

Epidemiological Analysis of Acute Intestinal Infections in Azerbaijan (2000-2024)

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Abstract. *Background.* Acute intestinal infections (AII) remain a significant public health concern worldwide, especially in developing countries. This study aims to analyze the epidemiological trends of reported AII cases in Azerbaijan between 2000 and 2024. *Methods.* A retrospective descriptive study was conducted using national surveillance data on AII cases from the Ministry of Health of Azerbaijan. Incidence rates per 100,000 population were calculated for each year across four time intervals: 2000–2010, 2011–2015, 2016–2020, and 2021–2024. *Results.* The incidence of AII in Azerbaijan demonstrated fluctuations over the studied years. The highest rates were observed between 2000 and 2005, followed by a gradual decline until 2015. However, a moderate resurgence was noted during the 2021–2024 period. Factors contributing to these trends may include seasonal variations, food safety practices, access to clean water, and improvements in disease surveillance systems. *Conclusion.* Although overall AII incidence in Azerbaijan has decreased compared to early 2000s, periodic increases underline the need for continuous monitoring, strengthened hygiene policies, and targeted public health interventions to mitigate future outbreaks.

Keywords: Acute intestinal infections, epidemiology, Azerbaijan, public health, disease trends, incidence rate

Introduction

Acute intestinal infections remain a significant global public health challenge, particularly in low- and middle-income countries, contributing substantially to morbidity (Kotloff et al., 2013) and mortality rates worldwide (Liu et al., 2015). These infections are primarily caused by various enteric pathogens, including *Escherichia coli*, *Salmonella* species, and Rotavirus, which are responsible for a wide spectrum of gastrointestinal diseases (Guerrant et al., 1992) ranging from mild diarrhea to severe dehydrating illness (Tate et al., 2010). Despite improvements in sanitation, vaccination, and healthcare access, acute intestinal infections continue to impose a heavy burden, especially among children under five years of age (Black et al., 2016). In Azerbaijan, limited comprehensive data exist regarding the long-term epidemiological trends of these infections. Monitoring incidence rates over extended periods is crucial for identifying outbreaks, assessing the effectiveness of public health interventions, and guiding resource allocation. Furthermore, the emergence of antibiotic resistance among enteric pathogens presents an ongoing threat to disease control efforts (Ochoa & Contreras, 2011).

This study aims to provide an epidemiological assessment of acute intestinal infections in Azerbaijan over a 25-year period (2000–2024), analyzing trends in reported cases and incidence rates.

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Materials and Methods

Study design

This is a retrospective descriptive study analyzing epidemiological data on acute intestinal infections in Azerbaijan from 2000 to 2024.

Setting

The study is based on national surveillance data collected by Azerbaijan's public health reporting system, which monitors infectious diseases across the country.

Participants

The study includes all reported cases of acute intestinal infections in the general population registered during the study period. No individual-level data or direct patient contact occurred.

Variables

Key variables include the number of reported cases, incidence rates per 100,000 population, and types of etiological agents such as *Escherichia coli*, *Salmonella* spp., and Rotavirus.

Data sources/measurement

Data were extracted from official national health surveillance databases and annual population statistics. Cases were confirmed according to standard diagnostic criteria reported by healthcare providers.

Bias

Potential reporting bias may exist due to underreporting or misclassification in surveillance data. Efforts were made to use official and consistent data sources to minimize bias.

Study size

The study covers all reported cases of acute intestinal infections nationwide between 2000 and 2024.

Quantitative variables

Incidence rates were calculated as cases per 100,000 population annually, based on official population estimates.

Statistical methods

Descriptive statistics were used to summarize data trends over time. Incidence rates were analyzed to identify temporal changes and disease patterns.

Ethical consideration

The study used anonymized, aggregated data without individual patient identifiers, thus ethical approval was not required.

Results

Participants

Between 2000 and 2024, the total number of reported acute intestinal infection cases varied annually across Azerbaijan's population. The study analyzed data from national surveillance records covering all reported cases in the country.

Outcome data

The primary etiological agents throughout the period remained *Escherichia coli*, *Salmonella* spp., and Rotavirus.

Descriptive data

Between 2000 and 2010, the number of reported cases rose from 7,327 (92.1 per 100,000 population) to a peak of 13,762 cases (160.0 per 100,000) in 2007, followed by minor fluctuations through 2010 (Table 1). From 2011 to 2015, incidence rates remained relatively stable, ranging from 12,876 (142.2 per 100,000) to 14,496 (154.0 per 100,000) cases annually (Table 2). Between 2016 and 2020, the highest number of cases was recor.

An increasing trend in acute intestinal infection incidence was observed in the early 2000s, followed by a relatively stable mid-decade period, and fluctuations during recent years. The notable decrease in 2020 corresponds with the COVID-19 pandemic, suggesting potential impacts on disease transmission or reporting.

Other analyses

Annual variations in case numbers may reflect changes in healthcare accessibility, public health policies, surveillance sensitivity, and socio-environmental factors influencing infection dynamics.

Incidence of acute intestinal infections in Azerbaijan increased by 84.95% between 2000 and 2010, rising from 7,327 to 13,551 reported cases, with a peak incidence of 160.0 per 100,000 population in 2007. The resurgence in 2010 indicates a persistent public health challenge linked to diverse pathogens like *E. coli* and *Salmonella*. Data indicates that the rise in infections outpaced population growth over the decade.

Table 1

Incidence of Acute Intestinal Infections Among the Population in Azerbaijan (Number of Reported Cases). 2000–2010

| 2000–2010 | 2000 | 2005 | 2007 | 2008 | 2009 | 2010 |
|--|--|--------|--------|--------|--------|--------|
| Etiological agents: Common enteric pathogens (e.g., <i>E. coli</i> , <i>Salmonella</i> spp., <i>Rotavirus</i>). | 7.327 | 10.520 | 13.762 | 12.769 | 11.737 | 13.551 |
| | Number of registered acute intestinal infection cases per 100,000 population | | | | | |
| | 92,1 | 125,5 | 160,0 | 146,5 | 133,0 | 151,7 |

Table 2 illustrates the epidemiological trends of acute intestinal infections (AII) caused by common enteric pathogens (such as *E. coli*, *Salmonella* spp., and *Rotavirus*) in Azerbaijan over a five-year period from 2011 to 2015. The data presents both the absolute number of reported cases and the incidence rate per 100,000 population.

Table 2

Incidence of Acute Intestinal Infections Among the Population in Azerbaijan (Number of Reported Cases). 2011–2015

| 2011–2015 | 2011 | 2012 | 2013 | 2014 | 2015 |
|--|--|--------|--------|--------|--------|
| Etiological agents: Common enteric pathogens (e.g., <i>E. coli</i> , <i>Salmonella</i> spp., <i>Rotavirus</i>). | 12.876 | 13.923 | 13.476 | 14.496 | 14.306 |
| | Number of registered acute intestinal infection cases per 100,000 population | | | | |
| | 142,2 | 151,7 | 145,0 | 154,0 | 150,1 |

Table 3 tracks the incidence of acute intestinal infections (AII) in Azerbaijan from 2016 to 2020. This period is characterized by an initial peak in reported cases followed by a dramatic decline, particularly in the final year of the study.

Table 3

Incidence of Acute Intestinal Infections Among the Population in Azerbaijan (Number of Reported Cases). 2016–2020

| 2016–2020 | 2016 | 2017 | 2018 | 2019 | 2020 |
|--|--|--------|--------|--------|-------|
| Etiological agents: Common enteric pathogens (e.g., <i>E. coli</i> , <i>Salmonella</i> spp., Rotavirus). | 15.880 | 16.017 | 13.182 | 13.504 | 7.601 |
| | Number of registered acute intestinal infection cases per 100,000 population | | | | |
| | 164,8 | 164,5 | 134,2 | 136,0 | 76,0 |

Table 4 presents the data for acute intestinal infections (AII) in Azerbaijan from 2021 to 2024. This period reflects the "post-pandemic" epidemiological shift, showing how infection rates stabilized following the unique conditions of the 2020 lockdown year.

Table 4

Incidence of Acute Intestinal Infections Among the Population in Azerbaijan (Number of Reported Cases). 2020–2024

| 2020–2024 | 2021 | 2022 | 2023 | 2024 |
|--|--|-------|--------|-------|
| Etiological agents: Common enteric pathogens (e.g., <i>E. coli</i> , <i>Salmonella</i> spp., Rotavirus). | 6.680 | 9.436 | 10.430 | 8.854 |
| | Number of registered acute intestinal infection cases per 100,000 population | | | |
| | 66,5 | 93,5 | 102,7 | 86,8 |

Discussion

The data presented in this study highlight the fluctuating incidence of acute intestinal infections in Azerbaijan from 2000 to 2024. The overall trend shows a peak in cases between 2016 and 2019, followed by a significant decline in 2020, likely related to the impact of the COVID-19 pandemic on healthcare access and public health measures such as lockdowns (Park et al., 2021). and improved hygiene practices (Baker et al., 2020). This pattern aligns with global observations where non-COVID infectious diseases temporarily decreased due to pandemic control efforts (Brueggemann et al., 2021).

The predominance of common enteric pathogens such as *Escherichia coli*, *Salmonella* spp., and rotavirus reflects the ongoing public health challenges in managing water quality, sanitation, and food safety in developing countries (Liu et al., 2015). These pathogens remain leading causes of morbidity and mortality, especially among children under five (Moe et al., 2011). Our findings underscore the urgent need for targeted interventions, including vaccination programs, improved sanitation infrastructure, and public education to reduce disease burden. Moreover, the decline in reported cases after 2019 might also indicate underreporting or reduced healthcare-seeking behavior during the pandemic, which warrants further investigation (Black et al., 2016). Continuous surveillance and robust epidemiological studies are essential to monitor trends and implement effective control measures.

In severe cases of acute intestinal infections requiring intensive care, secondary gastrointestinal complications such as gastric hemorrhage may arise, necessitating integrated management strategies for pathophysiology and treatment (Valizada, 2024).

Conclusion

This study highlights the persistent burden of acute intestinal infections in Azerbaijan over the last two decades, despite some fluctuations in incidence rates. The findings underscore the importance of sustained public health interventions targeting water quality, sanitation, and hygiene practices to reduce infection rates. Additionally, improvements in diagnostic capabilities and timely reporting systems are essential for effective disease monitoring and control. The impact of recent global events, including the COVID-19 pandemic, has further influenced infection dynamics, emphasizing the need for adaptable health strategies. Continued investment in vaccination programs, health education, and infrastructure development is critical to mitigate these infections and their associated morbidity. Policymakers should prioritize integrated approaches combining preventive and therapeutic measures to reduce the burden on healthcare systems and improve population health outcomes.

What is known:

- Acute intestinal infections remain a significant public health issue worldwide, especially in developing countries.
- Common causative agents include *Escherichia coli*, *Salmonella* spp., and Rotavirus.
- Disease incidence is influenced by sanitation, vaccination coverage, and healthcare access.
- *What this study adds:*
- Provides a 25-year epidemiological overview of acute intestinal infections in Azerbaijan from 2000 to 2024.
- Highlights fluctuations in incidence, including a sharp decline during the COVID-19 pandemic period.
- Identifies persistent main pathogens and suggests the need for strengthened surveillance and public health measures in Azerbaijan.

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Declaration of Competing Interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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