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SHORT COMMUNICATION

Annual Summary of Global Infectious Diseases in 2024

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Abstract

Infectious diseases pose a major challenge to public health worldwide. In recent years, vector-borne and zoonotic diseases have emerged as major public health threats. Effective prevention, control, and essential monitoring strategies are required to combat the rising global incidence and prevalence of infectious diseases. The frequency of infectious disease outbreaks has increased in the past several decades, and this trend has been predicted to be likely to continue. To effectively identify public health threats, and monitor and alert against infectious diseases, we obtained surveillance data from Shusi Tech's Global Epidemic Information Monitoring System and conducted a comprehensive analysis of outbreak timing and location from the beginning of the year to December of 2024.

Key words: Infectious disease, Dengue, Monkeypox, Cholera, Measles

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INTRODUCTION

Multiple outbreaks of infectious diseases, including Dengue, Monkeypox, and other viruses, occurred worldwide in the past year. Zoonotic diseases, which are transmitted from animals to humans, account for a substantial proportion of all emerging infectious diseases [1]. Emerging and re-emerging diseases pose significant risks, and often result in extensive outbreaks that can have profound economic and social repercussions. The recent proliferation of Monkeypox, particularly in regions where it is not typically found, has heightened apprehensions regarding its pandemic potential. Additionally, vector-borne diseases, which are transmitted by organisms such as mosquitoes and ticks, are another critical area of concern. The prevalence and distribution of these diseases are influenced by multiple factors, including climate change, urbanization, and international travel, all of which can modify the distribution and population dynamics of vectors, and subsequently increase the likelihood of disease transmission. Consequently, the implementation of effective vector control measures, such as the use of attractive toxic sugar baits, is essential for managing these diseases, particularly in endemic regions [2]. Establishing a comprehensive public health surveillance and response system is of paramount importance. In recent years, rapid advancements in globalization have markedly intensified the rate and extent of infectious disease transmission, thereby increasing the demand on public health systems globally. In response to these challenges, numerous countries and regions have initiated strategies aimed at improving public health surveillance capabilities.

To enhance the visualization of the geographical distribution and patterns of infectious disease development, we used Shusi Tech's Global Epidemic Information Monitoring System to perform a systematic and comprehensive

analysis of the five most prevalent global infectious diseases from January to December of 2024 (Fig 1).

Dengue

Dengue fever (DF) is an acute infectious disease caused by the dengue virus, and its vectors are the *Aedes albopictus* and *Aedes aegypti* mosquito species. The World Health Organization classifies dengue into two primary categories: standard DF and severe DF. These classifications are associated with a wide spectrum of clinical manifestations, which can range from the mild symptoms typical of DF to severe conditions that significantly threaten life [3].

The incidence of DF has significantly increased in Peru, Brazil, Mexico, Paraguay, Colombia, and Bangladesh over the past year. By summarizing and analyzing the reported cases and fatalities from the previous year, we determined that the incidence of dengue was notably higher during the first two quarters in Brazil, Peru, and Paraguay (Fig 2A–C). The incidence of DF is rising in countries such as Bangladesh and Mexico. In fact, the number of cases reported in the past two quarters was significantly higher than that in the previous two quarters in both Bangladesh and Mexico (Fig 2D,E). This transnational spread has exacerbated the dengue epidemic and presents a significant challenge to public health systems.

In Colombia, the prevalence of DF is closely associated with social, climatic, and entomological factors. Climatic elements, including temperature, relative humidity, and precipitation, have been demonstrated to significantly influence the incidence of DF [4]. The prevalence of dengue in Colombia was markedly higher during the third quarter than the other three quarters of the year (Fig 2F).

Monkeypox

Monkeypox has historically posed a significant challenge in certain regions of Africa. Recently, the increase in monkeypox cases in Central Africa has reached a critical threshold, thus leading the World Health Organization to declare in August that the outbreak constituted a public health emergency of international concern.

Monkeypox, endemic to Central and Western African nations, has exhibited a pattern of spread distinct from those of prior outbreaks; consequently, diverse preventive strategies were implemented by various countries to mitigate its transmission. In 2024, the outbreak extended to

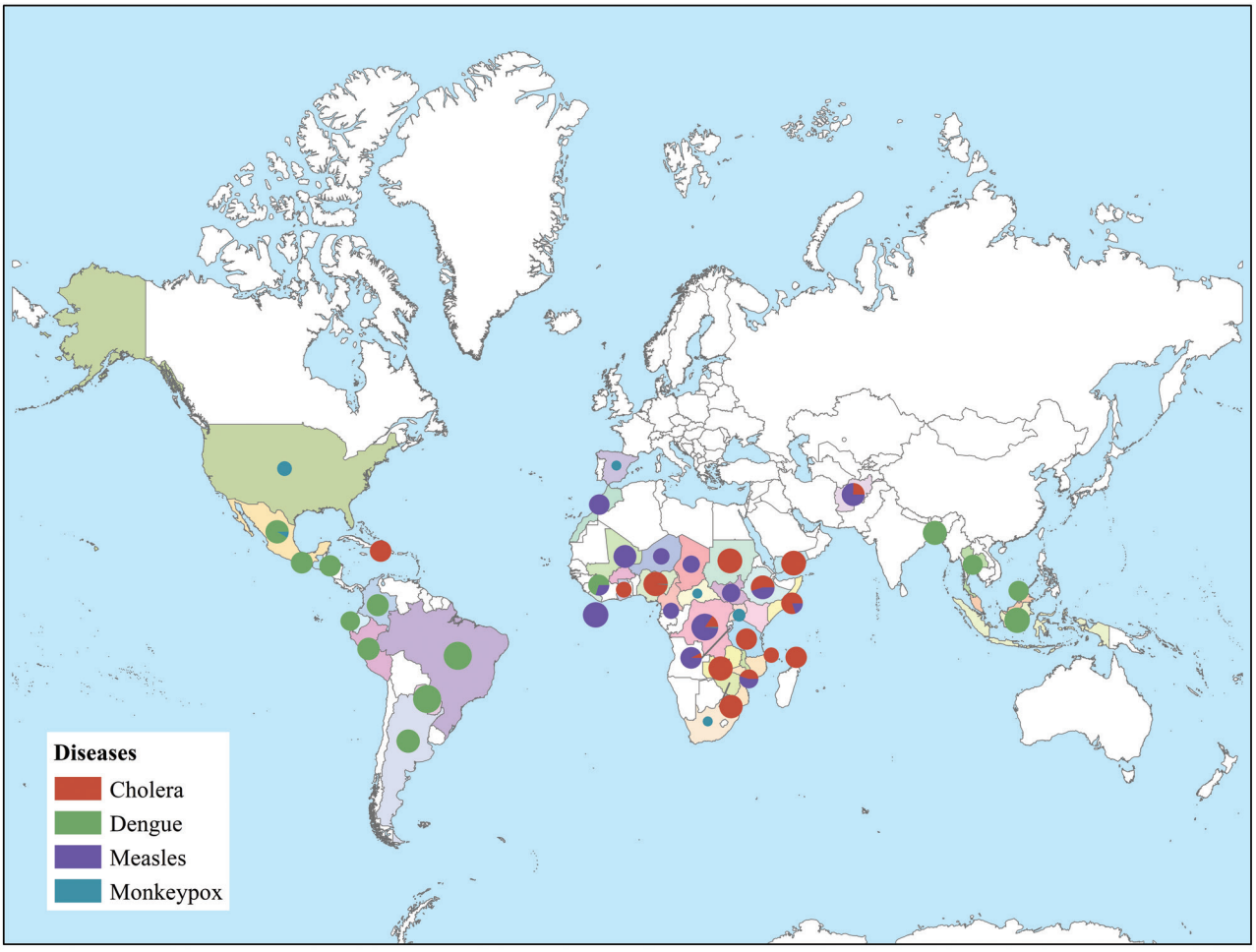

FIGURE 1 | Global distribution of the five most prevalent infectious diseases from January to December of 2024.

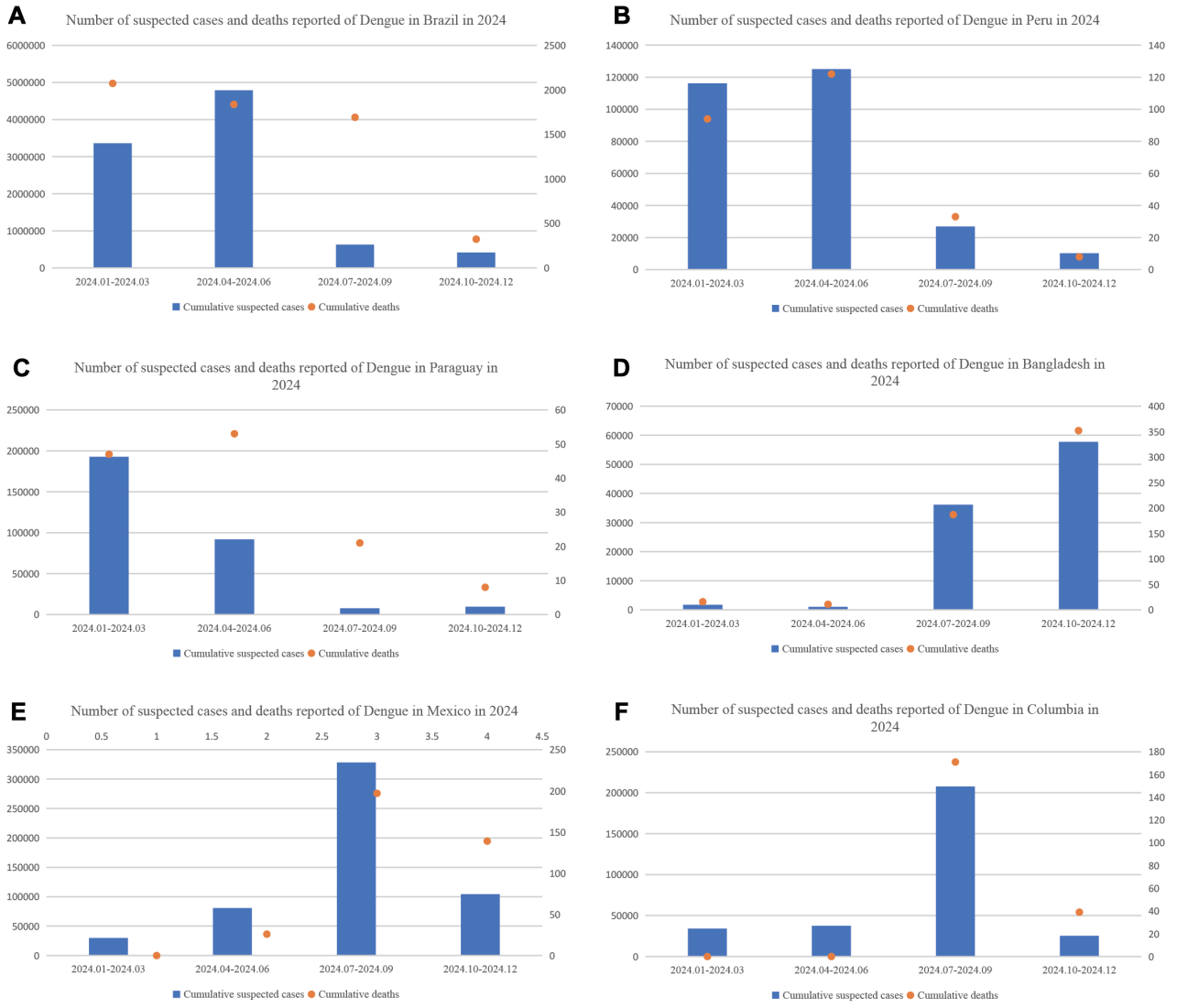

FIGURE 2 | Statistics of suspected dengue cases and deaths reported from January to December of 2024. (A) Numbers of suspected dengue cases and deaths reported in Brazil in 2024. (B) Numbers of suspected dengue cases and deaths reported in Peru in 2024. (C) Numbers of suspected dengue cases and deaths reported in Paraguay in 2024. (D) Numbers of suspected dengue cases and deaths reported in Bangladesh in 2024. (E) Numbers of suspected dengue cases and deaths reported in Mexico in 2024. (F) Numbers of suspected dengue cases and deaths reported in Columbia in 2024.

several nations, including Brazil, Burundi, the Democratic Republic of the Congo (Congo hereafter), Nigeria, and Uganda. We collected and compiled suspected monkeypox cases in 2024. The incidence was highest in Brazil, whereas Congo ranked second (Fig 3A). Congo, which reported its first case in 1970, is at the center of the current outbreak. Notably, in October 2024, the incidence of monkeypox in Congo surged and peaked (Fig 3B).

Cholera

Cholera, an acute diarrheal disease caused by the bacterium *Vibrio cholerae* [5], poses a considerable public health challenge, particularly in areas with insufficient water and sanitation systems. This infectious disease continues to pose a significant risk in numerous regions globally, particularly in locations that experience frequent outbreaks.

We analyzed the five countries or regions with the highest incidence of suspected cholera cases, by using data from 2024. Our results revealed that suspected cholera cases in Pakistan peaked in the fourth quarter of 2024 (Fig 4A). In contrast, Sudan exhibited the highest mortality rate associated with cholera among the leading four countries and regions (Fig 4B).

Afghanistan and Congo

The incidence of diseases such as DF, cholera, monkeypox, and measles has notably increased over the past year in Afghanistan and Congo. The subsequent section provides a comprehensive analysis of the prevalence of these diseases in both regions.

The prevalence of DF has prompted significant concern, particularly in light of climate change and the increased

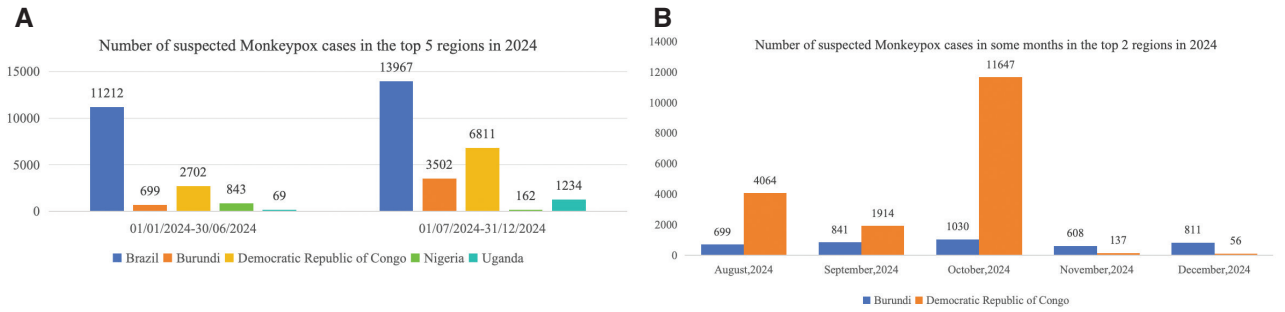

FIGURE 3 | Statistics of suspected monkeypox cases in 2024. (A) Numbers of suspected monkeypox cases in the top five regions in 2024. (B) Numbers of suspected monkeypox cases in the top two regions in 2024.

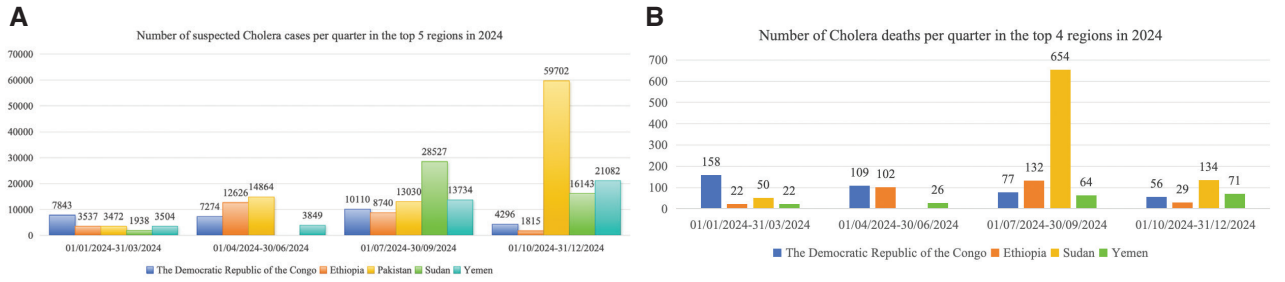

FIGURE 4 | Statistics of suspected cholera cases and deaths reported per quarter in the top five regions. (A) Numbers of suspected cholera cases per quarter in the top five regions in 2024. (B) Numbers of cholera deaths per quarter in the top four regions in 2024.

risk of mosquito-borne transmission in Afghanistan. Compared with that in the previous three quarters, the incidence of DF in Afghanistan sharply increased from October to December of 2024 (Fig 5A).

For monkeypox, the Congo Basin is a high-incidence area. In recent years, the epidemiological patterns of monkeypox have changed, potentially because of changes in environmental conditions [6]. The growth rate of monkeypox in the Congo region during the last two quarters of 2024 was significantly higher than that in the previous two seasons (Fig 5B).

Cholera continues to pose a significant public health challenge in the Congo region. The lack of access to safe drinking water and proper sanitation facilities contributes to seasonal outbreaks of cholera in the Central African Great Lakes region [5]. Despite efforts involving vaccination and cross-border cooperation, the incidence of cholera remains high. The incidence of monkeypox in Congo was relatively stable throughout 2024, and no significant differences were observed among the four quarters. In Afghanistan, the incidence rate was significantly higher from July to September of 2024 than in the other three quarters, and the number of cumulative suspected cases was high as 112,689 (Fig 5C).

The prevalence of measles in Afghanistan and Congo is particularly concerning, thus underscoring the urgent need to enhance vaccination efforts and public health education to mitigate measles spread. In Afghanistan, the prevalence of measles in 2024 was significantly higher during the initial two quarters than the final two quarters. Furthermore, our examination of measles incidence in Congo during the same year indicated markedly higher rates in the first and third quarters than the second and fourth quarters (Fig 5D).

In summary, the elevated prevalence of DF, cholera, monkeypox, and measles in Afghanistan and Congo underscores the considerable obstacles faced by these regions in terms of public health infrastructure and disease management. To effectively decrease the transmission of these illnesses, cross-border collaboration, sanitation measures, and vaccination coverage efforts must be increased.

SPORADIC INFECTIOUS DISEASES

Globally, although the prevalence of specific infectious diseases has decreased, numerous cases continue to manifest sporadically across different regions.

Pertussis

The incidence and trends in pertussis, also known as whooping cough, showed considerable variability across various global regions in 2024. Despite achieving high vaccination coverage, numerous countries continue to witness fluctuations in pertussis cases, which are often associated with factors such as diminishing immunity, alterations in vaccination strategies, and environmental influences. Pertussis has emerged as a significant public health issue in Australia, particularly in recent years. The resurgence of pertussis in certain areas of the United States and Australia has led to reporting of the highest

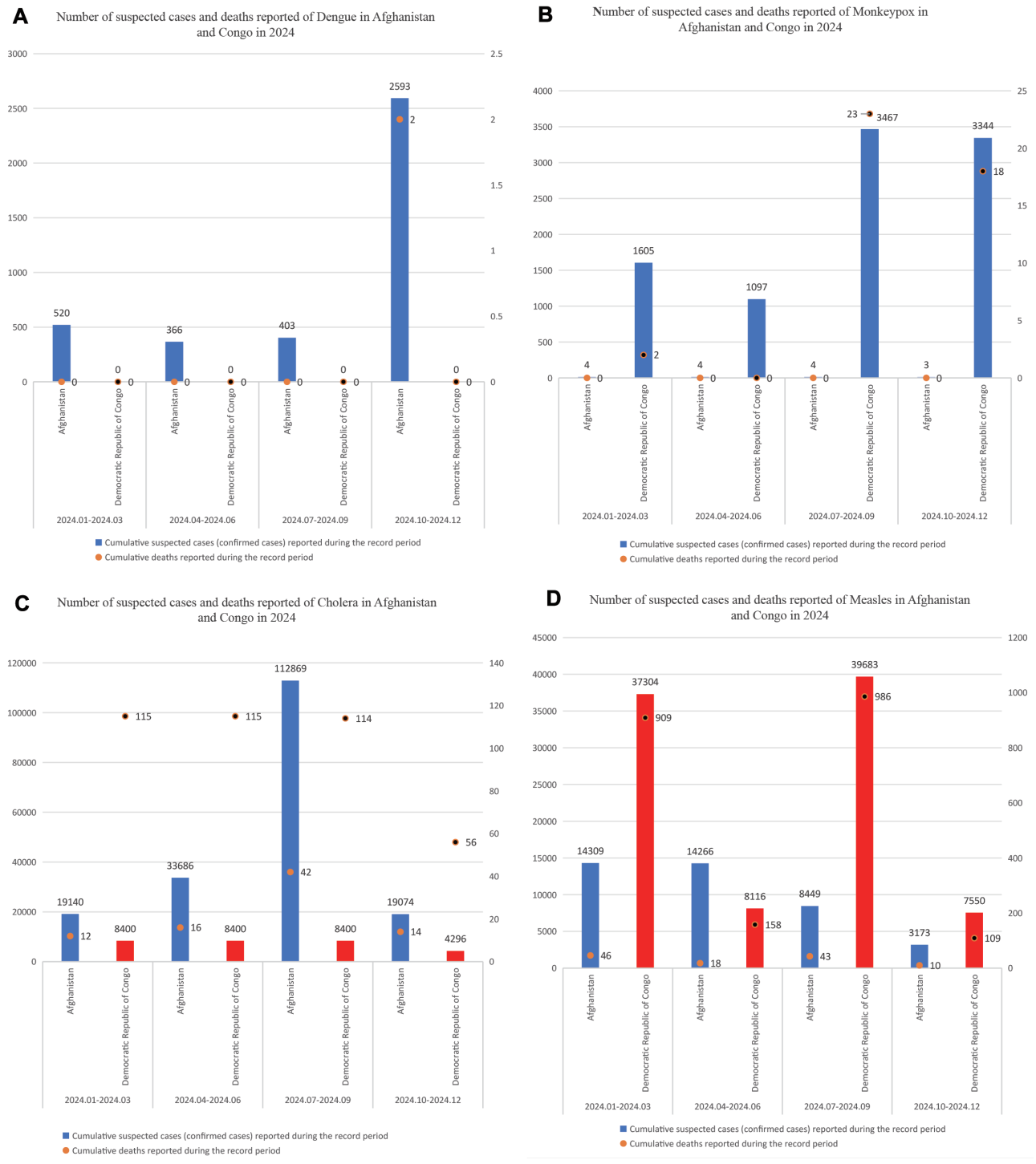

FIGURE 5 | Statistics of suspected infectious disease cases and deaths reported from January to December of 2024. (A) Numbers of suspected cholera cases and deaths reported in Afghanistan and Congo in 2024. (B) Numbers of suspected monkeypox cases and deaths reported in Afghanistan and Congo in 2024. (C) Numbers of suspected dengue cases and deaths reported in Afghanistan and Congo in 2024. (D) Numbers of suspected measles cases and deaths reported in Afghanistan and Congo in 2024.

annual case numbers in more than 50 years. In April 2024, Australia documented more than 6,000 cases (S1 Table).

H5N1

The H5N1 avian influenza outbreak, whose global dissemination started in 2021, continues to infect a considerable population of wild avifauna, domestic poultry, and various mammalian species. Notably, in late March, the virus was unexpectedly transmitted to dairy cattle. This continuing outbreak among dairy cows has affected more than 700 livestock across 16 states in the United States, thus decreasing milk yields and feed intake. Because elevated

temperatures can inactivate the virus, pasteurized milk and thoroughly cooked beef are safe for human consumption. Nonetheless, the virus may be transmitted between individuals through close contact (S1 Table).

Discussion

The recent monkeypox outbreaks have highlighted the need for both global and regional collaborations aimed at enhancing preparedness and response strategies for such health crises. This situation underscores the significance of using a One Health framework to effectively address the interconnections among human, animal, and environmental health [7].

In light of these challenges, applying the lessons learned from past outbreaks, such as the COVID-19 pandemic, is essential to enhance preparedness for future infectious disease threats. This preparation process entails enhancing surveillance mechanisms, refining data collection processes, and improving reporting practices, in addition to fostering international collaboration to formulate effective response strategies [8]. Understanding the systemic factors that contribute to pandemics and addressing the root causes of disease emergence would aid in enhancing public health protection and preventing future global health crises.

Moreover, understanding the ecological processes underlying the emergence of novel enzootic cycles is crucial. For instance, arboviruses in the neotropics have demonstrated how human activities can facilitate the establishment of new enzootic cycles and subsequently lead to human epidemics. This finding underscores the need for comprehensive ecological and epidemiological studies to predict and prevent such occurrences.

CONCLUSION

The global prevalence and patterns of infectious diseases have emerged as a central concern in public health research, particularly in the context of recent pandemics and the persistent challenges posed by various pathogens. Analyzing these trends is essential to formulate effective prevention and control measures. The COVID-19 pandemic has notably influenced the incidence rates of other infectious diseases. In China, the enforcement of stringent infection control protocols markedly decreased the incidence of respiratory infections, as well as diseases transmitted via the gastrointestinal tract and zoonotic infections. This finding underscores the efficacy of non-pharmaceutical interventions in mitigating the transmission of infectious diseases and offers critical insights for the development of future public health strategies.

SUPPLEMENTARY MATERIAL

Supplementary Material can be downloaded from https://zoonoses-journal.org/wp-content/uploads/2025/02/zoonoses20241006_Suppl.zip.

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CONFLICT OF INTEREST

The authors declare no potential conflicts of interest with respect to the research, authorship, and publication of this article.

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