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INCIDENCE AND TRENDS OF BRUCELLOSIS IN AZERBAIJAN FROM 2000 TO 2024

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ЗАБОЛЕВАЕМОСТЬ И ТЕНДЕНЦИИ РАСПРОСТРАНЕНИЯ БРУЦЕЛЛЁЗА В АЗЕРБАЙДЖАНЕ В ПЕРИОД С 2000 ПО 2024 ГОД

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Abstract. Brucellosis, a zoonotic infectious disease, is a serious problem in Azerbaijan. Monitoring is essential for effective disease control. The objective of the study was to analyze the incidence rate and trends of brucellosis in Azerbaijan from 2000 to 2024. Incidence rates per 100,000 population were calculated and a trend analysis was conducted. The number of registered brucellosis cases decreased from 649 in 2000 (8.2 per 100,000) to 364 in 2010 (4.1 per 100,000). Between 2011 and 2020, incidence rates fluctuated, peaking in 2019 at 551 cases (5.5 per 100,000), with a sharp decline to 190 cases (1.9 per 100,000) in 2020. The decline continued between 2021 and 2024, with 210 cases (2.1 per 100,000) recorded in 2024. Despite a decline in brucellosis incidence in Azerbaijan over the past two decades, the disease remains endemic. Strengthened surveillance and preventive measures are needed to further reduce incidence.

Аннотация Бруцеллёз, зоонозное инфекционное заболевание, представляет собой серьёзную проблему в Азербайджане. Мониторинг имеет важное значение для эффективного контроля заболевания. Целью исследования было проанализировать уровень заболеваемости и тенденции распространения бруцеллёза в Азербайджане в период с 2000 по 2024 год. Были рассчитаны показатели заболеваемости на 100 000 населения и проведён анализ тенденций. Количество зарегистрированных случаев бруцеллёза снизилось с 649 в 2000 году (8,2 на 100 000) до 364 в 2010 году (4,1 на 100 000). В период с 2011 по 2020 годы показатели колебались, достигнув пика в 2019 году — 551 случай (5,5 на 100 000), с резким снижением до 190 случаев (1,9 на 100 000) в 2020 году. В 2021–2024 годах снижение продолжилось, и в 2024 году было зарегистрировано 210 случаев (2,1 на 100 000). Несмотря на снижение заболеваемости бруцеллёзом в Азербайджане за последние два десятилетия, заболевание остаётся эндемичным. Для дальнейшего снижения заболеваемости необходим усиленный эпиднадзор и профилактические меры.

Keywords: brucellosis, epidemiology, incidence, Azerbaijan, infectious disease.

Ключевые слова: бруцеллёз, эпидемиология, заболеваемость, Азербайджан, инфекционные заболевания.

Brucellosis is a widespread zoonotic infection caused by bacteria of the genus *Brucella*, primarily transmitted to humans through direct contact with infected animals or the ingestion of contaminated animal products, particularly unpasteurized dairy items [1].

Globally, brucellosis remains endemic in regions with limited veterinary infrastructure and inadequate public health control, including parts of the Middle East, Central Asia, and Eastern Europe [2, 3].

The clinical manifestations of brucellosis in humans are diverse, ranging from acute febrile illness to chronic, debilitating complications affecting various organ systems [4]. Due to its nonspecific symptoms and frequent underdiagnosis, the true burden of brucellosis is often underestimated [5].

The disease presents significant economic consequences not only due to its impact on livestock productivity but also due to prolonged disability and healthcare costs in humans [6].

In Azerbaijan, agriculture and livestock breeding are integral components of the economy, especially in rural areas. These conditions increase the risk of transmission of brucellosis from animals to humans, particularly among farmers, veterinarians, and dairy workers. Despite national efforts toward brucellosis surveillance and control, including animal vaccination programs and public health interventions, the disease remains a persistent public health concern [7].

This study aims to analyze the epidemiological trends of human brucellosis in Azerbaijan between 2000 and 2024, using official data sources. Understanding the dynamics of the disease over this period may provide critical insight for strengthening prevention, control, and early detection strategies.

Materials and Methods

This study is a retrospective descriptive analysis of brucellosis incidence in Azerbaijan from 2000 to 2024. Data were obtained from the Azerbaijan Republic State Statistical Committee and the Ministry of Health's official reports. Reported cases of brucellosis were collected annually and analyzed to determine trends in incidence rates per 100,000 populations.

The diagnosis of brucellosis in reported cases was based on clinical symptoms supported by laboratory confirmation, including serological tests such as the standard agglutination test (SAT) and enzyme-linked immunosorbent assay (ELISA) [8, 9].

Data analysis was performed using descriptive statistics to identify changes in incidence over time.

Ethical approval was obtained from the relevant health authorities, and confidentiality of patient data was maintained throughout the study period [10, 11].

Results

Between 2000 and 2010, Azerbaijan experienced a notable decline in the incidence of brucellosis. In 2000, a total of 649 cases were reported, corresponding to an incidence rate of 8.2 per 100,000 population. This figure marked the highest recorded incidence during the observed decade. By 2005, reported cases had decreased to 415, with an incidence rate of 5.0 per 100,000.

The downward trend continued through 2007 and 2008, with 475 and 405 cases respectively, representing incidence rates of 5.5 and 4.6 per 100,000. In 2009, the number of registered cases slightly declined to 392 (4.4 per 100,000), and by 2010, it further dropped to 364 cases, corresponding to 4.1 per 100,000 population.

Overall, the data indicate a gradual reduction in brucellosis incidence over the decade, suggesting improved public health interventions, enhanced surveillance, or changes in exposure patterns related to zoonotic transmission.

Table 1

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

2000	2005	2007	2008	2009	2010
649	415	475	405	392	364
<i>Number of registered brucellosis cases per 100,000 population</i>					
8,2	5,0	5,5	4,6	4,4	4,1

Results (2011–2015)

From 2011 to 2015, the incidence of brucellosis in Azerbaijan demonstrated a continued but fluctuating downward trend. In 2011, 426 cases were reported, yielding an incidence rate of 4.7 per 100,000 population. However, a significant decline was observed in 2012, with only 289 cases reported (3.1 per 100,000), followed by further reduction in 2013 with 250 cases (2.7 per 100,000), marking the lowest incidence rate during this five-year period. A moderate rise occurred in 2014, where the number of reported cases increased to 337, equivalent to 3.6 per 100,000 population. This level remained stable in 2015, with 341 cases and an identical incidence rate of 3.6 per 100,000. The data suggest a partial stabilization of brucellosis incidence after a sharp decline in the early 2010s, potentially reflecting the impact of veterinary controls, public awareness efforts, and improvements in diagnostic surveillance systems.

Table 2

INCIDENCE OF BRUCELLOSIS AMONG THE POPULATION IN AZERBAIJAN
 (Number of Reported Cases)

2011	2012	2013	2014	2015
426	289	250	337	341
<i>Number of registered brucellosis cases per 100,000 population</i>				
4,7	3,1	2,7	3,6	3,6

Results (2016–2020)

Between 2016 and 2020, the incidence of brucellosis in Azerbaijan showed a noticeable increase, particularly from 2016 to 2019. In 2016, there were 425 reported cases (4.4 per 100,000 population), which rose to 487 in 2017 (5.0 per 100,000) and continued to climb to 532 cases in 2018 (5.4 per 100,000). The highest number of cases during this period was observed in 2019, with 551 reported cases and an incidence rate of 5.5 per 100,000 population. However, in 2020, a sharp decline occurred with only 190 reported cases, corresponding to an incidence of 1.9 per 100,000. This drop may have been influenced by the COVID-19 pandemic, which likely disrupted routine surveillance, healthcare access, and case reporting mechanisms. The data from this period indicate a temporary resurgence of brucellosis followed by a sudden decline, underlining the need for continuous disease monitoring and consistent public health interventions.

Table 3

INCIDENCE OF BRUCELLOSIS AMONG THE POPULATION IN AZERBAIJAN
 (Number of Reported Cases)

2016	2017	2018	2019	2020
425	487	532	551	190
<i>Number of registered brucellosis cases per 100,000 population</i>				
4,4	5,0	5,4	5,5	1,9

Results (2020–2024)

From 2020 to 2024, the incidence of brucellosis in Azerbaijan showed a moderate fluctuation. In 2021, 207 cases were reported, with an incidence rate of 2.1 per 100,000 population. This slightly increased to 230 cases (2.3 per 100,000) in 2022 and further to 277 cases (2.7 per 100,000) in 2023. However, in 2024, a decline was observed with 210 cases, corresponding to an incidence rate of 2.1 per 100,000. Despite the fluctuations, the overall incidence remained lower than the peak years observed in 2018 and 2019. These findings highlight the ongoing public health challenge posed by brucellosis and the importance of sustained surveillance and preventive measures to control the disease.

Table 4

INCIDENCE OF BRUCELLOSIS AMONG THE POPULATION IN AZERBAIJAN
(Number of Reported Cases)

2021	2022	2023	2024
207	230	277	210
<i>Number of registered brucellosis cases per 100,000 population</i>			
2,1	2,3	2,7	2,1

Discussion

The pathogenesis of Brucellosis involves the ability of *Brucella* species to survive and multiply within host macrophages, leading to chronic infection and systemic dissemination. The bacteria evade the immune system by inhibiting phagosome-lysosome fusion and manipulating host cell signaling pathways, which complicates treatment and contributes to persistent infection [12].

The data analyzed from 2000 to 2024 reveal fluctuating but overall declining trends in brucellosis incidence in Azerbaijan. Despite reductions in reported cases over the last two decades, periodic increases highlight ongoing challenges in controlling this zoonotic disease. These fluctuations may be related to variations in animal reservoir control, public awareness, and diagnostic capacity [1, 13].

Brucellosis remains a significant public health concern, especially in rural areas where livestock farming is prevalent. The disease's nonspecific symptoms and potential for chronic complications necessitate continued emphasis on early diagnosis and effective treatment protocols [14]. Furthermore, the implementation of One Health approaches, integrating human, animal, and environmental health measures, is critical for sustained brucellosis control [1].

The findings align with global patterns where brucellosis persists as a neglected zoonosis, particularly in developing regions. Strengthening surveillance systems, enhancing laboratory diagnostics, and increasing public health education could help further reduce incidence rates in Azerbaijan.

Conclusion

The epidemiological data on brucellosis in Azerbaijan between 2000 and 2024 reveal important insights into the disease dynamics over the past two decades. Although there has been a noticeable decline in the incidence rates, brucellosis remains endemic, especially in rural regions where animal husbandry is prevalent. The persistent presence of the disease underscores gaps in current prevention and control strategies, including challenges in livestock vaccination coverage and insufficient public health education [15, 16].

Effective control of brucellosis requires a multifaceted approach integrating veterinary and human health sectors, consistent with the One Health framework [17]. Strengthening surveillance and diagnostic capacities can facilitate early detection and timely treatment, reducing both animal-

to-human transmission and associated complications [18]. Moreover, increasing community awareness about transmission risks and preventive measures is essential to change behaviors that contribute to disease spread [19].

Finally, sustained governmental commitment and international collaboration will be pivotal in improving disease control programs, advancing research, and ultimately achieving brucellosis eradication in Azerbaijan. Future efforts should prioritize evidence-based interventions, including enhanced vaccination strategies, routine screening, and capacity building for healthcare professionals [20].

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