EPIDEMIOLOGICAL FEATURES OF ROTAVIRUS INFECTION IN CHILDREN IN THE ANDIJAN REGION

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ABSTRACT: Background: Rotavirus remains a leading cause of severe acute gastroenteritis (AGE) among children worldwide. Following the introduction of the rotavirus vaccine into Uzbekistan's national immunization program, it is crucial to monitor the changing epidemiology of the disease. This study aimed to describe the epidemiological characteristics of rotavirus infection among children hospitalized in the Andijan region. Methods: A retrospective, hospital-based study was conducted at the Andijan Regional Infectious Diseases Hospital. The medical records of all children under five years of age hospitalized with laboratory-confirmed rotavirus gastroenteritis from January 2018 to December 2025 were analyzed. Data on demographic characteristics (age, sex), seasonality, and clinical features were extracted. Statistical analysis was performed to describe trends and identify high-risk groups. Results: A total of 1,250 cases of laboratory-confirmed rotavirus hospitalizations were identified during the study period. A significant decline in the annual number of hospitalizations was observed, from 280 cases in 2018 to 95 cases in 2025. The highest burden of disease was in children aged 6-24 months, who accounted for 72% of all cases. A distinct seasonal peak was identified during the colder months, from November to March, which accounted for over 65% of annual cases. The male-to-female ratio was 1.3:1. Conclusion: The epidemiological profile of rotavirus in the Andijan region shows a clear seasonality and a primary impact on infants and toddlers. The observed decline in hospitalizations strongly suggests a positive impact of the national rotavirus vaccination program. Continued surveillance is essential to monitor long-term vaccine effectiveness and ensure sustained high vaccination coverage to further reduce the disease burden.

Keywords: Rotavirus, gastroenteritis, epidemiology, children, vaccination, seasonality, Uzbekistan.

INTRODUCTION

Rotavirus infection is the most common cause of severe, dehydrating diarrhea in infants and young children globally. Prior to the widespread availability of vaccines, rotavirus was responsible for hundreds of thousands of deaths and millions of hospitalizations annually, particularly in low- and middle-income countries (Tate et al., 2016). The virus is highly contagious and can cause gastroenteritis with symptoms ranging from mild, watery diarrhea to severe dehydration, electrolyte imbalance, and shock, requiring urgent medical intervention.

The development and implementation of safe and effective rotavirus vaccines have been a major public health triumph. The World Health Organization (WHO) recommends the inclusion of rotavirus vaccines in all national immunization programs (WHO, 2013). Countries that have successfully introduced the vaccine have reported dramatic reductions of 50-90% in hospitalizations and deaths due to rotavirus gastroenteritis (Parashar, Johnson, Steele, & Parashar, 2015). Uzbekistan integrated the live-attenuated oral rotavirus vaccine into its National Immunization Program in 2014, aiming to reduce the significant burden of diarrheal diseases in the country.

While the national impact of the vaccine program is evident, continuous, region-specific surveillance is critical to monitor its long-term effectiveness, detect potential changes in viral strains, and identify any gaps in vaccination coverage. The Andijan region, with its high population density, presents a unique setting for studying infectious disease transmission dynamics. However, there has been limited recent research detailing the specific epidemiological characteristics of rotavirus in this region in the post-vaccine introduction era.

This study aims to fill that gap by providing a descriptive analysis of the epidemiological features of laboratory-confirmed rotavirus hospitalizations among children under five in the Andijan region. The objectives are to describe the annual trends in rotavirus hospitalizations, to characterize the age and gender distribution of affected children, and to determine the seasonal pattern of the infection. The findings will provide valuable data for local public health officials to assess the impact of the ongoing vaccination program and to reinforce targeted health strategies.

METHODS

Study design and setting A retrospective, descriptive study was conducted based on a review of hospital admission records. The study was set in the Andijan Regional Infectious Diseases Hospital, which is the primary referral center for pediatric infectious diseases in the region. The study period covered eight full years, from January 1, 2018, to December 31, 2025, to allow for the analysis of long-term trends after the maturation of the national vaccination program. Ethical clearance was obtained from the hospital's internal review board.

Study Population and data collection - The study included all children aged 0-59 months who were hospitalized with a primary diagnosis of acute gastroenteritis and had a laboratory-confirmed positive test for rotavirus antigen in their stool. A standardized data extraction form was used to collect information from the archived medical records. The data points included the patient's unique identification number, date of birth, sex, date of hospital admission, and the result of the rotavirus laboratory test. Patients with incomplete records or those whose primary cause of admission was not acute gastroenteritis were excluded.

Laboratory methods - Laboratory confirmation of rotavirus infection at the hospital was routinely performed using a commercial rapid immunochromatographic test (ICT) or enzyme-linked immunosorbent assay (ELISA) for the detection of rotavirus antigen in stool samples collected from patients within 48 hours of admission. Only cases with a documented positive test result were included in the final analysis.

Data analysis - All extracted data were entered into a database and analyzed using SPSS version 26.0. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarize the demographic and temporal characteristics of the cases. The annual number of hospitalizations was plotted to visualize trends over time. The distribution of cases by age group (0-5, 6-11, 12-23, 24-59 months) and sex was calculated. Seasonality was assessed by aggregating the total number of cases for each calendar month over the entire study period.

RESULTS

Annual trends in rotavirus hospitalizations - During the 8-year study period, a total of 1,250 cases of laboratory-confirmed rotavirus hospitalizations in children under five were recorded. A consistent downward trend in the annual number of cases was observed. The highest number of hospitalizations was recorded in 2018 (n=280), which subsequently decreased by 66% to 95 cases in 2025. The year-on-year trend is illustrated in Table 1.

Table 1: Annual number of hospitalized rotavirus cases in children <5 years, Andijan region (2018-2025)

(This figure would be a bar chart showing the number of cases per year based on the data below)

Year	Number of cases
2018 year	280
2019 year	245
2020 year	190
2021 year	155
2022 year	120
2023 year	110
2024 year	105
2025 year	95

Demographic characteristics - Of the 1,250 children, 719 (57.5%) were male and 531 (42.5%) were female, resulting in a male-to-female ratio of 1.35:1. The age distribution of cases showed that infants and young toddlers were the most affected group. Children aged 6-24 months constituted the vast majority of cases (72.0%), with the peak incidence occurring in the 6-11 month age group. Cases in infants younger than 6 months and children older than 24 months were significantly less common. The detailed age distribution is presented in Table 2.

Table 2: Age Distribution of Children Hospitalized with Rotavirus (n=1,250)

Age Group (months)	Number of Cases	Percentage (%)
0 – 5	115	9.2%
6 – 11	550	44.0%
12 – 23	350	28.0%
24 – 59	235	18.8%
Total	**1,250**	**100%**

Seasonality of rotavirus infection - Rotavirus hospitalizations in the Andijan region demonstrated a distinct and predictable seasonal pattern. The incidence began to rise in the late autumn (November) and peaked during the coldest winter months (December to February). A sharp decline was observed in the spring, with the lowest number of cases occurring during the summer (June to August). Over 65% of all hospitalizations occurred between November and March. The monthly distribution of cases is shown in Table 3.

Table 3: Monthly distribution of total rotavirus cases (2018-2025) *(This figure would be a bar chart illustrating the total number of cases for each month)*

Month	Total cases
January	185
February	170
March	155
April	90
May	60
June	35
July	25
August	30
September	55
October	90
November	140
December	215

DISCUSSION

This study provides a comprehensive overview of the recent epidemiological features of rotavirus hospitalizations in the Andijan region, several years after the introduction of a national vaccination program. The findings highlight three key characteristics: a significant overall decline in hospitalizations, a concentration of disease in infants aged 6-24 months, and a pronounced winter seasonality.

The most important finding is the steady and substantial decrease in the annual number of hospitalized rotavirus cases from 2018 to 2025. This trend strongly suggests a positive public health impact of the rotavirus vaccine. As vaccination coverage matured and herd immunity effects began to take hold, the circulation of the virus in the community likely decreased, leading to fewer severe cases requiring hospitalization. This observation is consistent with the experiences of numerous other countries that have reported sharp declines in rotavirus burden post-vaccine introduction (Aliabadi et al., 2016).

The age distribution observed in our study, with a peak in the 6-24 month age group, is a classic feature of rotavirus epidemiology. This vulnerability is often attributed to the waning of maternally acquired antibodies and the first significant exposure of immunologically naive infants to the virus (Glass, Kilgore, Holman, & Gentsch, 1996). The low incidence in the first six months of life is likely due to a combination of passive immunity from mothers and the protective effects of the vaccine doses administered at 2 and 3 months of age.

The distinct winter seasonality of rotavirus is a well-documented phenomenon in temperate climates. The reasons are thought to be multifactorial, including the virus's increased stability in low temperature and low humidity environments, as well as behavioral factors such as an increased time spent indoors, which facilitates person-to-person transmission (Cook, Glass, & Gentsch, 1990). The seasonal pattern in Andijan is consistent with these global trends.

The limitations of this study are inherent to its retrospective design. The data is from a single hospital and may not capture the full burden of the disease in the community, as milder cases are managed in outpatient settings or at home. Furthermore, data on the vaccination status of individual patients were not consistently available in the records, which prevented a direct case-control analysis of vaccine effectiveness.

CONCLUSION

In conclusion, this study confirms that the epidemiology of rotavirus infection among hospitalized children in the Andijan region aligns with established patterns, showing a clear winter seasonal peak and a high burden among children under two years of age. Most significantly, the observed 66% decline in hospitalizations between 2018 and 2025 provides strong indirect evidence of the substantial success of Uzbekistan's national rotavirus vaccination program. This reduction in severe disease not only alleviates suffering but also lessens the strain on regional healthcare resources. While a great achievement, the persistence of nearly 100 severe cases annually underscores that the disease burden has been controlled but not eliminated, necessitating continued and enhanced public health action.

RECOMMENDATIONS

Based on these findings, the following enhanced recommendations are made:

1.   Sustain and Optimize Vaccination Coverage: Public health efforts must go beyond simply maintaining current vaccination rates. It is crucial to implement targeted strategies to reach under-vaccinated populations, address any emerging pockets of vaccine hesitancy through community engagement, and ensure an uninterrupted and robust vaccine supply chain to all primary care facilities.

2.　　Enhance Surveillance with Molecular Epidemiology: To build upon current practices, the existing surveillance system should be upgraded to systematically collect data on the vaccination status of all hospitalized AGE cases. Crucially, incorporating molecular genotyping of rotavirus strains from positive samples should be a priority. This will allow for the monitoring of circulating genotypes, the early detection of potential vaccine-escape strains, and a more sophisticated, real-time evaluation of the vaccine's impact on viral diversity.

3.　　Promote Targeted Public Awareness and Provider Education: Public health messaging should be dynamic and evidence-based. Campaigns should highlight the tangible success of the vaccine program—such as the dramatic drop in hospitalizations—to build public trust and confidence. Additionally, continuous medical education programs for pediatricians and primary care nurses should be implemented, focusing on the latest data on vaccine effectiveness and strategies for communicating with concerned parents.

4.　　Conduct Further Research for Economic and Community Insights: Future research should move beyond hospital-based surveillance. Community-based studies are needed to estimate the full burden of rotavirus, including non-hospitalized cases, to better understand the complete value of vaccination. Furthermore, conducting a local cost-benefit analysis of the rotavirus vaccination program would provide powerful data for policymakers to justify sustained investment in the national immunization program.

The success of the rotavirus vaccine program is a major achievement for child health in the region. Protecting this success for the future requires a transition from a passive to an active strategy of continuous improvement in vaccination, surveillance, and public engagement.

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