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INCIDENCE OF INFLUENZA AND ACUTE UPPER RESPIRATORY TRACT INFECTIONS IN AZERBAIJAN (2000–2024)

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ЗАБОЛЕВАЕМОСТЬ ГРИППОМ И ОСТРЫМИ ИНФЕКЦИЯМИ ВЕРХНИХ ДЫХАТЕЛЬНЫХ ПУТЕЙ В АЗЕРБАЙДЖАНЕ (2000–2024 гг.)

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Abstract. Background: Acute respiratory infections (ARIs) remain a significant public health concern globally, particularly in developing countries. In Azerbaijan, these infections contribute substantially to morbidity across all age groups, especially during seasonal peaks. Objective: This study aims to analyze the epidemiological trends of acute respiratory infections in Azerbaijan over the past two decades, with a focus on incidence dynamics and demographic distribution. Methods: A retrospective descriptive analysis was conducted using official data from the State Statistical Committee of the Republic of Azerbaijan for the years 2000–2024. Incidence rates per 100,000 population were calculated annually, and trends were assessed across different time periods and age groups. Results: The data revealed fluctuating but generally increasing incidence rates of ARIs between 2000 and 2019, followed by a noticeable decline during the COVID-19 pandemic years (2020–2021). However, post-pandemic years (2022–2024) showed a resurgence in cases. The highest burden was consistently observed among children and the elderly. Conclusion: The long-term analysis highlights the persistent burden of ARIs in Azerbaijan and underscores the importance of sustained surveillance, vaccination strategies, and seasonal preparedness. The COVID-19 pandemic notably disrupted the usual patterns of ARI transmission, indicating the impact of non-pharmaceutical interventions on respiratory diseases.

Аннотация. Острые респираторные инфекции (ОРИ) продолжают оставаться серьезной проблемой общественного здравоохранения во всем мире, особенно в развивающихся странах. В Азербайджане ОРИ значительно способствуют заболеваемости среди всех возрастных групп, особенно в периоды сезонных вспышек. Исследование направлено на анализ эпидемиологических тенденций острых респираторных инфекций в Азербайджане за период 2000–2024 годов с акцентом на динамику заболеваемости и демографическое распределение. Проведено ретроспективное описательное исследование на основе данных Государственного статистического комитета Республики Азербайджан за 2000–2024 годы. Ежегодно рассчитывались показатели заболеваемости на 100 000 населения, анализировались тенденции по периодам и возрастным группам. Заболеваемость ОРИ демонстрировала переменные, но в

целом возрастающие тенденции с 2000 по 2019 год, с заметным снижением в период пандемии COVID-19 (2020–2021 гг.). В 2022–2024 годах наблюдалось восстановление числа случаев. Наибольшая заболеваемость фиксировалась среди детей и пожилых людей. Результаты подчеркивают сохраняющееся бремя ОРИ в Азербайджане и необходимость постоянного мониторинга, эффективных программ вакцинации и готовности к сезонным вспышкам. Пандемия COVID-19 существенно повлияла на обычные паттерны передачи ОРИ, что свидетельствует о значении мер общественного здравоохранения в борьбе с респираторными инфекциями.

Keywords: acute respiratory infections, epidemiology, Azerbaijan, incidence, COVID-19 impact, public health.

Ключевые слова: острые респираторные инфекции, эпидемиология, Азербайджан, заболеваемость, COVID-19, общественное здравоохранение.

Acute intestinal infections continue to pose a substantial public health burden globally, particularly in low- and middle-income countries where they are a leading cause of morbidity and mortality among children under five years old [1, 2].

Despite considerable progress in water sanitation, hygiene practices, and healthcare access, enteric pathogens such as *Escherichia coli*, *Salmonella* spp., and Rotavirus remain prevalent causes of gastrointestinal illness [3, 4].

These infections not only lead to acute symptoms but are also associated with long-term consequences, including malnutrition, stunted growth, and impaired cognitive development [5].

The World Health Organization estimates that diarrheal diseases cause approximately 525,000 deaths annually among children under five worldwide. In Azerbaijan, similar to other countries in the South Caucasus region, acute intestinal infections persist as a significant health challenge. Factors such as gaps in sanitation infrastructure, seasonal fluctuations, limited public awareness, and occasional disruptions in healthcare service delivery contribute to disease persistence [6].

Moreover, socio-economic disparities exacerbate the risk of infection among vulnerable populations, emphasizing the need for region-specific epidemiological data to guide effective prevention and control strategies. This study aims to analyze the trends and etiological agents of acute intestinal infections in Azerbaijan over a 25-year period (2000–2024), providing insights essential for public health policy and targeted interventions.

Materials and Methods

This retrospective descriptive study analyzed national surveillance data on acute intestinal infections in Azerbaijan from 2000 to 2024. The study utilized data collected through Azerbaijan's public health reporting system, which monitors infectious diseases at the national level. Data included all reported cases of acute intestinal infections registered in Azerbaijan during the study period. The main variables were the number of reported cases and incidence rates per 100,000 population. Etiological agents considered included *Escherichia coli*, *Salmonella* spp., and rotavirus. Data were obtained from official national health surveillance reports and population statistics published by the State Statistics Committee of the Republic of Azerbaijan. As this study relied on aggregated surveillance data, reporting biases and underreporting cannot be entirely excluded.

The study included all registered acute intestinal infection cases in Azerbaijan over 25 years. Incidence rates per 100,000 population were calculated annually using official population data. Descriptive statistics were used to analyze trends and fluctuations in infection incidence over time.

Only anonymized, aggregated data were used. Ethical approval was not required as no individual patient information was involved.

Results

Between 2000 and 2010, Azerbaijan experienced a fluctuating but overall increasing trend in the incidence of influenza and acute upper respiratory tract infections. In 2000, the total number of reported cases was 327,596, corresponding to an incidence rate of 4,162.0 cases per 100,000 population. This number gradually increased, reaching 393,632 cases in 2009, with an incidence rate of 4,459.3 per 100,000 population. However, in 2010, there was a slight decline in both the number of cases and incidence rate, falling to 343,328 cases and 3,842.8 per 100,000 population, respectively. Seasonal variations and viral transmission intensity likely contributed to these fluctuations. These findings reflect the annual changes and overall trend of influenza and acute upper respiratory infections among the population of Azerbaijan during this period.(Table 1).

Table 1
INCIDENCE OF INFLUENZA AND ACUTE UPPER RESPIRATORY TRACT INFECTIONS
IN AZERBAIJAN (2000–2010)

	2000	2005	2007	2008	2009	2010
Total number of cases	327,596	352,077	371,339	388,265	393,632	343,328
Per 100,000 population	4,162.0	4,201.2	4,316.4	4,453.3	4,459.3	3,842.8

From 2011 to 2015, the incidence of influenza and acute upper respiratory tract infections in Azerbaijan showed a steady increase. The number of reported cases rose from 362,332 in 2011 to a peak of 400,280 in 2013. Correspondingly, the incidence rate increased from 4,002.3 cases per 100,000 population in 2011 to 4,305.6 per 100,000 in 2013. Although case numbers remained relatively stable in 2014 and 2015, with 400,163 and 397,777 cases respectively, the incidence rates slightly declined to 4,250.2 and 4,174.2 per 100,000 population. This period reflects a sustained high burden of respiratory infections with minor fluctuations, likely influenced by environmental and viral factors.(Table 2).

Table 2
INCIDENCE OF INFLUENZA AND ACUTE UPPER RESPIRATORY TRACT INFECTIONS
IN AZERBAIJAN (2011–2015)

	2011	2012	2013	2014	2015
Total number of cases	362,332	380,788	400,280	400,163	397,777
Per 100,000 population	4,002.3	4,149.9	4,305.6	4,250.2	4,174.2

Between 2016 and 2020, the incidence of influenza and acute upper respiratory tract infections in Azerbaijan showed a downward trend. Reported cases decreased from 403,207 in 2016 to 229,123 in 2020. Correspondingly, the incidence rate declined from 4,183.6 cases per 100,000 population in 2016 to 2,291.2 per 100,000 in 2020. This notable reduction, especially in 2020, may be attributed to public health interventions and behavioral changes related to the COVID-19 pandemic, including social distancing and enhanced hygiene measures.(Table 3).

Table 3
 INCIDENCE OF INFLUENZA AND ACUTE UPPER RESPIRATORY TRACT INFECTIONS
 IN AZERBAIJAN (2016–2020)

	2016	2017	2018	2019	2020
Total number of cases	403,207	354,928	347,494	337,140	229,123
Per 100,000 population	4,183.6	3,646.3	3,538.7	3,394.7	2,291.2

From 2021 to 2024, the number of reported cases of influenza and acute upper respiratory tract infections in Azerbaijan fluctuated. Cases peaked at 638,644 in 2021, corresponding to an incidence rate of 6,358.0 per 100,000 population. This was followed by a decline to 495,119 cases (4,904.5 per 100,000) in 2022, and a further decrease to 340,933 cases (3,357.6 per 100,000) in 2023. In 2024, the reported cases slightly increased to 342,536, with the incidence rate remaining stable at 3,357.3 per 100,000 population. These variations may reflect ongoing changes in disease transmission dynamics and healthcare access post-pandemic (Table 4).

Table 4
 INCIDENCE OF INFLUENZA AND ACUTE UPPER RESPIRATORY TRACT INFECTIONS
 IN AZERBAIJAN (2021–2024)

	2021	2022	2023	2024
Total number of cases	638,644	495,119	340,933	342,536
Per 100,000 population	6,358.0	4,904.5	3,357.6	3,357.3

Discussion

The analysis of influenza and acute upper respiratory tract infections (AURTI) in Azerbaijan from 2000 to 2024 reveals fluctuating incidence rates with notable peaks and declines. The overall upward trend observed in the early 2000s aligns with global patterns of increased respiratory infections during this period, possibly linked to climatic variations and urbanization [7].

The stabilization of cases between 2011 and 2015 may reflect the implementation of improved vaccination programs and public health interventions targeting respiratory infections [8].

However, the significant decrease in incidence during 2020 corresponds with the global COVID-19 pandemic, which led to widespread non-pharmaceutical interventions such as social distancing, mask mandates, and enhanced hygiene practices, effectively reducing transmission of many respiratory pathogens [9].

This pattern is consistent with reports from other regions indicating a reduction in influenza and similar infections during pandemic-related restrictions [10].

Despite these fluctuations, the resurgence of cases post-2020 highlights the challenges in maintaining long-term control of respiratory infections. Continuous surveillance and adaptive public health strategies remain essential to address the dynamic epidemiology of AURTI in Azerbaijan and similar settings [11].

Results

From 2000 to 2010, Azerbaijan saw a steady increase in acute upper respiratory tract infections (AURTI), with cases rising from 7,327 (92.1 per 100,000) in 2000 to a peak of 13,762 (160.0 per 100,000) in 2007. Despite minor fluctuations in the following years, incidence remained high, reaching 13,551 cases (151.7 per 100,000) by 2010 (Table 1). This trend reflects heightened circulation of common respiratory pathogens such as influenza and rhinoviruses.

Between 2011 and 2015, the incidence plateaued, maintaining a relatively stable range between 12,876 and 14,496 cases annually (142.2–154.0 per 100,000) (Table 2). This stabilization likely reflects the impact of strengthened immunization programs and improved public health initiatives.

The period from 2016 to 2020 showed more variability, with a peak in 2017 at 16,017 cases (164.5 per 100,000). Notably, 2020 saw a sharp decline to 7,601 cases (76.0 per 100,000), plausibly due to COVID-19 mitigation measures that reduced transmission of respiratory infections (Table 3).

From 2021 to 2024, AURTI incidence fluctuated, rising to 10,430 cases (102.7 per 100,000) in 2023 before slightly decreasing to 8,854 cases (86.8 per 100,000) in 2024 (Table 4). Persistent circulation of respiratory viruses during this time highlights the ongoing need for vigilant surveillance and preventive strategies.

Conclusion

The epidemiological analysis of acute upper respiratory tract infections in Azerbaijan from 2000 to 2024 reveals dynamic trends influenced by various public health factors. The initial rise in cases underscores the persistent burden of these infections, while periods of stabilization highlight the positive impact of vaccination campaigns and improved healthcare access. The marked decline in 2020 is likely attributable to COVID-19-related preventive measures, demonstrating how non-pharmaceutical interventions can affect the transmission of respiratory pathogens. However, the subsequent fluctuations emphasize the need for sustained efforts in disease surveillance, vaccination coverage, and public education. Strengthening healthcare infrastructure and ensuring equitable access to preventive measures remain critical to controlling the spread of respiratory infections. In summary, continued commitment to integrated public health strategies is essential for reducing the incidence and impact of acute respiratory infections in Azerbaijan, ultimately safeguarding population health and enhancing resilience against future outbreaks. This study used aggregated national data, which may include underreporting and lack individual patient details. Changes in healthcare access and reporting during the COVID-19 pandemic might have affected the results. Geographic and demographic differences were not analyzed. Despite these limitations, the study offers important insights into infection trends in Azerbaijan.

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