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ORIGINAL ARTICLE

Rotavirus-associated acute gastroenteritis in children under five years: a cross-sectional study from southern Iran

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ABSTRACT

Background and Objectives: Rotavirus is a major cause of acute gastroenteritis in children. This study assessed the frequency and clinical characteristics of rotavirus infection in children under five years old.
Materials and Methods: This cross-sectional study was conducted in 2020 on children with acute gastroenteritis. Clinical and demographic data were collected, dehydration severity was assessed by a pediatrician, and stool samples obtained within 48 hours of admission were tested for rotavirus antigen using ELISA.
Results: A total of 301 children with acute gastroenteritis were included. Rotavirus antigen was detected in 34.6% of cases. Vomiting (81.2%) and diarrhea (96.1%) were significantly common among rotavirus-positive children (p = 0.01). Severe dehydration (>10%) and the need for parenteral rehydration were observed more frequently among rotavirus-positive children compared with rotavirus-negative cases (20.9% vs. 9.2%, p = 0.02 and 91.1% vs. 78.1%, p = 0.01, respectively). However, these findings should be interpreted cautiously, as clinical severity may also have been influenced by other demographic and clinical factors.
Conclusion: Rotavirus was detected in a considerable proportion of children with acute gastroenteritis in southern Iran. Rotavirus-positive cases showed more frequent severe dehydration, although this finding should be interpreted cautiously. Early assessment and supportive care remain important.

Keywords: Rotavirus infections; Gastroenteritis; Child; Preschool; Infant; Dehydration

INTRODUCTION

Acute gastroenteritis remains a major contributor to childhood morbidity and mortality, particularly among children under five years of age in low- and middle-income countries (1, 2). Among viral pathogens causing acute gastroenteritis in young children, rotavirus remains one of the leading causes, being responsible for a substantial proportion of hospitalizations, outpatient visits and deaths worldwide (3, 4). In Iran, systematic reviews and meta-analyses have estimated that approximately one-third of children hospitalized with acute gastroenteritis test positive for rotavirus, although the reported prevalence

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varies considerably by region and study setting (5, 6).

Rotavirus infection may range from asymptomatic infection to severe gastroenteritis, often leading to dehydration, electrolyte imbalance and prolonged hospitalization. The spectrum of clinical severity may be influenced by multiple factors including viral genotype, host immunity, nutritional status and access to prompt management (7, 8). Although effective rotavirus vaccines are available in many countries, universal implementation remains incomplete in some regions and local epidemiological data remain critical to inform preventive strategies and resource allocation (9-11).

In Iran, several studies have evaluated rotavirus prevalence and genotype distribution in different provinces. However, data from southern provinces remain limited, despite their distinct climatic, socioeconomic, and healthcare characteristics (12, 13). Addressing this gap is important for national surveillance, guiding rotavirus vaccination policies and improving clinical care protocols (3). Therefore, this study was designed to determine the prevalence and clinical characteristics of rotavirus-associated acute gastroenteritis among children under five years of age presenting to a referral pediatric hospital in southern Iran.

MATERIALS AND METHODS

Study design and participants. This cross-sectional study was conducted in 2020 at Bandar Abbas Children's Hospital, a referral pediatric center located in Hormozgan Province. The present study was part of a larger national surveillance program on rotavirus infection among Iranian children (14), with a specific focus on data collected from this hospital.

The target population included children under five years of age who presented with acute gastroenteritis. Exclusion criteria included age over five years, chronic diarrhea (lasting more than 14 days), stool sample collection more than 48 hours post-admission and patients referred from other healthcare facilities. Eligible participants were consecutively enrolled during the study period.

Data collection and variables. Upon presentation to the hospital, written informed consent was obtained from parents or legal guardians after a detailed explanation of the study objectives and procedures. Demographic characteristics, including age and sex, as well as clinical symptoms such as vomiting, fever, and duration of diarrhea, were recorded using a structured data collection form. The degree of dehydration was clinically assessed by a pediatrician during physical examination using standard clinical indicators. This assessment was performed without laboratory testing and relied on clinical signs and symptoms to estimate the percentage of fluid loss, allowing classification into three levels of dehydration severity.

Mild dehydration, corresponding to less than 5% fluid loss, was characterized by normal skin turgor, moist oral mucous membranes, visible tear production and normal eye appearance. Moderate dehydration, estimated at 7.5% to 10% fluid loss, was characterized by restlessness or irritability, sunken eyes, absence of tears, dry mucous membranes and delayed skin pinch recoil. Severe dehydration, defined as fluid loss exceeding 10%, was characterized by lethargy or markedly reduced level of consciousness, deeply sunken eyes, dry oral mucosa, absence of tears, inability to drink fluids and very delayed skin pinch recoil. These clinical signs were used systematically by the pediatrician to classify hydration status at presentation.

Fresh stool specimens (5-10 mL) were collected from all participants within 48 hours of hospital admission and immediately transported to the central hospital laboratory under appropriate storage conditions. Rotavirus antigen detection was performed on stool samples using a commercially available enzyme-linked immunosorbent assay (ELISA) kit (Pishtaz Teb Diagnostics, Tehran, Iran), which is designed for the qualitative detection of Group A rotavirus antigen in human fecal specimens. Stool samples were diluted according to the manufacturer's instructions and transferred into microtiter wells pre-coated with anti-rotavirus monoclonal antibodies. Following the incubation and washing procedures, horseradish peroxidase (HRP)-conjugated antibodies were addedand after completion of the substrate reaction, optical density was measured at 450 nm using an ELISA reader. All laboratory procedures and quality control measures were carried out in accordance with the manufacturer's protocol. Based on the manufacturer's data, the assay demonstrated a sensitivity of 94.7% and a specificity of 99.2%.

Statistical analysis. Quantitative variables were expressed as mean ± standard deviation (SD), while

qualitative variables were presented as frequencies and percentages. Normality of continuous variables was assessed using the Kolmogorov–Smirnov test and Q–Q plots. Comparisons between groups were performed using the independent t-test for continuous variables and the chi-square test for categorical variables, as appropriate. To further evaluate factors associated with severe dehydration, univariable and multivariable logistic regression analyses were performed. Variables with potential clinical relevance, including age, genderand nutritional status, were included in the multivariable model to adjust for possible confounding effects. Adjusted odds ratios (OR_{adj}) and corresponding 95% confidence intervals (95% CI) were reported. A p-value < 0.05 was considered statistically significant. All statistical analyses were conducted using SPSS software version 23 (IBM Corp., Armonk, NY, USA).

Ethics approval. The study protocol was reviewed and ethically approved by the Ethics Committee at Hormozgan University of Medical Sciences under approval code IR.HUMS.REC.1401.334. Informed consent for participation was obtained from the parents or legal guardians of all minors involved in the study.

RESULTS

A total of 301 children were included in the study, with a mean age of 18.96 ± 15.60 months. Of all cases, 87% were hospitalized, while 13% received outpatient treatment. Among the hospitalized children, the mean duration of hospital stay was 3.35 ± 1.49 days. The overall mean duration of diarrhea among the study population was 4.78 ± 2.22 days (Table 1).

Rotavirus-positive and rotavirus-negative children were comparable in terms of age, gender, nutritional status, admission type, recent fever or cough history, fever on admissionand prior antibiotic use, with no statistically significant differences observed between the groups. Vomiting and diarrhea on admission were significantly more frequent among rotavirus-positive children compared with rotavirus-negative cases (81.2% vs. 63.3%, p = 0.016; 96.1% vs. 78.5%, p = 0.019, respectively). Severe dehydration and the need for parenteral rehydration were also more commonly observed in the rotavirus-positive group, although these findings should be interpreted cautiously in light of potential clinical confounders (Table 2).

In the multivariable logistic regression model adjusted for age, nutritional status and gender, vomiting on admission (OR_{adj} =1.1, 95% CI: 1.0–1.3, P=0.029) and diarrhea on admission (OR_{adj} =1.4, 95% CI: 1.1–1.7, P=0.037) were identified as significant predictors of severe dehydration due to rotavirus infection (Table 3).

DISCUSSION

This cross-sectional study investigated the frequency and clinical characteristics of rotavirus-associated acute gastroenteritis among children under five years of age presenting to Bandar Abbas Children's Hospital in southern Iran. Rotavirus antigen was detected in 34.6% of cases, indicating that rotavirus remains an important contributor to pediatric acute gastroenteritis in this setting. This finding is broadly consistent with previous studies from Iran, which reported rotavirus frequencies of 38.5% in Shiraz (15), 36% in Gorgan (16), and 41.9% in Tehran (17). Differences in reported frequencies across regions may be related to variations in seasonality, demographic characteristics, healthcare access, diagnostic methods and vaccination coverage.

In the present cohort, vomiting and diarrhea were more frequently observed among rotavirus-positive children compared with rotavirus-negative cases. This pattern is consistent with the typical clinical presentation of rotavirus gastroenteritis, in which vomiting, watery diarrhea and dehydration are common clinical manifestations (18). Severe dehydration (>10%) was also observed more often among rotavirus-positive children than among rotavirus-negative children. However, this finding should be interpreted cautiously, as dehydration severity may be influenced by several demographic and clinical factors, including age, nutritional status and the presence of other untested enteric pathogens.

To address potential confounding, an additional multivariable logistic regression analysis was performed adjusting for age, gender and nutritional status. In the adjusted model, vomiting on admission and diarrhea on admission remained significantly associated with severe dehydration, suggesting that these clinical features may be useful indicators of increased dehydration risk in children with acute gastroenteritis. Nevertheless, given the cross-sectional nature of the study, these associations should not be interpreted as evidence of causality.

Table 1. Demographic and clinical profile of children with acute gastroenteritis

Variables			N	Percent
Age (months)		18.96 ± 15.60		
	0-6		69	22.9%
	6-12		47	15.6%
	12-24		33	11.0%
	Over 24		152	50.5%
Gender	Male		173	57.5%
	Female		128	42.5%
Rotavirus antigen test	positive		104	34.6%
	negative		197	65.4%
Nutritional status	Breast feeding		135	44.9%
	Formula feeding		100	33.2%
	Combined feeding		66	21.9%
Type of admission	Out patient		39	13.0%
	In patient		262	87.0%
History of fever during recent 4 weeks	Yes		139	49.8%
	No		162	50.2%
History of cough during recent 4 weeks	Yes		38	13.7%
	No		263	86.3%
Fever on admission	Yes		132	44.9%
	No		169	55.1%
Vomiting on admission	Yes		204	69.2%
	No		97	30.8%
Antibiotic use before admission	Yes		32	10.8%
	No		269	89.2%
Rehydration therapy	Oral replacement therapy (ORT)		55	17.7%
	Parenteral rehydration therapy		246	82.3%
ICU admission			0	0.0%

The need for parenteral rehydration was also more common among rotavirus-positive children compared with rotavirus-negative cases. This observation may reflect a greater clinical burden among children with rotavirus infection in this cohort; however, interpretation should remain cautious because other viral, bacterial, or parasitic causes of gastroenteritis were not systematically assessed. Similar findings have been reported by Sedighi et al. (2024), who described a considerable need for intravenous rehydration among children with rotavirus-associated gastroenteritis in western Iran (19).

Although breastfed children represented a smaller proportion of rotavirus-positive cases compared with rotavirus-negative cases, this difference did not reach statistical significance. Previous studies have suggested that breastfeeding may have a protective role in reducing the incidence or severity of rotavirus infection (3). However, the non-significant finding in the present study indicates that this association requires further investigation in larger, preferably longitudinal studies with more detailed assessment of feeding patterns (20).

Hospitalization was frequent in both groups and was numerically higher among rotavirus-positive children. This may reflect the referral nature of the study center and the clinical severity of children presenting with acute gastroenteritis. Comparable findings have been reported in studies from Tehran and central Iran, where a substantial proportion of rotavirus-positive children required inpatient care due to dehydration and persistent symptoms (21). Overall, these findings highlight the continued clinical relevance of rotavirus-associated gastroenteritis in children under five years of age, while also emphasizing the need for cautious interpretation in light

Table 2. Comparison of clinical and demographic characteristics between rotavirus-positive and rotavirus-negative children

Variables		*rotavirus*		P value
		Positive	Negative	
Age (months)		17.76 ± 15.32	18.08 ± 13.44	0.513
Gender	Male	61.8%	54.4%	0.267
	Female	38.2%	45.6%	
Nutritional status	Breast feeding	34.9%	49.9%	0.165
	Formula feeding	30.1%	29.5%	
	Combined feeding	33.7%	20.5%	
Admission	Out patient	8.8%	15.8%	0.111
	In patient	91.2%	84.4%	
History of fever (during recent 4 weeks)		45.3%	52.0%	0.314
History of cough (during recent 4 weeks)		12.8%	14.6%	0.717
Fever on admission		49.0%	43.1%	0.380
Vomiting on admission		81.2%	63.3%	0.016
Diarrhea on admission		96.1%	78.5%	0.019
History of antibiotic use		13.7%	9.0%	0.236
Estimated dehydration	5% (mild)	26.4%	36.2%	0.027
	7.5-10% (mild to moderate)	52.7%	54.6%	
	>10% (severe)	20.9%	9.2%	
Rehydration therapy	Oral rehydration therapy	8.9%	21.9%	0.013
	Parenteral rehydration	91.1%	78.1%	

Table 3. Multivariable logistic regression analysis adjusting for age, nutritional status and gender in predicting severe dehydration due to rotavirus

Variables	Odds Ratio (OR_{adj})	(CI 95%)	P value
In patient	0.8	(0.5 - 1.1)	0.053
Vomiting on admission	1.1	(1.0 - 1.3)	0.029
Diarrhea on admission	1.4	(1.1 - 1.7)	0.037
History of antibiotic use	1.2	(0.9 - 1.5)	0.458

of potential confounding factors and the absence of comprehensive pathogen screening.

This study has several limitations that should be considered when interpreting the findings. First, the study was conducted at a single referral center and used a cross-sectional design; therefore, the results may not fully represent epidemiological patterns across different regions, healthcare settings, or seasons. Second, data collection was performed during the covid-19 pandemic in 2020. Public health measures such as social distancing, improved hand hygiene, reduced interpersonal contact and school closures may have affected the transmission of rotavirus and other enteric pathogens. Moreover, comparison with pre-pandemic data and assessment of SARS-COV-2 co-infection were not performed; therefore, the observed prevalence may not fully reflect routine epidemiological conditions. Third, diagnostic testing was limited to rotavirus detection and other viral, bacterial and parasitic enteropathogens were not systematically investigated. As a result, some rotavirus-negative cases may have been caused by other infectious agents or co-infections, which could have influenced the observed clinical differences between groups. Finally, molecular typing of rotavirus strains was not performed, limiting the ability to assess genotype distribution and potential vaccine-related implications. Future studies should include multicenter surveillance across different seasons, comprehensive pathogen screening, molecular characterization of circulating rotavirus strains and longitudinal designs to better evaluate disease burden, genotype trends and the potential impact of vaccination programs.

CONCLUSION

Rotavirus was detected in a considerable proportion of children under five years of age with acute gastroenteritis in this single-center study from southern Iran. Rotavirus-positive cases showed higher frequencies of vomiting, diarrhea, severe dehydration and parenteral rehydration; however, these findings should be interpreted cautiously due to the cross-sectional design and potential confounding factors. The results support the need for continued local surveillance and further multicenter studies with broader pathogen testing and molecular characterization. Preventive strategies, including consideration of rotavirus vaccination policies, may help reduce disease burden if supported by larger epidemiological evidence. Caregiver education and early use of oral rehydration therapy may also contribute to improved clinical outcomes.

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REFERENCES

1. Wielgos K, Setkowicz W, Pasternak G, Lewandowicz-Uszyńska A. Management of acute gastroenteritis in children. *Pol Merkur Lekarski* 2019; 47: 76-79.
2. Robson K, Bouchoucha S, Considine J. Emergency department assessment and management of children with gastroenteritis. *Australas Emerg Care* 2024; 27: 81-87.
3. Moradi-Lakeh M, Shakerian S, Yaghoubi M, Esteghamati A, Shokraneh F, Baradaran HR, et al. Rotavirus Infection in Children with Acute Gastroenteritis in Iran: A Systematic Review and Meta-analysis. *Int J Prev Med* 2014; 5: 1213-1223.
4. Jalilvand S, Roohvand F, Arashkia A, Shoja Z-O. Update on Epidemiology and Circulating Genotypes of Rotavirus in Iranian Children With Severe Diarrhea: 1986–2015. *Int J Travel Med Glob Health* 2018; 6: 7-10.
5. Guarino A, Aguilar J, Berkley J, Broekaert I, Vazquez-Frias R, Holtz L, et al. Acute gastroenteritis in children of the world: what needs to be done? *J Pediatr Gastroenterol Nutr* 2020; 70: 694-701.
6. Cai H, Shao Y, Yu W. Prevalence and associated factors of acute gastroenteritis in children and adolescents aged from 6 to 17 years old: a cross-sectional study based on the National Health and Nutrition Examination Survey database 1999–2018. *BMJ Open* 2023; 13(2): e068319.
7. Zhuo R, Freedman SB, Xie J, Charlton C, Plitt S, Croxen MA, et al. Molecular epidemiology of rotavirus among children in Western Canada: Dynamic changes in genotype prevalence in four consecutive seasons. *J Med Virol* 2023; 95(8): e29028.
8. Ha EK, Kim JH, Cha HR, Lee GC, Shin J, Shin YH, et al. Rotavirus-associated hospitalization in children with subsequent autoimmune disease. *JAMA Netw Open* 2023; 6(7): e2324532.
9. Chigor VN, Chidebelu PE, Digwo DC, Chigor CB, Nwagwu AU, Udeh OS, et al. Assessment of the aetiology of acute gastroenteritis outbreaks in infants reveals rotavirus, noroviruses and adenovirus prevalence and viral coinfections in Nsukka, Nigeria. *VirusDisease* 2023; 34: 297-306.
10. Indrawan M, Chendana J, Handoko TGH, Widjaja M, Octavius GS. Clinical factors predicting rotavirus diarrhea in children: A cross-sectional study from two hospitals. *World J Clin Pediatr* 2023; 12: 319-330.
11. Hazan G, Goldstein Y, Greenberg D, Khalde F, Mahajna R, Keren-Naos A, et al. Comparing single versus multiple virus detection in pediatric acute gastroenteritis postimplementation of routine multiplex RT-PCR diagnostic testing. *J Med Virol* 2024; 96(1): e29344.
12. Kachooei A, Tava Koli A, Minaeian S, Hosseini M, Jalilvand S, Latifi T, et al. Molecular characterization of rotavirus infections in children less than 5 years of age with acute gastroenteritis in Tehran, Iran, 2021–2022: Emergence of uncommon G9P[4] and G9P[8] rotavirus strains. *J Med Virol* 2023; 95(2): e28529.
13. Shams S, Nasab SDM, Heydari H, Tafaroji J, Ahmadi N, Afzali ES. Detection and characterization of rotavirus G and P types from children with acute gastroenteritis in Qom, central Iran. *Gastroenterol Hepatol Bed Bench* 2020; 13(Suppl 1): S128-S133.
14. Ghanaiee RM, Fallah T, Karimi A, Sedighi I, Tariverdi M, Nazari T, et al. Multicenter Study of Rotavirus Infection, Diversity of Circulating Genotypes and Clinical Outcomes in Children ≤5 Years Old in Iran. *Pediatr Infect Dis J* 2024; 43: 320-327.
15. Najafi A, Kargar M, Jafarpour T. Burden and typing of rotavirus group a in children with acute gastroenteritis in Shiraz, Southern Iran. *Iran Red Crescent Med J* 2012; 14: 531-540.
16. Lorestani N, Moradi A, Teimoori A, Masodi M, Khanizadeh S, Hassanpour M, et al. Molecular and serologic characterization of rotavirus from children with

acute gastroenteritis in northern Iran, Gorgan. *BMC Gastroenterol* 2019; 19: 100.
17. Arashkia A, Nejat B, Farsi M, Jalilvand S, Nateghian A, Rahbarimanesh A, et al. Epidemiology and Clinical Characteristics of Rotavirus and Norovirus Infections in Hospitalized Children Less Than 5 Years of Age With Acute Gastroenteritis in Tehran, Iran. *Acta Med Iran* 2020; 57: 640-644.
18. Whorld Health Organuzation. Rotavirus vaccines WHO position paper: January 2013 - Recommendations. *Vaccine* 2013; 31: 6170-6171.
19. Sedighi P, Karami M, Razzaghi M, Emamjamaat M, Karimi A, Mansour Ghanaiee R, et al. The Frequency of Rotavirus Gastroenteritis in Children from West of Iran and Genotyping of Rotavirus Isolates: A Suggestion for Further Changes in Childhood Immunization Program. *J Res Health Sci* 2024; 24(3): e00621.
20. Tavakoli Nick S, Mohebbi SR, Ghaemi A, Hosseini SM. Human rotavirus in Iran; molecular epidemiology, genetic diversity and recent updates on vaccine advances. *Gastroenterol Hepatol Bed Bench* 2019; 12: 98-109.
21. Kachooei A, Ataei-Pirkooh A, Mir-Hosseinian M, Behnezhad F, Eftekhari M, Hoseini-Fakhr SS, et al. Viral co-infections in pediatric acute gastroenteritis: Epidemiology of rotavirus, norovirus, adenovirus, and astrovirus in Tehran, Iran (2021–2022). *BMC Infect Dis* 2025; 25: 1319.