete Peer review History: <http://www.sciencedomain.org/review-history/28088>

Received 06 February 2018

Accepted 26 April 2018

Published 03 January 2019

Mini-review Article

ABSTRACT

Emerging infectious diseases are diseases with an incidence rate that increased in the past 20 years and could increase in the near future. There are two categories of infectious diseases namely; emerging and reemerging infectious diseases. As such, are diseases that are recognized in the human host for the first time and diseases that historically have infected humans, but continue to appear in new locations or drug-resistant forms. Certain factors resulted in the emergence of emerging and reemerging infectious diseases, which include; ecological factors, human demographic changes and behaviour; travel and commerce; as well as; technology and industry. Moreover, they are also widespread in the universe despite the awareness of preventive measures across the globe.

Keywords: Emerging; reemerging; infections; diseases; flavivirus and influenza.

1. INTRODUCTION

Emerging infectious disease (EID) is an infectious disease with an incidence rate that has

increased in the past 20 years and could increase in the near future. Two major categories of infectious diseases namely; emerging and reemerging infectious diseases, they can also be

*Corresponding author: E-mail: Msgamoji1@gmail.com;

defined, as diseases that are recognized in the human host for the first time; and diseases that historically have infected humans, but continue to appear in new locations or drug-resistant forms, or that reappear after apparent control, or elimination of Emerging and reemerging infections may exhibit successive stages of emergence [1]. However, responsible factors for emergence include; ecological changes, such as those due to agricultural or economic development or to anomalies in climate; human demographic changes and behaviour; travel and commerce; technology and industry; microbial adaptation and change; and breakdown of public health measures. Each of these will be considered in turn. Examples of infections originating as zoonoses suggest that the zoonotic pool introductions of infections from other species are an essential and potentially rich source of emerging diseases. Once introduced, an infection might then be disseminated through other factors, although rapid course and high mortality combined with low transmissibility are often limiting. However, even if a zoonotic agent is not able to spread readily from person to person and establish itself, other factors (e.g., nosocomial infection) might transmit the infection [2]. Emerging infections account for at least 12% of all human pathogens. EIDs are caused by newly identified species or strains (e.g., SARS, AIDS) that may have evolved from a known infection (e.g., influenza), or spread to a new population (e.g., West Nile virus), or to an area undergoing ecologic transformation (e.g., Lyme disease). They could also be reemerging infections, such as drug-resistant tuberculosis, as such growing concern are adverse synergistic interactions between emerging diseases and other infectious and non-infectious conditions leading to the development of novel syndemics [2].

Nevertheless, pathogenic strains of dengue have also spread back from Southeast Asia to the Western Hemisphere, as has a major mosquito vector, *Aedes albopictus*. Unlike most arboviruses, which are partly or completely host-restricted, WNV has become adapted to multiple mosquitoes and avian species, a major factor in increasing its opportunity to infect humans. The lack of additional hosts undoubtedly drove the mosquitoes that are the vectors of dengue and the dengue virus itself to favour adapting to humans and their behaviours and environments. The association of dengue with *Aedes* mosquitoes that live in and around human habitations mean that crowding, poor sanitation,

and poverty provide ideal environments for transmission to humans. Host immunity factors are also thought to be involved in the severe/fatal form of dengue known as dengue shock syndrome [1]. Other non-arboviral examples of emerging infections abound. For example, cholera has repeatedly reemerged over more than two centuries in association with global travel, changing seasons, war, natural disasters, and conditions that lead to inadequate sanitation, poverty, and social disruption. Emergences of disease caused by community and hospital-acquired *Clostridium difficile* and methicillin-resistant *Staphylococcus aureus* (MRSA) have been driven by increased and or inappropriate use of antibiotics, and some hospital-acquired organisms such as MRSA have now moved into community transmission [3].

The global emergence of plasmid-spread NDM-1 (New Delhi β -lactamase) Gram-negative pan-resistant organisms, linked to global antibiotic used and inadequate antibiotic stewardship, medical tourism, economic globalization, and other aspects of modern life, has prompted calls for development of international control mechanisms that are applicable to a number of emerging bacterial diseases in the developing and developed world. Drug resistance mutations have also caused the reemergences of certain pathogens such as multidrug-resistant and extensively drug-resistant tuberculosis, drug-resistant malaria, and numerous bacterial diseases such as vancomycin-resistant enterococci. Fungi have made significant contributions to disease emergence as well [3]. The main objective of this work, is to know a wide range of emerging and Reemerging Infectious diseases across the globe and also know their origins.

The following are some of the examples of Emerging and Reemerging Infectious Diseases:

2. HIV

Human immunodeficiency virus infection/acquired immunodeficiency syndrome (HIV/AIDS) is a disease of the human immune system caused by the human immunodeficiency virus (HIV). During the initial infection a person may experience a brief period of influenza-like illness. This is typically followed by a prolonged period without symptoms. As the illness progresses it interferes more and more with the immune system, making people much more likely to get infections, including opportunistic

infections, and tumours that do not usually affect people with working immune systems [4]. Nevertheless, the most salient modern example of an emerging infectious disease is HIV/AIDS, which likely emerged a century ago after multiple independent events in which the virus jumped from one primate host to another (chimpanzees to humans) and subsequently, as a result of a complex array of social and demographic factors, spread readily within the human population. AIDS was not recognized as a distinct entity until 1981, after its initial detection among certain risk groups, such as men who have sex with men, recipients of blood products, and injection drug users. It was soon apparent, however, that the disease was not restricted to these groups, and indeed, the bulk of HIV infections globally has resulted from heterosexual transmission that has been heavily weighted within the developing world, particularly sub-Saharan Africa where a number of factors were responsible for this rapid spread; chief among these were human movement along truck routes accompanied by a high level of commercial sex work, inadequate public health infrastructures, poverty, and social inequality [4].

3. INFLUENZA

Influenza, commonly known as the flu, is an infectious disease of birds and mammals caused by RNA viruses of the family Orthomyxoviridae, the influenza viruses. The most common symptoms are chills, fever, sore throat, muscle pains, headache (often severe), coughing, weakness/fatigue and general discomfort. Although it is often confused with other influenza-like illnesses, especially the common cold, influenza is a more severe disease caused by a different type of virus. Influenza may produce nausea and vomiting, particularly in children, but these symptoms are more common in the unrelated gastroenteritis, which is sometimes inaccurately referred to as "stomach flu" or "24-hour flu" [5].

4. WEST NILE VIRUS

West Nile virus (WNV) is a mosquito-borne zoonotic arbovirus belonging to the genus flavivirus in the family flaviviridae. This flavivirus is found in temperate and tropical regions of the world. It was first identified in the West Nile sub-region in the East African nation of Uganda in 1937. Prior to the mid 1990s, WNV disease occurred only sporadically and was considered a minor risk for humans. However, there was an

outbreak in Algeria in 1994, with cases of WNV-caused encephalitis, and the first large outbreak in Romania in 1996, with a high number of cases with neuroinvasive disease. WNV has now spread globally, with the first case in the Western Hemisphere being identified in New York City in 1999; over the next 5 years, the virus spread across the continental United States, north into Canada, and southward into the Caribbean Islands and Latin America. WNV also spread to Europe, beyond the Mediterranean Basin. A new strain of the virus was recently identified in Italy. WNV is now considered to be an endemic pathogen in Africa, Asia, Australia, the Middle East, Europe and in the United States, which in 2012 has experienced one of its worst epidemics [5].

5. TUBERCULOSIS

Tuberculosis, MTB, or TB (short for tubercle bacillus) is a common, and in many cases lethal, infectious disease caused by various strains of mycobacteria, usually *Mycobacterium tuberculosis*. Tuberculosis typically attacks the lungs, but can also affect other parts of the body. It is spread through the air when people who have an active TB infection cough, sneeze, or otherwise transmit their saliva through the air. Most infections are asymptomatic and latent, but about one in ten latent infections eventually progresses to active disease which, if left untreated, kills more than 50% of those so infected [6].

6. FACTORS LEADING TO THE EMERGENCE OF INFECTIOUS DISEASES

6.1 Ecological Changes and Agricultural Development

Ecological changes, including those due to agricultural or economic development, are among the most frequently identified factors in emergence. They are especially frequent as factors in outbreaks of previously unrecognized diseases with high case-fatality rates, which often turn out to be zoonotic introductions. Ecological factors usually precipitate emergence by placing people in contact with a natural reservoir or host for an infection hitherto unfamiliar but usually already present (often a zoonotic or arthropod-borne infection), either by increasing proximity or, often, also by changing conditions so as to favor an increased population of the microbe or its natural host (Moss, 1990).

6.2 Changes in Human Demographics and Behavior

Human population movements or upheavals, caused by migration or war, are often important factors in disease emergence. In many parts of the world, economic conditions are encouraging the mass movement of workers from rural areas to cities. The United Nations has estimated that, largely as a result of continuing migration, by the year 2025, 65% of the world population (also expected to be larger in absolute numbers), including 61% of the population in developing regions, will live in cities. However, human behavior can have important effects on disease dissemination. The best known examples are sexually transmitted diseases, and the ways in which such human behaviour as sex or intravenous drug use have contributed to the emergence of HIV are now well known. Other factors responsible for disease emergence are influenced by a variety of human actions, so human behaviour in the broader sense is also very important [4].

6.3 Technology and Industry

High-volume rapid movement characterizes not only travel, but also other industries in modern society. In operations, including food production, that process or use products of biological origin, modern production methods yield increased efficiency and reduced costs but can increase the chances of accidental contamination and amplify the effects of such contamination. The problem is further compounded by globalization, allowing the opportunity to introduce agents from far away. A pathogen present in some of the raw material may find its way into a large batch of final product, as happened with the contamination of hamburger meat by *E. coli* strains causing hemolytic uremic syndrome. In the United States the implicated *E. coli* strains are serotype O157:H7 [7].

6.4 Microbial Adaptation and Change

Microbes, like all other living things, are constantly evolving. The emergence of antibiotic-resistant bacteria as a result of the ubiquity of antimicrobials in the environment is an evolutionary lesson on microbial adaptation, as well as a demonstration of the power of natural selection. Selection for antibiotic-resistant bacteria [8] and drug-resistant parasites has become frequent, driven by the wide and sometimes inappropriate use of antimicrobial

drugs in a variety of applications. Pathogens can also acquire new antibiotic resistance genes from other, often nonpathogenic, species in the environment selected or perhaps even driven by the selection pressure of antibiotics [9].

7. CONCLUSION

Infectious disease is a global threat throughout the world among several populations irrespective of its environmental hazards, ecological factors and human health. Emerging infectious diseases have the potential to cause considerable morbidity, mortality, and economic damage. Infectious agents are generally transmitted through either direct or indirect contact, which can be prevented mostly by vaccination. Development of several life-saving vaccines and antimicrobial drugs had created hope that infectious diseases could be controlled or even eliminated.

COMPETING INTERESTS

Author has declared that no competing interests exist.

REFERENCES

1. Fauci AS, Morens DM. The perpetual challenge of infectious diseases. *N Engl J Med.* 2012;366:454–461.
2. Morens DM, Folkers GK, Fauci AS. Emerging infections: A perpetual challenge. *Lancet Infect Dis.* 2008;8:710–719.
3. Laughlin CA, Morens DM, Cassetti MC, Costero-Saint Denis A, San Martin J-L, et al. Dengue research opportunities in the Americas. *J Infect Dis.* 2012;206:1121–1127.
4. Morse SS, Schluederberg A. Emerging viruses: the evolution of viruses and viral diseases. *J Infect Dis.* 1990;162:1–7.
5. Morse SS. Examining the origins of emerging viruses. In: Morse SS, ed. *Emerging viruses.* New York: Oxford University Press. 1993;10-28.
6. Walsh TR, Toleman MA. The emergence of pan-resistant Gram-negative pathogens merits a rapid global political response. *J Antimicrob Chemother.* 2012;67:1–3.
7. Centers for Disease Control and Prevention. Update: Multistate outbreak of *Escherichia coli* O157:H7 infections

- from hamburgers western United States; 1993.
8. Davies J. Inactivation of antibiotics and the dissemination of resistance genes. *Science*. 1994;264:375–82.
9. Gubler DJ, Trent DW. Emergence of epidemic dengue/dengue hemorrhagic fever as a public health problem in the Americas. *Infect Agents Dis*. 1993;26:383–93.

© 2018 Abdallah; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:
The peer review history for this paper can be accessed here:
<http://www.sciencedomain.org/review-history/28088>