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EDITORIAL

Unraveling the resurgence of pertussis: Insights into epidemiology and global health strategies

Pertussis, or whooping cough, is an acute respiratory infection caused by Bordetella pertussis (B. pertussis). Following the introduction of pertussis vaccines, there was a significant decrease in the incidence and mortality rates of this disease. However, the year 2022 witnessed a marked resurgence in cases worldwide, highlighting a major public health concern. This epidemiological shift emphasizes the urgent need for global health strategies to effectively manage and mitigate the evolving dynamics of pertussis.

Data from 2008 to 2016 show stable pertussis cases in China, with annual counts ranging from 1612 to 6658. A sharp increase occurred from 2017 to 2019, with cases rising from 10,390 to 30,027. After a drop to 4475 in 2020, cases rebounded to 9611 in 2021 and surged beyond 38,000 in 2022 and 2023. Alarmingly, by early 2024, cases had already topped 32,000, [#] indicating a concerning trend that demands vigilant monitoring and proactive public health measures.

Pertussis incidence fluctuations are linked to changes in epidemic prevention measures, with global patterns reflecting this trend. Fig. 1 depicts trends in pertussis cases reported per 100,000 people in China, US, UK, and Australia. In the U.S., cases peaked at 48,277 in 2012, then declined during the COVID-19 pandemic, with a notable decrease to 6124 in 2020, before rising again post-pandemic to 5611 in 2023. [#] The UK and Australia showed similar trends, with initial declines during the pandemic followed by recent increases, suggesting a rebound effect as COVID-19 restrictions were lifted. For instance, UK cases surged from 69 in 2022 to 1468 in early 2024, [#] while Australia saw an increase to 2910 cases in early 2024. [#] These changes underscore the complex interplay between public health interventions, vaccination uptake, immune durability, and pathogen evolution in influencing pertussis spread.

The rise in global pertussis cases has multiple causes. Waning immunity from acellular pertussis (aP) vaccines diminishes after 2—3 years,[1—3] leading to periodic spikes in cases. Stringent COVID-19 health measures temporarily reduced transmission, but their relaxation, such as lifting mask mandates, may have led to an 'immunity debt',[4] fueling a resurgence. Moreover, pathogen evolution has resulted in acellular vaccine antigens changing more rapidly than other proteins,[5] influencing outbreaks. Despite high Diphtheria-Tetanus-Pertussis (DTP3) vaccination rates among one-year-olds, maintained across China, Australia, the U.S., and the U.K. from 2008 to 2022, with China achieving a 99 % rate since 2009 (Fig. 2), the current outbreak may be tied to reduced vaccine efficacy and B. pertussis mutations. The complexities of diagnosing pertussis, due to subtle vaccine-modified symptoms and testing limitations, necessitate refined clinical and lab coordination.[6] Enhanced pertussis surveillance has led to better case detection, underscoring the need for continuous adaptation in public health strategies.

The global increase in pertussis cases highlights the critical need for focused international response and preparedness. To prevent more severe outbreaks, it's crucial for countries to rapidly improve their diagnostic and preventive measures. On December 4, 2023, China's National Health Commission and the State Administration of Traditional Chinese Medicine jointly updated the "Pertussis Diagnosis and Treatment Protocol (2023 Edition)", [#] a comprehensive medical guide covering all aspects of pertussis management from etiology to prevention. While this protocol is set to significantly impact China's approach to pertussis, the lack of similar targeted policies in other countries amidst rising global cases is a major concern.

In response to the global resurgence of pertussis, our strategy includes a national vaccination program targeting newborns, pregnant women, and immunocompromised individuals, with emphasis on vaccinating pregnant women between 27 and 36 weeks to maximize maternal antibody transfer. We plan to enhance surveillance systems for prompt case detection and intervention, boost public awareness through media and community initiatives, and conduct regular health screenings in schools and nursing homes. Training healthcare providers in the latest diagnostic techniques, such as bacterial cultures early in symptom onset and PCR testing within three to four weeks, is vital for

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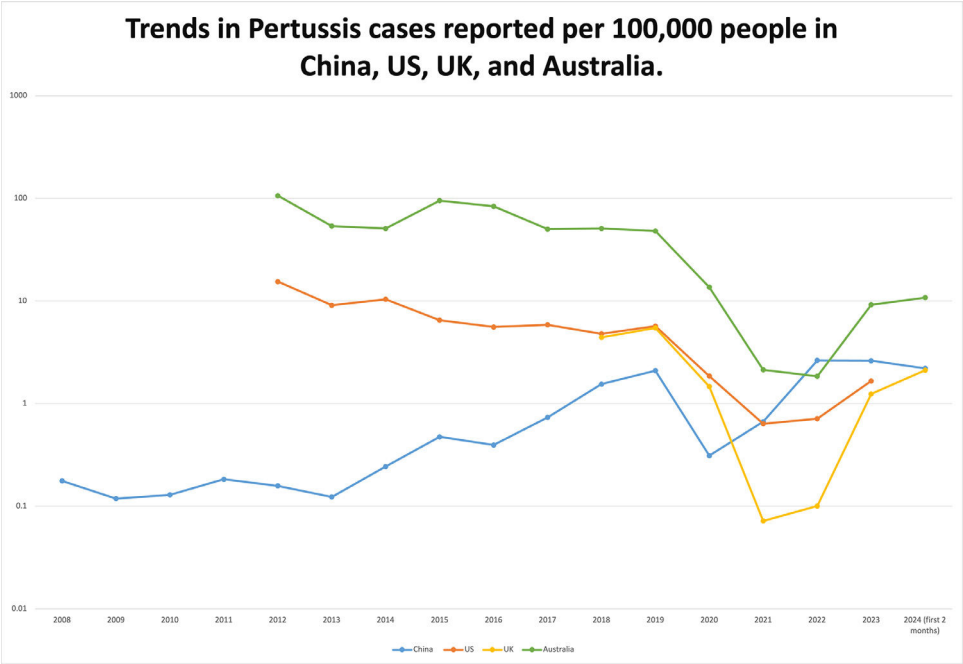

Fig. 1 Trends in Pertussis cases reported per 100,000 people in China, US, UK, and Australia. Data were collected from government official website. [#]

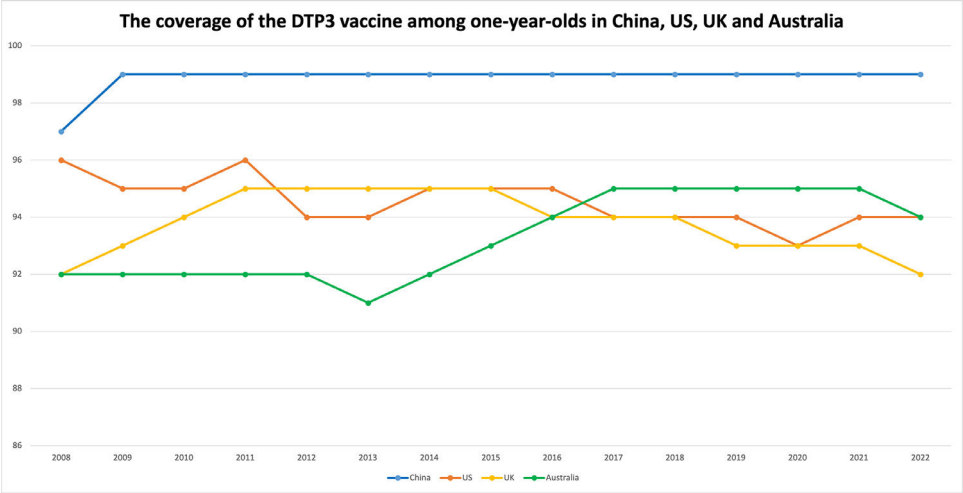

Fig. 2 The coverage (%) of the Diphtheria-Tetanus-Pertussis (DTP3) vaccine among one-year-olds, from 2008 to 2022, in China, US, UK and Australia. Data were collected from the WHO website. [#]

accurate diagnosis. We also aim to establish health education stations in busy public areas to promote healthy lifestyles and reduce pertussis transmission.

As policy implementation progresses, a marked decline in pertussis incidence is anticipated, reducing its global impact. A 2020 study demonstrated China's success through pertussis vaccination, preventing over 100 million cases and saving around 370,000 children's lives from 1978 to 2017.[7] However, the global eradication of pertussis remains a formidable challenge. Increasing vaccine coverage, especially in underdeveloped regions, and addressing health education, economic barriers, and vaccine hesitancy are crucial. Governments must focus resources on underserved areas, ensuring vaccinations for high-risk groups and combating vaccine hesitancy. With the rise in antibiotic resistance, developing more effective treatments is vital. Consequently, global efforts must focus on crafting and implementing comprehensive strategies to eradicate pertussis.

Declare of AI program assistance

Portions of this manuscript were assisted by AI-based tools for language polishing. All final decisions and edits were made by the authors.

Declaration about figure originality

Figs. 1 and 2 are original and were created by the authors for this manuscript.

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Conflicts of interest

None.

Supplementary materials

Supplementary material associated with this article can be found in the online version at doi:10.1016/j.pulmoe.2024.04.009.

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