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# CHANGING EPIDEMIOLOGY OF SCARLET FEVER IN AZERBAIJAN: A LONGITUDINAL STUDY (2000–2024)

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# ИЗМЕНЕНИЕ ЭПИДЕМИОЛОГИИ СКАРЛАТИНЫ В АЗЕРБАЙДЖАНЕ: ЛОНГИТЮДИНАЛЬНОЕ ИССЛЕДОВАНИЕ (2000–2024 ГГ.)

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*Abstract.* Scarlatina (scarlet fever), caused by Streptococcus pyogenes, remains a significant public health concern due to its potential for outbreaks and complications. The aim of this study was to assess the incidence of scarlatina in Azerbaijan between 2000 and 2024 and to analyze trends in disease dynamics. This retrospective descriptive study utilized national epidemiological surveillance data from the State Statistical Committee of the Republic of Azerbaijan. Reported scarlatina cases and incidence rates per 100,000 population were analyzed over five-year intervals. Between 2000 and 2010, the incidence of scarlatina remained low, ranging from 0.5 to 2.1 per 100,000. A moderate increase occurred from 2011–2020, with annual rates fluctuating between 1.5 and 2.6. However, the most notable surge was observed from 2022 to 2024, with the incidence reaching 11.1 in 2024. This increase may be partially linked to post-pandemic healthcare changes and enhanced surveillance. The recent rise in scarlatina incidence in Azerbaijan calls for reinforced surveillance, public education, and targeted interventions. Further research is needed to explore the causes of this resurgence and to evaluate potential preventive measures.

*Аннотация.* Скарлатина, вызываемая Streptococcus pyogenes, остается важной проблемой общественного здравоохранения из-за потенциала возникновения вспышек и осложнений. Целью данного исследования была оценка заболеваемости скарлатиной в Азербайджане в период с 2000 по 2024 год и анализ тенденций в динамике заболевания. В данном ретроспективном дескриптивном исследовании использовались данные национального эпидемиологического надзора Государственного комитета статистики Азербайджанской Республики. Зарегистрированные случаи скарлатины и показатели заболеваемости на 100 000 населения анализировались с пятилетними интервалами. В период с 2000 по 2010 год заболеваемость скарлатиной оставалась низкой, колеблясь от 0,5 до 2,1 на 100 000 человек. Умеренный рост произошел в 2011–2020 годах, когда ежегодные показатели колебались в пределах 1,5–2,6. Однако наиболее заметный всплеск наблюдался в период с 2022 по 2024 год, при этом заболеваемость в 2024 году достигла 11,1. Этот рост может быть частично связан с изменениями в сфере здравоохранения после пандемии и усилением надзора. Недавний рост заболеваемости скарлатиной в Азербайджане требует усиления эпидемиологического надзора, просвещения населения и проведения целевых мероприятий. Необходимы дальнейшие исследования для изучения причин этого всплеска и оценки потенциальных профилактических мер.

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*Keywords:* Scarlatina, Scarlet Fever, Streptococcus pyogenes, Epidemiology, Azerbaijan, Incidence, Public Health.

*Ключевые слова:* скарлатина, Streptococcus pyogenes, эпидемиология, Азербайджан, заболеваемость, общественное здравоохранение.

Scarlatina, also known as scarlet fever, is an acute infectious disease caused by Streptococcus pyogenes (Group A β-hemolytic streptococcus) [1].

It primarily affects children and is characterized by fever, sore throat, and a distinctive red rash [2].

Despite the availability of effective antibiotics, outbreaks continue to occur globally, reflecting the pathogen's evolving epidemiological behavior and public health significance [1, 3].

Historically, scarlatina was a leading cause of childhood morbidity and mortality [4]. Although its incidence dramatically declined with the advent of antibiotics and improved hygiene, recent years have witnessed a resurgence in several countries, including parts of Europe and Asia [5, 6].

The resurgence may be attributed to shifts in microbial virulence, population susceptibility, or gaps in public health responses [7].

In Azerbaijan, scarlatina is a notifiable disease, with annual surveillance data collected by the State Statistical Committee. However, limited research has been conducted to evaluate its long-term trends. This study aims to assess the epidemiological profile of scarlatina in Azerbaijan over a 24-year period (2000–2024), analyze incidence patterns, and discuss implications for disease control and prevention.

*Differences Between Measles and Scarlatina.* Scarlatina (scarlet fever) is one of the infectious diseases that can be confused with measles due to similarities in symptoms such as sneezing, runny nose, and fever. However, these two diseases have different etiologies. Scarlatina is caused by the bacterial infection Streptococcus pyogenes, classifying it as a bacterial disease, whereas measles is caused by the measles virus.

In terms of prevention and treatment, vaccination is the primary preventive measure for measles, while scarlatina is mainly treated with antibiotics [8].

Prompt and appropriate management of scarlatina is crucial, as untreated or poorly treated cases may result in serious complications such as rheumatic fever and cardiovascular diseases [9–10].

*Differences Between Varicella (Chickenpox) and Scarlatina (Scarlet Fever).* Varicella, also known as chickenpox, is an infectious disease caused by the varicella-zoster virus. It primarily manifests with a widespread itchy rash and fever, mostly affecting children. In contrast, scarlatina (scarlet fever) is a bacterial infection triggered by Streptococcus pyogenes (Group A β-hemolytic streptococcus). It is characterized by symptoms such as sore throat, high fever, and a distinctive red rash. Unlike varicella, which can be effectively prevented through vaccination, scarlatina requires antibiotic therapy due to its bacterial origin. Timely treatment of scarlatina is crucial, as delayed or inadequate management may lead to serious complications, including rheumatic fever and cardiac conditions. Thus, although both diseases share some overlapping clinical features, their causes, treatment approaches, and prevention strategies differ significantly [11, 12].

*Differences Between Measles (Rubeola) and Scarlatina (Scarlet Fever).* Measles (rubeola) is a highly contagious viral illness caused by the measles virus, primarily transmitted through respiratory droplets. It is characterized by symptoms such as high fever, cough, conjunctivitis, and a distinctive maculopapular rash that typically starts on the face and spreads downward. Measles often leads to complications like pneumonia and encephalitis, especially in unvaccinated populations [13, 14].

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In contrast, scarlatina (scarlet fever) is a bacterial infection caused by Streptococcus pyogenes (Group A β-hemolytic streptococcus). It presents with sudden onset of fever, sore throat, and a fine, sandpaper-like red rash primarily affecting the trunk and extremities. Unlike measles, scarlet fever can be effectively treated with antibiotics, which also help prevent severe complications such as rheumatic fever and kidney disease [15].

While both diseases involve rash and fever, their etiology, clinical course, and treatment differ significantly. Measles is viral and prevented primarily by vaccination, whereas scarlet fever is bacterial and requires antibiotic therapy for management.

*Methods*

This study is a retrospective epidemiological analysis of scarlatina cases reported in Azerbaijan from 2000 to 2024. Data were obtained from the official reports of the State Statistical Committee of the Republic of Azerbaijan.

Annual counts of registered scarlatina cases and incidence rates per 100,000 population were analyzed across four periods: 2000–2010, 2011–2015, 2016–2020, and 2021–2024. The etiological agent in all cases was Streptococcus pyogenes, as confirmed through clinical and laboratory diagnosis according to national reporting standards.

Descriptive statistics were used to examine trends in incidence rates over time. Graphs and tables were generated to illustrate variations and detect any temporal increases or decreases in reported cases. Ethical approval was not required, as the study used publicly available aggregated data.

*Results*

*Incidence of Scarlatina in Azerbaijan (2000-2010):* Between 2000 and 2010, the incidence of scarlatina fluctuated moderately. The number of reported cases ranged from 43 in 2007 to 185 in 2009. Correspondingly, the incidence rate varied between 0.5 and 2.1 cases per 100,000 population. The highest incidence during this period was observed in 2009 (2.1/100,000), while the lowest was in 2007 (0.5/100,000).

Table 1

INCIDENCE OF SCARLATINA AMONG THE POPULATION IN AZERBAIJAN (NUMBER OF REPORTED CASES)

| *2000* | *2005* | *2007* | *2008* | *2009* | *2010* |
|---|---|---|---|---|---|
| 123 | 52 | 43 | 81 | 185 | 144 |
| *Number of registered scarlatina cases per 100,000 population* | | | | | |
| 1,6 | 0,6 | 0,5 | 0,9 | 2,1 | 1,6 |

*Incidence of Scarlatina in Azerbaijan (2011-2015):* From 2011 to 2015, there was a slight increase in scarlatina cases, with annual reports ranging from 168 to 236 cases. Incidence rates during these years ranged between 1.8 and 2.6 cases per 100,000 population. The peak incidence was observed in 2014 with 2.5 cases per 100,000 population.

Table 2

INCIDENCE OF SCARLATINA AMONG THE POPULATION IN AZERBAIJAN (NUMBER OF REPORTED CASES)

| *2011* | *2012* | *2013* | *2014* | *2015* |
|---|---|---|---|---|
| 233 | 200 | 188 | 236 | 168 |
| *Number of registered varicella (chickenpox) cases per 100,000 population* | | | | |
| 2,6 | 2,2 | 2,0 | 2,5 | 1,8 |

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*Incidence of Scarlatina in Azerbaijan (2016-2020):* During the years 2016 to 2020, scarlatina incidence showed some variability, with reported cases between 72 and 189 annually. Incidence rates ranged from 0.7 in 2020, likely influenced by pandemic-related factors, to 1.9 cases per 100,000 in 2017 and 2019.

Table 3

INCIDENCE OF SCARLATINA AMONG THE POPULATION
IN AZERBAIJAN (NUMBER OF REPORTED CASES)

| *2016* | *2017* | *2018* | *2019* | *2020* |
|---|---|---|---|---|
| 160 | 181 | 151 | 189 | 72 |
| *Nu Number of registered Scarlatina cases per 100,000 population* | | | | |
| 1,7 | 1,9 | 1,5 | 1,9 | 0,7 |

*Incidence of Scarlatina in Azerbaijan (2021-2024):* A marked resurgence of scarlatina was noted from 2021 onwards. The number of reported cases increased sharply from 22 in 2021 to 1,136 in 2023. The incidence rate similarly rose from 0.2 cases per 100,000 in 2021 to a peak of 11.1 cases per 100,000 in 2024, indicating a significant outbreak.

Table 4

INCIDENCE OF SCARLATINA AMONG THE POPULATION
IN AZERBAIJAN (NUMBER OF REPORTED CASES)

| *2021* | *2022* | *2023* | *2024* |
|---|---|---|---|
| 22 | 121 | 733 | 1136 |
| *Number of registered Scarlatina cases per 100,000 population* | | | |
| 0,2 | 1,2 | 7,2 | 11,1 |

*Discussion*

The epidemiological trends of scarlet fever (scarlatina) in Azerbaijan from 2000 to 2024 demonstrate dynamic fluctuations in both the number of reported cases and incidence rates per 100,000 population. During the early 2000s, the incidence remained relatively low, ranging between 0.5 to 2.1 cases per 100,000 population. A slight increase was observed in the period from 2011 to 2015, peaking at 2.6 in 2011. However, the most significant increase was recorded between 2022 and 2024, with the incidence rate rising sharply to 11.1 per 100,000 population in 2024. This surge may be attributed to multiple factors, including improved disease surveillance, enhanced diagnostic capacity, and possible changes in pathogen virulence or transmission dynamics. Notably, the decline in reported cases during 2020–2021 coincides with the COVID-19 pandemic, which disrupted routine surveillance and healthcare access globally [16].

Similar patterns were documented in other countries, where reductions in reported cases of Group A Streptococcus infections were followed by significant rebounds post-pandemic [17].

The etiological agent, Streptococcus pyogenes, remains a major cause of not only scarlet fever but also other invasive infections, and its re-emergence in epidemic patterns has been observed in multiple regions in recent years [17].

The sharp rise in Azerbaijan in 2023 and 2024 may reflect such a resurgence and warrants closer public health attention, including consideration of targeted interventions, school-based monitoring, and awareness campaigns. These findings underscore the importance of continuous surveillance and rapid response systems, particularly during and after public health crises. Further research into strain-specific epidemiology, vaccination potentials, and risk factor analysis is recommended to prevent future outbreaks and control disease spread effectively.

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*Conclusion*

The epidemiological data on scarlatina (scarlet fever) in Azerbaijan from 2000 to 2024 reveals a concerning upward trend, particularly in recent years. While early decades showed relatively stable and low incidence rates, a remarkable increase has occurred since 2022, peaking in 2024 at 11.1 cases per 100,000 population. This rise may reflect changes in transmission patterns, increased population susceptibility, or the aftereffects of the COVID-19 pandemic on healthcare access and public health interventions. The etiological agent, Streptococcus pyogenes, remains a persistent public health threat due to its ability to cause both endemic and epidemic outbreaks. Continuous national surveillance, prompt diagnosis, and public awareness campaigns are crucial to control the further spread of scarlatina in Azerbaijan. Moreover, strengthening the reporting system and considering potential preventive strategies, including vaccine development, could prove beneficial in the long term [13–15].

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*Limitations:* This study is based on secondary data from national surveillance reports, which may be influenced by underreporting or inconsistencies in diagnostic practices, particularly in rural areas. Laboratory confirmation was not uniformly detailed in the available data, which may affect the precision of incidence rates. Furthermore, the absence of individual-level data limited our ability to analyze risk factors or clinical outcomes.

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