frontiers | Frontiers in Tropical Diseases

TYPE Editorial
PUBLISHED 18 November 2024
DOI 10.3389/fitd.2024.1517628

OPEN ACCESS

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RECEIVED 26 October 2024
ACCEPTED 04 November 2024
PUBLISHED 18 November 2024

CITATION
Sah R and Rodriguez-Morales AJ (2024) Editorial: Recent outbreak of viral infections. *Front. Trop. Dis* 5:1517628.
doi: 10.3389/fitd.2024.1517628

Editorial: Recent outbreak of viral infections

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KEYWORDS

outbreak, viruses, viral infection, measles, COVID-19, influenza, pandemic

Editorial on the Research Topic
Recent outbreak of viral infections

Over the last few years, multiple viral outbreaks have significantly affected multiple countries across the continents, regionally and globally (1). Its approach represents multiple challenges for the scientific and medical community (2). One of the primary issues of viral outbreaks is related to the rapid mutation and evolution of viruses, as seen with influenza and SARS-CoV-2 (Figure 1), making predicting their behaviour difficult (3). These genetic changes can lead to new strains that may be more virulent or resistant to treatments and vaccines, complicating public health efforts, as especially occurred with the variants of concern (VOC) or interests (VOI) of SARS-CoV-2 (4), from Alpha to Omicron (5), which has become the predominant VOC/VOI (Figure 1). Another challenge is global interconnectedness, where the ease of international travel accelerates the spread of viruses (6–8), making containment much harder. Outbreaks that begin locally can quickly become global pandemics, as demonstrated during the COVID-19 crisis (9).

In many regions, particularly in low- and middle-income countries (LMIC), weak healthcare infrastructure and inadequate surveillance systems delay detection and response. This hinders the timely identification of new viral threats and hampers effective containment. Misinformation fueled by social media (10), contributes to vaccine hesitancy and resistance to public health measures (11), exacerbating the impact of outbreaks. Environmental factors such as deforestation and climate change increase the risk of zoonotic diseases jumping from animals to humans (12), further complicating outbreak prediction. Lastly, geopolitical tensions often obstruct international collaboration, slowing the sharing of crucial data and coordinated responses vital for controlling viral outbreaks globally.

Therefore, this Research Topic was proposed. It aimed to collect manuscripts on recent progress and future approaches to emerging viral diseases that help promote the development of effective prevention and treatment measures for viral threats in different regions of the world. Five papers, four Original Articles and one Opinion, have been accepted for this Research Topic.

In the article by Mohapatra et al., it was observed that since mid-October 2023, China has observed a rise in respiratory illness among children, attributed to seasonal changes and post-COVID-19 immunity shifts. The increase in cases is linked to pathogens like influenza, RSV, and *Mycoplasma pneumoniae*, without signs of novel or unusual viruses.

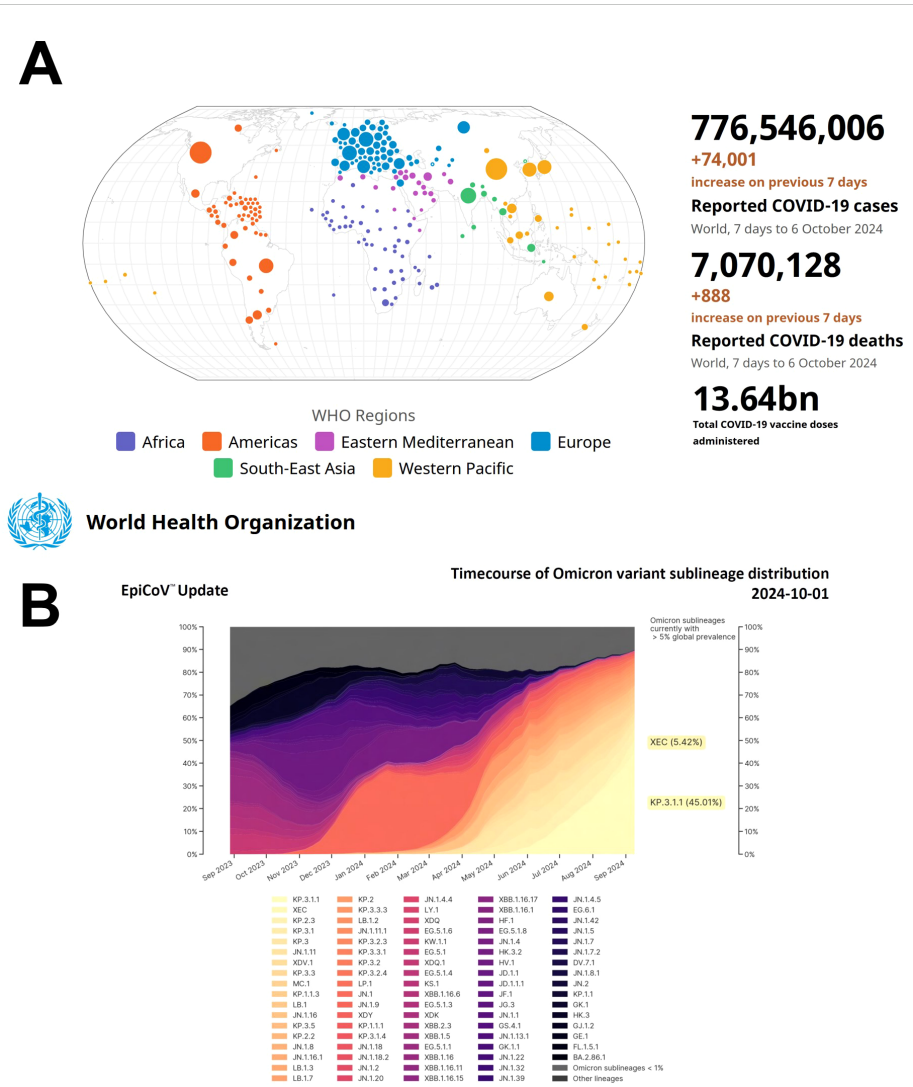

FIGURE 1
SARS-CoV-2/COVID-19. **(A)** Global epidemiology, 2020-2024, according to the World Health Organisation (https://data.who.int/dashboards/covid19/cases?n=c). **(B)** Evolution of the variant of concern/interest Omicron sublineages, September 2023-September 2024 (https://gisaid.org/hcov19-variants/).

The World Health Organization (WHO) has asked China for more data, while China's health authorities have bolstered surveillance and enhanced healthcare measures to monitor this trend. Studies suggest COVID-19-related hygiene practices may have temporarily suppressed common respiratory infections, but their resurgence post-pandemic could strain healthcare systems, especially in dense populations. Experts recommend preventive measures like vaccines, timely diagnoses, and travel advisories for international travellers to curb respiratory infection spread (13–15).

The study of Dulkadir and Gunduz explores using haematological parameters to differentiate COVID-19 from influenza in children. Researchers analysed blood samples from 231 children aged 1 month to 18 years with respiratory symptoms, including 130 COVID-19 cases and 101 influenza cases. Key findings indicate that age, eosinophil count, and monocyte count are significantly associated with COVID-19. An increase in these factors raised the risk of a COVID-19 diagnosis. The study used ROC analysis to assess diagnostic accuracy, showing that monocyte and eosinophil counts achieved high sensitivity and specificity for COVID-19. That suggests that these parameters could serve as practical, cost-effective tools for distinguishing COVID-19 from influenza in clinical settings.

Also, related to influenza, the original investigation of Yin et al. examines the impact of influenza on excess mortality across various diseases in China from 2012 to 2021. Using data on influenza cases, population demographics, and mortality records, the researchers applied a negative binomial regression model to assess influenza's influence on eight health conditions, finding that respiratory and circulatory diseases accounted for the most significant portion (58.5%) of influenza-related excess deaths. On average, China experienced 201,722 influenza-related excess deaths annually, with a rate of 14.53/100,000 people. Influenza A (H1N1) and B strains were most strongly linked to deaths from respiratory diseases, chronic obstructive pulmonary disease, and ischemic

heart disease. Seasonal peaks were noted, especially in winter, highlighting the need for targeted health interventions. The findings suggest that enhanced influenza surveillance and early warning systems could improve prevention and control of influenza's impact on mortality, especially among vulnerable populations.

Although significantly reduced over time in multiple countries, recent setbacks due to lack of vaccination, migration and antivaccine movements have set the stage for the reemergence of measles in some countries (16–18). In the study of Tefera et al., the authors investigate a measles outbreak in Tocha District, Ethiopia, from March to April 2023. This unmatched case-control study identified risk factors for measles in the Dawuro Zone. Data were collected from 147 confirmed cases and 147 controls. Analysis revealed that the attack rate was notably high among children under five (104.59/10,000), with a case fatality rate of 2.72%. Key risk factors included poor ventilation (adjusted odds ratio [AOR] =3.54) and contact history with measles cases (AOR=2.53). Vaccination coverage was insufficient, with only 53.88% of children receiving the measles vaccine. That highlighted the need for improved vaccination campaigns and surveillance. Public health recommendations include enhanced vaccination coverage, better cold chain management, and community awareness campaigns to reduce measles transmission.

Finally, in the study of Ghurab et al., authors the role of the gut microbiome in the modulation of metabolic health and how dietary interventions can influence this relationship. It emphasises the connection between gut bacteria composition, nutrient absorption, and metabolic disorders like obesity and diabetes. The findings suggest that personalised dietary strategies tailored to individual microbiome profiles could enhance metabolic function and reduce the risk of related diseases. The authors advocate further exploring microbiome-targeted diets as a promising approach to improve health outcomes and inform future nutritional guidelines. Overall, the study underscores the importance of understanding the gut microbiome's role in metabolism and its potential for guiding effective dietary interventions.

Overall, several studies covered in this Research Topic have shown that surveillance and research on viral threats should be enhanced. Spillover continues to be critical of this. The transmission of viruses from animals to humans is often due to environmental changes, increased human-wildlife interaction, or habitat destruction. This process plays a crucial role in emergent viral outbreaks, facilitating the spread of zoonotic diseases and highlighting the need to monitor wildlife health and human encroachment on ecosystems.

Author contributions

RS: Investigation, Visualization, Writing – original draft, Writing – review & editing. AR-M: Conceptualization, Data curation, Formal analysis, Investigation, Project administration, Validation, Visualization, Writing – original draft, Writing – review & editing.

Conflict of interest

AR-M declared to have been a speaker/consultant in the last years for the following industries: Sanofi Pasteur, Johson & Johnson, Abbott, Takeda, Amgen, AstraZeneca, MSD, and Valneva.

The remaining author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

The author(s) declared that they were an editorial board member of Frontiers, at the time of submission. This had no impact on the peer review process and the final decision.

Publisher's note

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