

Rising epidemiological trends in prevalence and mortality of mpox

Global insights and analysis

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ABSTRACT

الأهداف: استكشاف الاتجاهات الوبائية العالمية في معدلات الانتشار والوفيات الناجمة عن الجدري في مناطق مختلفة من العالم.

المنهجية: تم تسجيل البيانات من قبل "منظمة الصحة العالمية ومراكز السيطرة على الأمراض والوقاية منها" في الفترة من أغسطس 2023م إلى أغسطس 2024م، مع تحليل الاتجاهات الوبائية في مختلف البلدان حول العالم.

النتائج: بلغ العدد الإجمالي لحالات الجدري 99,518 (95,196 حالة من 115 دولة لم تبلغ تاريخياً عن الجدري؛ و4,322 حالة من 7 ولايات أبلغت تقليدياً عن الجدري)، من إجمالي 122 دولة. وتشمل الدول العشر الأولى التي لديها أكبر عدد من الحالات الولايات المتحدة (33,435)، تليها البرازيل (11,212)، وإسبانيا (8,084)، وفرنسا (4,272)، وكولومبيا (4,249)، والمكسيك (4,124)، والمملكة المتحدة (3,952)، والبيرو (3,875)، وألمانيا (3,857)، وجمهورية الكونغو الديمقراطية (3,104). وتشهد أمريكا أكبر عدد من الحالات (63,145)، أي ما يعادل 63% من إجمالي الحالات على مستوى العالم، تليها أوروبا (27,194). وتواجه جمهورية الكونغو الديمقراطية أعلى زيادة في الحالات خلال عام واحد، مع ارتفاع معدل الإصابة في المنطقة بنسبة 160%، إلى جانب ارتفاع خطر الوفاة.

الخلاصة: انتشرت حالات الجدري بسرعة في جميع أنحاء العالم، حيث وصلت إلى 99,518 حالة في 122 دولة، وتم إعلانها «حالة طوارئ صحية عامة تثير قلقاً دولياً» (PHEIC) من قبل منظمة الصحة العالمية. يجب على سلطات الرعاية الصحية اتخاذ التدابير في الوقت المناسب للسيطرة على هذا التفشي لأن العالم لا يستطيع تحمل العبء العالمي المتمثل في كونه وباءً محتملاً آخر.

Objectives: To explore the global epidemiological trends in the prevalence and mortality due to mpox in various regions worldwide.

Methods: In this cross-sectional study the data about mpox outbreak were recorded by the "World Health Organization, Centers for Disease Control and Prevention, and GSAID" from August 2023 to August 2024, analyzing the epidemiological trends from different countries worldwide.

Results: The total number of mpox cases has reached 99,518 (95,196 cases from 115 countries that have not historically reported mpox; and 4,322 cases from 07 states that have traditionally reported mpox), from a total of 122 countries. The top 10 countries with the greatest number of mpox cases include the United States (33,435) followed by Brazil (11,212), Spain (8,084), France (4,272), Colombia (4,249), Mexico (4,124), United Kingdom (3,952), Peru (3,875), Germany (3,857), and Democratic Republic of Congo (3,104). America has the highest number of cases (63,145) accounting for 63% of total cases globally, followed by Europe (27,194). Democratic Republic of Congo faces the highest increase in cases within a single year, with the infectious rate in the region up by 160%, alongside a higher risk of mortality.

Conclusion: Mpox cases have rapidly spread worldwide, reaching 99,518 cases across 122 countries, and being declared a "Public Health Emergency of International Concern" by the WHO. Healthcare authorities must take timely measures to control this outbreak since the world cannot afford the global burden of it being another potential pandemic.

Keywords: Mpox, human monkeypox, epidemiological trends, cases, deaths

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Mpx (formerly known as monkeypox) is a viral disease caused by the monkeypox virus (MPXV). This is a zoonotic virus from the genus Orthopoxvirus. The genomes of this family are estimated to be ≈ 200 kb long.¹ This virus was first identified in 1958 amongst laboratory monkeys in the capital of Denmark, Copenhagen. It was then later on discovered in humans in 1970, in the Democratic Republic of Congo. Over time, the disease became endemic in Central and West Africa.² There was an outbreak in non-endemic countries from May 2022, where the disease spread across the globe, including the United States (US), Asia, Europe, the United Kingdom (UK), and the Middle East, causing the World Health Organization (WHO) to declare this as a “Public Health Emergency of International Concern” (PHEIC). The disease came under control, due to public information and effective vaccination campaigns. However, another outbreak has been recorded in August 2024, causing the WHO to declare another PHEIC on August 14, 2024.

This disease was renamed to mpox (from monkeypox), following criticism from the scientific community and other public health organizations, over claims that the name could be associated with racist and stigmatizing language.³ Therefore, in August 2022, the disease was renamed to Clade I and Clade II, and the name was officially changed to ‘mpox’ in November 2022 by the WHO. Clade 1 is endemic to Central Africa, while Clade 2 is endemic to West Africa. Clade 1 tends to be much more severe – this variant can kill up to 10% of its patients, whereas people who have been infected with Clade 2 have a survival rate of 99.9%. When this disease resurfaced in May 2022, it was caused by the milder Clade 2. However, the cases that are being reported this year belong to Clade 1. This is a cause of much greater concern since the fatality rate could be higher, increasing the urgency to bring this disease under control.⁴

Regarding the route of transmission, mpox is “animal-human and human-human.” The virus can first spread from an animal to a human by animal bites, and scratches. Human-to-human transmission can then happen via respiratory droplets, direct or indirect contact with body fluids, and contact with lesions or sores of those infected with the disease.⁵

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The outbreak which has resurfaced this month has caused alarm amongst health organizations worldwide again. According to findings from “The Africa Centers for Disease Control and Prevention” (CDC), there have been more than 15,000 cases and 400 deaths in Africa alone this year. The fatalities this year have already exceeded the deaths in the 2022-2023 outbreak, with the number of infections being up to 160% higher than in 2023.^{6,7} On August 14, 2024, the World Health Organization declared the spread of mpox as a global emergency.⁸ Therefore, this study aims to explore the global epidemiological trends in the prevalence and mortality due to mpox in various regions worldwide.

Methods. This observational study was carried out in the Department of Physiology, College of Medicine, King Saud University, Riyadh, Kingdom of Saudi Arabia in August 2024. After the study concept, the research team members appointed an investigator to identify the various notable websites and literature on mpox cases. For quality assertion, another researcher was appointed to recheck the electronic platforms and data for any inaccuracies. Initially, the WHO, CDC, PubMed and Web of Science were selected. However, after reviewing the detailed reports and articles, the required information about the outbreak and prevalence-based data was gathered mainly from the WHO and CDC.⁵⁻⁷ The required data was also searched in PubMed and Web of Science by using key terms.^{9,10} The relevant literature was explored through keyword searches, including “mpox, monkeypox, epidemiology, incidence, prevalence, countries, regions, continents.” After the literature had been shortlisted, the appropriate period prevalence-based data were recorded, analyzed, and interpreted.

Inclusion and exclusion criteria: We ensured the accuracy, relevance, and quality of the data used. The datasets cover regions where mpox cases have been reported, including global, regional, or country-specific data on mpox within a specified time limit. The data was recorded from reliable sources such as WHO, CDC, GSAID, “PubMed, Web of Science, and ministries of health. However, we excluded the reports from social media, or non-verified sources with no confirmation of cases and deaths from regions.

Statistical analysis. The global mpox outbreak cases and deaths allied data were recorded from publicly available web sources; hence, ethical approval was not required. The data were documented and analyzed, and the findings were expressed in numbers (n) and percentages (%). A *p*-value of ≤ 0.05 is considered significant.

Results. The prevalence of Mpox, with global epidemiological data has been provided in tables and figures (Table 1, Figures 1&2). This study recorded the data until August 18, 2024. The total number of cases is 99,518, which are spread across 122 countries. The total number of mpox cases has reached 99,518 across 122 countries (95,196 cases from 115 countries that have not historically reported mpox; and 4,322 cases from 07 states that have traditionally reported mpox). The top 10 countries with the greatest number of cases include the United States (33,435) followed by Brazil (11212), Spain (8084), France (4272), Colombia (4249), Mexico (4124), United Kingdom (3952), Peru (3875), Germany (3857), and Democratic Republic of Congo (3104) (Table 1).⁷

However, what is also important to note here, is that from these top 10 countries, the only country that has witnessed a significant percentage change is the Democratic Republic of Congo (Figure 1). Cases of mpox here have shot up by more than 300% within a year, from 734 (recorded on 2nd August 2023), to 3104 (recorded on 6th August 2024).⁸ In fact, according to CDC Africa, the cases in the continent have now surpassed 15,000+, along with 400+ deaths. This represents a 160% increase in the infectious rate in the region.⁶

Other countries that have a lower number of cases - but have witnessed an even bigger percentage change - include Indonesia (8700% increase, from 1 to 88 cases), Vietnam (6633.33% increase, from 3 to 202 cases), China (1593.86%, from 114 to 1931), Republic of the Congo (800%, from 5 to 45), and Thailand (576.47% from 119 to 805).⁷

Moreover, out of the 122 countries affected by mpox, 115 had not historically reported cases of the disease, while the rest of the 7 countries had historically recorded instances of the infection. These 7 countries include the Democratic Republic of Congo, Nigeria, Ghana, Central African Republic, Cameroon, the Republic of Congo, and Liberia.

Looking at regional distribution, America had the highest number of cases, with a total of 63154; this accounts for 63% of the total cases worldwide, almost 2/3rd globally. Europe (27,194), Africa (4394), and Asia (3999) followed this, with the final 2 being the Middle East (389) and Oceania (388) which had an almost identical number. Regarding fatalities, the highest number of deaths was in the United States (60), followed by Mexico (34), Peru (20), Brazil (16), and Democratic Republic of Congo (10). According to regions, America had the highest percentage, accounting for 141 deaths (68%) (Figure 2).

Discussion. The world is currently experiencing an outbreak of mpox after the COVID-19 pandemic outbreak resulting in another added public health threat. This study explores the global epidemiological trends of prevalence and mortality of mpox in various regions worldwide. The total number of cases has reached 99,518, and the top 10 countries with the greatest number of cases include the “United States, followed by Brazil, Spain, France, Colombia, Mexico, the United Kingdom, Peru, Germany, and the Democratic Republic of Congo”. The regional distribution shows that America has the highest number of cases accounting for 63% of total cases globally, followed by Europe.

The increased number of cases in non-endemic regions has raised great apprehension amongst societies, with fears of yet another potential pandemic.¹¹ What is interesting to note is that of the 122 countries, only 7 had historically recorded instances of the infection.⁷ This again signifies the transmission and spread of the disease amongst the community from areas where it was endemic to non-endemic ones.

African countries have had a higher death rate in comparison to countries in America. On one hand, Brazil has had 11212 cases and 16 deaths, while South Africa has had only 27 cases but with 3 fatalities.⁷ This could be due to poor health facilities in Africa, or lack of awareness surrounding monkeypox and combating it. The government should play a stronger role in spreading further awareness amongst the general public and improving health facilities in general.

Therefore, it is now more important than ever to take action to control the outbreak, including improved surveillance and observation of the spread of mpox cases. Prevention tactics would cut down on the further spread of the disease, with vaccinations being the core of these strategies. Understanding the trends and the dynamics behind the spread of mpox would help people in healthcare to distinguish the most common symptoms, and to better comprehend how to manage patients, such as knowing whether to send them home for isolation or to keep them in the hospital. Unfortunately, instability in the Democratic Republic of Congo and nearby countries in Africa due to civil unrest and conflicts could result in health inequity and have a negative impact on efforts to try to limit the outbreak.¹²

Overall, certain African countries have seen outbreaks of mpox during the past 5 decades, but this marks the second time that mpox has crossed continental borders, spreading across a total of 122 countries.⁷ It is prime time to analyze and understand the transmission trends of this disease and find the answers behind its

Table 1 - Total number of mpox cases across the world.

Country	Total cases (until August 2024)	Total cases (until August 2023)	% Change in total case	Total deaths (until August 2024)	Total deaths (until August 2023)
United States	33435	30647	9.1	60	45
Brazil	11212	10967	2.23	16	16
Spain	8084	7559	6.95	3	3
France	4272	4147	3.01	0	0
Colombia	4249	4090	3.89	0	0
Mexico	4124	4039	2.1	34	30
United Kingdom	3952	3761	5.08	0	0
Peru	3875	3812	1.65	20	20
Germany	3857	3691	4.5	0	0
Democratic Republic of the Congo	3104	734	322.89	10	3
China	1931	114	1593.86	0	0
Canada	1557	1496	4.08	0	0
Chile	1449	1442	0.49	3	3
Netherlands	1304	1265	3.08	0	0
Portugal	1193	965	23.63	3	1
Argentina	1149	1129	1.77	2	2
Italy	1049	957	9.61	0	0
Nigeria	898	843	6.52	9	9
Belgium	810	795	1.89	2	2
Thailand	805	119	576.47	10	0
Switzerland	579	554	4.51	0	0
Ecuador	557	557	0	3	3
Guatemala	405	405	0	1	1
Austria	348	328	6.1	1	0
Taiwan	340	242	40.5	0	0
Australia	334	145	130.34	0	0
Israel	314	263	19.39	0	0
Sweden	299	260	15	0	0
Bolivia	265	265	0	0	0
Ireland	249	229	8.73	0	0
Japan	247	191	29.32	1	0
Panama	239	237	0.84	1	1
Costa Rica	225	225	0	0	0
Poland	223	217	2.76	0	0
Vietnam	202	3	6633.33	8	0
Denmark	198	196	1.02	0	0
South Korea	161	124	29.84	0	0
Ghana	127	127	0	4	4
Paraguay	126	126	0	0	0
Norway	106	96	10.42	0	0
El Salvador	104	104	0	0	0
Greece	99	88	12.5	0	0
Indonesia	88	1	8700	0	0
Hungary	85	80	6.25	0	0
Hong Kong	84	14	500	0	0
Czechia	82	71	15.49	1	1
Central African Republic	75	30	150	1	1
Luxembourg	61	57	7.02	0	0
Singapore	61	25	144	0	0
New Zealand	53	41	29.27	0	0
Dominican Republic	52	52	0	0	0
Cameroon	50	41	21.95	5	3
Romania	47	47	0	0	0
Slovenia	47	47	0	0	0

The last 48 countries in the table have been written in one concise row due to the numbers being low (dated August 6th, 2024, Centers for Disease Control and Prevention)⁷

Table 1 - Total number of mpox cases across the world (continuation).

Country	Total cases (until August 2024)	Total cases (until August 2023)	Percentage change in total case	Total deaths (until August 2024)	Total deaths (until August 2023)
Republic of the Congo	45	5	800	2	0
Honduras	44	44	0	0	0
Finland	43	42	2.38	0	0
Serbia	40	40	0	0	0
Malta	35	34	2.94	0	0
Croatia	34	33	3.03	0	0
India	27	22	22.73	1	1
Lebanon	27	27	0	0	0
South Africa	27	5	440	3	0
Liberia	23	13	76.92	0	0
Jamaica	21	21	0	0	0
Sudan	19	19	0	1	1
Uruguay	19	19	0	0	0
Iceland	17	16	6.25	0	0
Slovakia	16	14	14.29	0	0
United Arab Emirates	16	16	0	0	0
Cambodia	13	N/A	N/A	0	N/A
Turkey	12	12	0	0	0
Venezuela	12	12	0	0	0
Estonia	11	11	0	0	0
Remaining countries	176	135	30.37	2	2

The last 48 countries in the table have been written in one concise row due to the numbers being low. (dated Aug 6th, 2024, Centers for Disease Control and Prevention)⁷

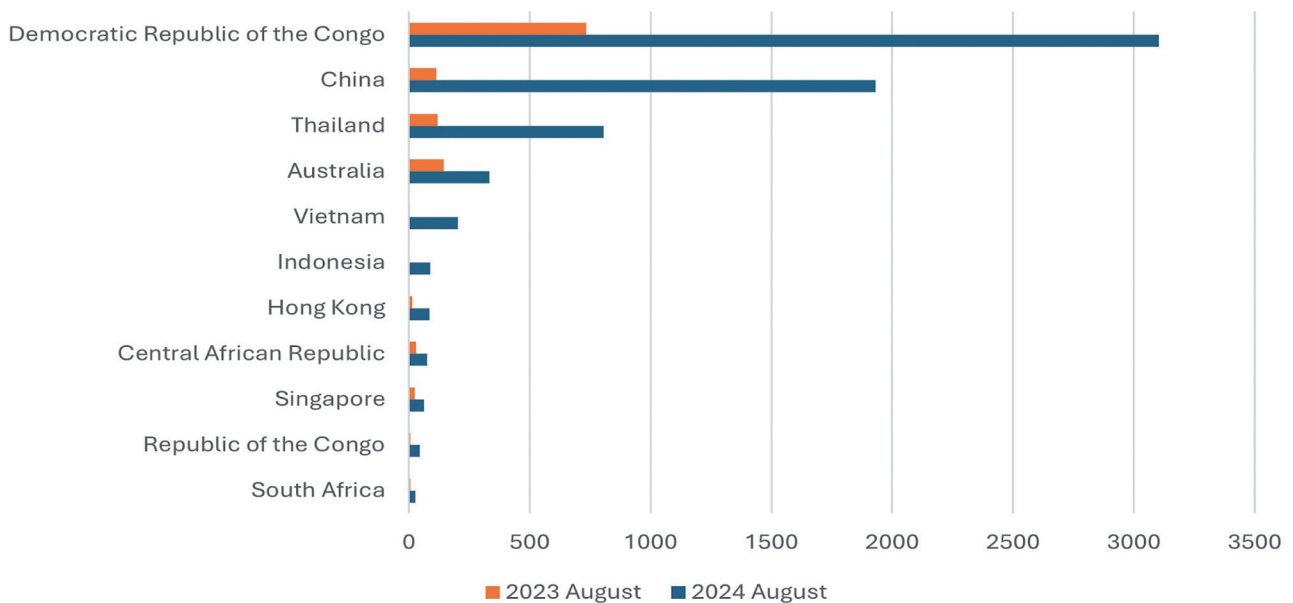


Figure 1 - Mpox cases in countries with the highest percentage change from August 1, 2023, to August 18, 2024.

recent outbreaks. The virus was ignored in Africa in the past, and unfortunately, it may lead to a potential pandemic now. The newer variant, Clade I, is much more dangerous than the variant seen in the 2022-2023 outbreak, which may result in a higher prevalence of cases and mortality rate.

While investigating the transmission trends of viral infectious diseases including Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) infection and mpox, the recent literature highlights the involvement of new risk factors such as sandstorms, air pollutants which can carry the viral particles, sources from place to place

and region to region. Meo et al,¹³ investigated the effect of environmental pollutants, particulate matter and their role in the cases and deaths due to SARS-CoV-2 infection. The authors reported that sandstorms significantly increased the air pollutants, which were temporally associated with increased SARS-COV-2 cases. In another study, Meo et al,¹⁴ established a positive relationship between environmental pollution and daily mpox cases. Meo et al,¹⁵ also explored the impact of travelling on the transmission of mpox and found that travelling may enhance the spread of mpox disease, and viral particles can spread the disease from person to person and from country to country. These findings provide evidence that policymakers should highlight the role of environmental pollution and travel in the transmission trends of viral particles, including mpox.

Study strengths and limitations. The strengths of this study include, on August 14, 2024; the World Health Organization declared Mpox a public health emergency of international concern, this is the first study that explored the global epidemiological trends in the prevalence and mortality due to mpox in various regions worldwide. This study attempts to harmonize the information across the regions and countries and provides a piece of additional information to highlight the epidemiological trends of the prevalence of the mpox outbreak in endemic and non-endemic regions. The limitation of this study is that PubMed- and Web of Science-based literature consist of brief communication and editorials and are hence unable to provide more detailed analyses and conclusions.

In conclusion, mpox cases are spreading rapidly across the globe, having already involved 122 countries, with a total of 99,518 cases, until 18th August 2024. The countries with the highest number of cases is the United States, followed by Brazil, Spain, France, Colombia, Mexico, the United Kingdom, Peru, Germany, Democratic Republic of the Congo; out of these countries, the Democratic Republic of Congo has the highest percentage changed when compared with last year, showcasing the current spread of the new variant (Clade I) amongst African countries. The healthcare authorities must make timely decisions to control the outbreak of mpox, as the world cannot afford the global burden of this mpox outbreak as another potential pandemic.

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