Measles outbreaks in Azerbaijan

Halima Safarli[1], Mestan Emek[2], Nigar Mutalibova[3], Afet Akbarova[1], Aygun Ismayilova[4], Aljafar Jafarov[4], Rashad Chobanli[5] and Belgin Unal[6]

[1]Scientific Research Medical Preventive Institute named after V.Y.Akhundov, Baku, Azerbaijan (Correspondence to Halima Safarli: halisafarli@gmail.com). [2]Akdeniz University School of Medicine, Antalya, Turkey. [3]Azerbaijan State Advanced Training Institute for Doctors named after A.Aliyev, Baku, Azerbaijan. [4]Republic Hygiene and Epidemiology Center, Ministry of Health, Baku, Azerbaijan. [5]Regional Medical Divisions Administration, Baku, Azerbaijan. [6]Dokuz Eylul University, Faculty of Medicine, Izmir, Turkiye.

Abstract

Background: Measles, a highly contagious, vaccine-preventable, airborne disease, resurged globally post-COVID-19 pandemic, and Azerbaijan reported 31 730 cases between January 2023 and June 2024.

Aim: To analyse the measles outbreaks in Azerbaijan and propose prevention strategies.

Methods: We collected and analysed secondary data on measles cases reported to the Hygiene and Epidemiological Centers of Azerbaijan for January 2023 to June 2024, including vaccination coverage data for 2017–2023.

Results: A total of 13 207 cases were recorded in 2023, and this increased to 18 523 by June 2024. Of these cases, 52.2% were children aged 5–13 years in 2023 and 47.3% in 2024, while 42.1% of the cases in 2023 were hospitalised. Rural areas accounted for 52.6% of cases in 2023 and 51.9% in 2024. Measles-containing vaccine coverage decreased significantly nationwide in 2020–2021 during the COVID-19 pandemic: 78.9% coverage for first dose and 89.9% for second dose.

Conclusion: Pandemic-related decrease in vaccination coverage caused measles outbreaks in Azerbaijan, which disproportionately affected children and rural populations. To prevent future outbreaks, there is a need to rapidly increase vaccination coverage, alongside awareness campaigns, and to strengthen surveillance systems.

Keywords: measles, COVID-19, pandemic, Azerbaijan

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Introduction

Azerbaijan, a country of 10.2 million people as of 2024 and distributed across 14 economic regions (*1*), maintains a health system anchored by public institutions that are managed by the Administration of Regional Medical Divisions (TABIB) and the State Agency for Mandatory Health Insurance (SAMHI) (*2,3*). Vaccines, including the measles, mumps and rubella (MMR) vaccine, are administered under TABIB's supervision as part of the national immunisation programme (*4*). Despite achieving the WHO-endorsed measles elimination in 2015, Azerbaijan faces renewed threats from imported measles cases (*5*). This reflects the current trend in the WHO European Region, which reported 114 563 cases between April 2023 and March 2024, of which 98% was concentrated in 10 countries including Azerbaijan (*6*).

Measles, a highly contagious airborne disease (reproduction number R0=12–18) (*7*), spreads via respiratory droplets and requires ≥95% 2-dose MMR coverage to effect and sustain its elimination (*8*). Globally, post-COVID-19 decreases in routine vaccination have fuelled outbreaks, particularly among under-vaccinated and unvaccinated paediatric populations (*9*). In Azerbaijan, MMR1/MMR2 coverage decreased during the pandemic-related disruptions in 2020–2021 (*4*), exacerbating immunity gaps.

Previous studies have highlighted the role of subnational heterogeneity in vaccination coverage and mobility-driven transmission in sustaining measles outbreaks (*10*). However, a comprehensive analysis of the 2023–2024 measles epidemic in Azerbaijan—covering geographic distribution, demographic patterns and immunization status—has not yet been conducted. This study aimed to quantify measles incidence by month, region and age group; map transmission hotspots; and propose context-specific strategies to strengthen outbreak preparedness, leveraging secondary data from national surveillance systems.

Methods

This descriptive study was based on aggregated surveillance data provided by the Hygiene and Epidemiological Center, Ministry of Health, Republic of Azerbaijan. The data included all laboratory-confirmed, clinically compatible or epidemiologically linked reported measles cases from primary and secondary health facilities of Azerbaijan from January 2023 to June 2024. The number of cases was provided by month, region, age group (0–1, 1–4, 5–13, 14–17, ≥18 years), gender, and type of residence. We included information on hospitalisations due to measles, collected from facilities managed by TABIB. MMR1/MMR2 vaccination coverage information

for 2017–2023 was sourced from Azerbaijan's Hygiene and Epidemiological Center.

Measles incidence rates (per 100 000) were calculated by dividing the case counts by the region- and age-specific 2024 population data from the State Statistical Committee. Visualisations illustrating the geographic, temporal and demographic patterns were created using Adobe Illustrator, Photoshop, Figma, and Canva to enhance clarity and presentation quality.

Ethics clearance

This study was conducted with permission from the Ministry of Health and TABIB using fully anonymized surveillance data, which does not include any personal identifiers. Therefore, ethics approval and informed consent were not required in accordance with applicable guidelines and regulations.

Results

Measles cases in 2023

In 2023, the first measles cases were reported in Azerbaijan in May in 3 people. Subsequently, 13 207 cases of measles infection were reported in 2023, of which 118 98 (90%) were reported in December only (Figure 1). Of the cases, 355 (2.7%) were laboratory-confirmed and 12 872 (97.3%) were clinically compatible and epidemiologically linked. Three hundred and seventy (2.8%) were infants <1 year old, 2088 (15.8%) were 1–4 years, 6894 (52.2%) were 5–13 years , 1430 (10.8%) were 14–17 years, and 2425 (18.4%) were adults aged ≥18 years. Incidence rate among children aged 0–4 years was 386.62 cases per 100 000 population. Of all cases, 6940 (52.6%) were from rural areas, of which 5833 (84.1%) were aged 0–17 years.

Measles cases were reported in nearly all Azerbaijan regions. Khizi had the highest incidence rate, with 508.98 cases per 100 000 population (Figure 2). The highest number of cases were reported in Baku City (5249), Absheron District (1271), Sumgayit (476), and Imishli (430).

Measles cases in January to June 2024

In the first half of 2024, Azerbaijan reported 18 523 measles cases (Figure 1), with the majority occurring in January (8555) and February (5336). The number of cases gradually decreased subsequently, up to 184 in June. Only 108 of the total cases were laboratory-confirmed, while the remainder were classified as clinically compatible and epidemiologically linked. Males accounted for 10 137 (54.7%) of the cases, while females were 8386 (45.3%).

Four hundred and fifty (2.43%) of the cases were infants <1 year old, 2479 (13.3%) were 1–4 years, 8757 (47.3%) were 5–13 years, 2404 (13.0%) were 14–17 years, and 4433 (24.0%) were ≥18 years. Incidence rate among children aged 0–4 years was 481.11 cases per 100 000 population. Of the cases, 9209 (52.0%) were from rural areas, of which 7484 (77.8%) were <17 years old.

In comparison to the previous year, 1256 measles cases were also reported in the Nakhchivan Autonomous Republic in 2024, translating to 268.03 cases per 100 000 population (Figure 2). The highest number of cases (6126) occurred in Baku, representing an incidence rate of 261.24 per 100 000 people. Other areas with high number of cases were Sumgayit (1196), Absheron District (1043), Ganja (917), Aghjabadi (635), and Agstafa (567). Naftalan had the highest incidence rate in the country, with 1116.27 cases per 100 000 population, followed by Khizi (742.5), Agstafa (657.01), and Siyazan (571.7) (Figure 2).

Figure 1 Measles incidence in Azerbaijan, 2023 and January–June 2024

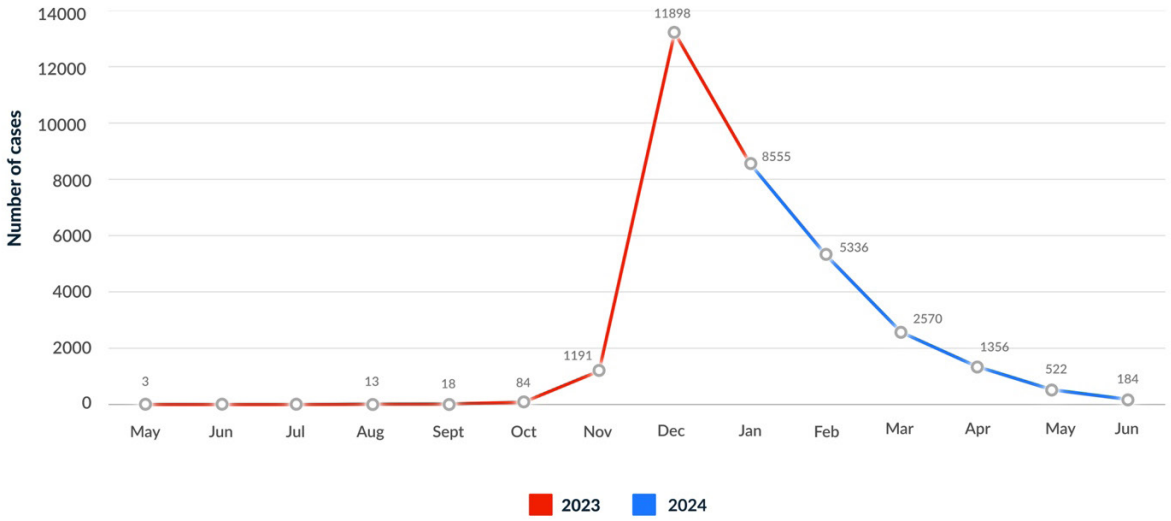
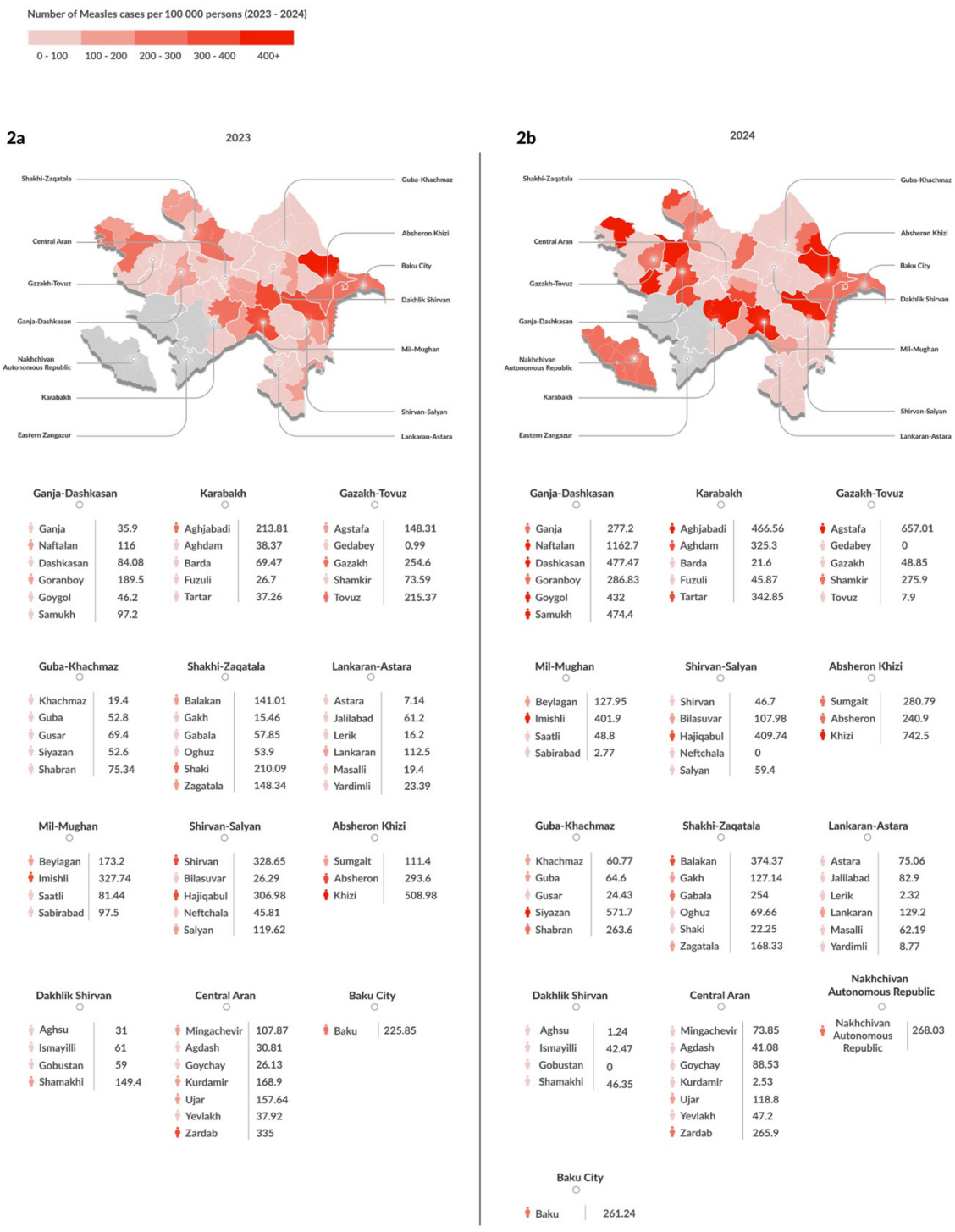


Figure 2 Measles incidence per 100 000 population by region and district in 2023 and January–June 2024



Hospitalisation

In 2023, 5565 individuals were hospitalised due to measles, representing 42.1% of all reported cases. Of these, 3041 hospitalisations occurred in Baku, of which 57.4% were hospitalised. In Sumgayit, 334 (70.1%) people were hospitalised, with 208 (53.8%) in Shaki, 170 (88.1%) in Zagatala, and 124 (62%) in Kurdamir.

During the first half of 2024, 15 265 (82.4%) cases received inpatient care across Azerbaijan, although data on hospitalisation in the Nakhchivan Autonomous Republic was not available. The average length of hospital stay was 5.28 days, the shortest stay was 2.9 days and the longest was 7.5 days. Unfortunately, detailed information regarding the causes of hospitalisation, including complications such as pneumonia, encephalitis and keratoconjunctivitis, was not available (*11*).

Vaccination status

The vaccination status of all measles cases in 2023 and the first half of 2024 remains unknown. However, based on available data for 2017–2023, there was a significant decrease in MMR1 (78.9%) and MMR2 (89.9%) vaccination coverage during the COVID-19 pandemic in 2020 and 2021 (Figure 3). Regions that reported the lowest coverage were Qobustan (MMR2: 18% in 2020 and 52.7% in 2021), Yevlakh (MMR2: 24.8% in 2020 and 30.8% in 2021) and Mingachevir (MMR2: 47.7% in 2020 and 39.2% in 2021). Conversely, Agstafa (97.1–95.1%), Imishli (96.7–96.4%) and Khizi (95.3–96.4%) maintained high MMR2 coverage in 2020 and 2021 (Figure 3).

Discussion

Azerbaijan experienced measles outbreaks in 2023–2024. Although the specific vaccination status data for the measles cases was unavailable, data from the WHO regional office indicates that a significant portion of cases with known vaccination status was either unvaccinated or incompletely vaccinated (*12*). This pattern has been reported for other measles outbreaks across the European Region, where the highest incidence was observed among 0–4-year-olds (*4*).

Children aged 5–13 years represented over half of the cases (52.2% in 2023 and 47.3% in 2024). This disparity aligns with the decrease in MMR1 and MMR2 coverage in Azerbaijan during the pandemic, which can be attributed to lockdowns and movement restrictions, which made it difficult for families to access health facilities for routine childhood immunization (*13-15*). In 2023, the measles incidence per 100 000 persons in Azerbaijan was predominantly high (566.1) among the 5–9-year age group, while in countries like Kazakhstan (538.2) and Kyrgyzstan (1129.1), a high incidence was reported among infants aged <1 year (*16*).

A contrasting pattern was reported in regions like Agstafa and Khizi, where high MMR1/MMR2 coverage coincided with elevated incidence rates (657.01–742.50 per 100 000 in 2024). This could be attributed to discrepancies in residency, because individuals could register in regions different from where they actually reside. The low-coverage regions like Qobustan and Yevlakh reported fewer cases, likely due to gaps in surveillance systems or inaccurate disease reporting.

Adults aged ≥18 years accounted for 18.4–23.9% of all cases, similar to Kyrgyzstan which had 19% of cases as adults in 2023 (*17*). Available research emphasizes the importance of achieving 95% immunity by the age of 5 to eliminate measles, making it crucial to close immunity gaps in older age groups to prevent outbreaks (*18*).

A significant proportion of the patients were hospitalised, although we could not obtain detailed information on the reasons for hospitalisation. However, this practice risks nosocomial transmission (*19*), underscoring the need to prioritise outpatient management for mild cases.

To prevent future outbreaks, Azerbaijan should prioritise catch-up vaccination campaigns for children aged 5–13 years, following Turkey's model that helped reduce paediatric cases (*20,21*). Genotyping, successfully implemented in Georgia to track imported strains (*22*), could help clarify the transmission dynamics, while adult serosurveys would identify the immunity gaps.

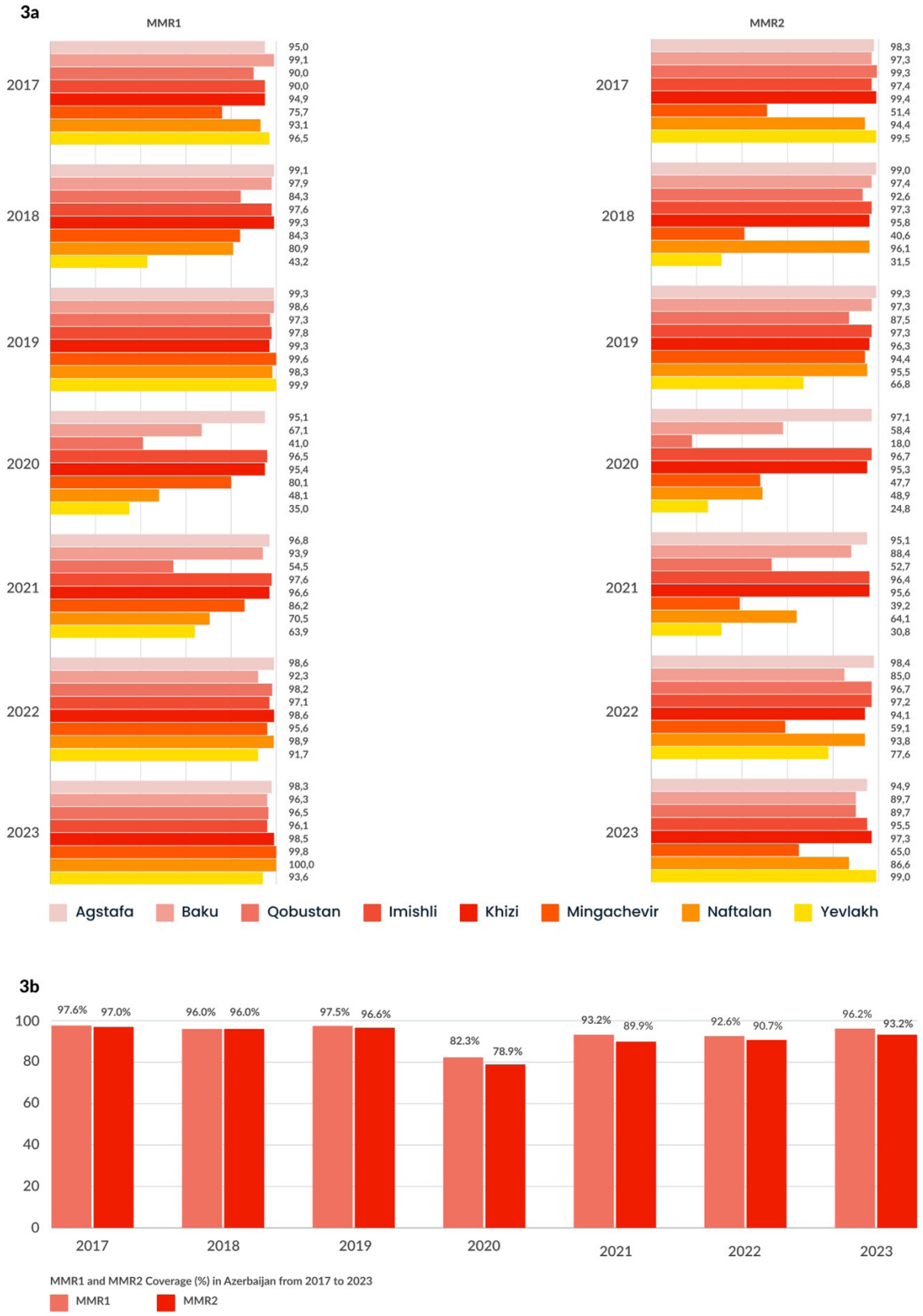
Strengths and limitations of the study

This study is the first comprehensive analysis of measles cases in Azerbaijan for 2023–2024, offering detailed geographic and subnational insights into the outbreak and the immunisation trends. However, reliance on surveillance data from a single source (Hygiene and Epidemiological Center) may have caused underreporting, particularly in rural regions with weaker healthcare infrastructure. The lack of laboratory confirmation for some cases (2.69% in 2023) may have caused the inclusion of rubella or vaccine-associated reactions. The absence of case-level vaccination status data limits direct analysis of immunity gaps, while incomplete adoption of the European Region case definitions (*24*) and the missing genetic characterisation of the measles virus (*23*) hinder comparability with regional outbreaks and obscure transmission origins. Unavailability of mortality data precludes the assessment of outbreak severity. These gaps highlight the need for enhanced diagnostics, genotyping and standardised reporting aligned with global surveillance benchmarks.

Conclusion

Measles is a highly contagious but vaccine-preventable disease. To achieve its eradication and reduce the strain on the health systems, robust measures—including widespread vaccination and effective surveillance—are essential. The measles outbreak in Azerbaijan disproportionately impacted children aged 5–13 years and regions with low vaccination coverage, indicating the need to strengthen routine immunisation. Adult cases expose immunity gaps among the older age groups, and the high hospitalisation rates meant higher burden

Figure 3 MMR1 and MMR2 vaccination coverage (%) in Azerbaijan and selected regions (2017–2023)



on the health system. Targeted catch-up vaccination campaigns must reach children who missed their second MMR dose, especially in rural areas. Improving laboratory capacity for rapid diagnosis and confirmation will enhance detection. Strengthened surveillance is critical to close reporting gaps and mitigate risks due to imported cases.

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Competing interests: None declared.

Flambées épidémiques de rougeole en Azerbaïdjan

Résumé

Contexte : La rougeole, une maladie à transmission aérienne hautement contagieuse et évitable par la vaccination, a connu une résurgence mondiale après la pandémie de COVID-19. En Azerbaïdjan, 31 730 cas ont été notifiés entre janvier 2023 et juin 2024.

Objectifs : Analyser les flambées de rougeole en Azerbaïdjan et proposer des stratégies de prévention.

Méthodes : Nous avons recueilli et analysé des données secondaires sur les cas de rougeole signalés aux centres d'hygiène et d'épidémiologie d'Azerbaïdjan entre janvier 2023 et juin 2024, incluant les données de couverture vaccinale pour la période 2017-2023.

Résultats : Au total, 13 207 cas ont été enregistrés en 2023, ce nombre ayant augmenté pour atteindre 18 523 en juin 2024. Parmi ces cas, 52,2 % et 47,3 % concernaient des enfants âgés de 5 à 13 ans en 2023 et en 2024, respectivement. Par ailleurs, 42,1 % des cas enregistrés en 2023 ont nécessité une hospitalisation. En 2023, 52,6 % des cas provenaient de zones rurales, contre 51,9 % en 2024. La couverture vaccinale contre la rougeole a fortement diminué à l'échelle nationale en 2020-2021 durant la pandémie de COVID-19 : 78,9 % pour la première dose et 89,9 % pour la seconde.

Conclusion : La baisse de la couverture vaccinale due à la pandémie a provoqué des flambées de rougeole en Azerbaïdjan, touchant de manière disproportionnée les enfants et les populations rurales. Pour prévenir de futures flambées épidémiques, il est nécessaire d'augmenter rapidement la couverture vaccinale, de mener des campagnes de sensibilisation et de renforcer les systèmes de surveillance.

فاشيات الحصبة في أذربيجان

حليمة سفرلي، ميستان إيميك، نيجار موتاليبوفا، عفت أكبروفا، أيجون إسماعيلوفا، الجعفر جعفروف، رشاد تشوبانلي، بيلجين أونال

الخلاصة

الخلفية: الحصبة مرض شديد العدوى يمكن الوقاية منه باللقاحات وينتقل عن طريق الهواء، وقد عاود الظهور عالميًا بعد جائحة كوفيد-19، وأبلغت أذربيجان عن 31730 حالة في الفترة بين يناير/ كانون الثاني 2023 ويونيو/ حزيران 2024.

الأهداف: هدفت هذه الدراسة إلى تحليل فاشيات الحصبة في أذربيجان واقتراح استراتيجيات وقائية.

طرق البحث: جمعنا وحللنا بيانات ثانوية عن حالات الحصبة أُبلغت إلى المراكز الصحية والوبائية في أذربيجان عن الفترة من يناير/ كانون الثاني 2023 إلى يونيو/ حزيران 2024، بما في ذلك بيانات التغطية بالتطعيم للفترة 2017–2023.

النتائج: سُجِّل ما مجموعه 13207 حالات في عام 2023، وارتفع هذا العدد إلى 18523 حالة بحلول يونيو/ حزيران 2024. وكان 52.2% من تلك الحالات من الأطفال الذين تتراوح أعمارهم بين 5 سنوات و13 سنة في عام 2023، و47.3% في عام 2024، ودخل 42.1% منهم المستشفى. وشكّلت المناطق الريفية 52.6% من الحالات في عام 2023، و51.9% في عام 2024. وانخفضت التغطية باللقاحات المحتوية على

الحصبة انخفاضًا كبيرًا على الصعيد الوطني في الفترة 2020–2021 خلال جائحة كوفيد-19: حيث كانت التغطية بالجرعة الأولى 78.9% وبالجرعة الثانية 89.9%.

الاستنتاجات: تسبب انخفاض التغطية بالتطعيم المرتبط بالجوائح في تفشّي الحصبة في أذربيجان، وهو ما أثَّر تأثيرًا غير متناسب على الأطفال والسكان في المناطق الريفية. ومن أجل الوقاية من الفاشيات في المستقبل، هناك حاجة إلى الإسراع في زيادة التغطية بالتطعيم وحملات التوعية، إلى جانب تعزيز نُظُم الترصُّد.

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