

# THE ROLE OF ROTAVIRUS IN ACUTE PEDIATRIC DIARRHEA IN ISFAHAN, IRAN

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## ABSTRACT

**Background:** Acute diarrhea is one of the most important causes of morbidity and mortality in young children. This study was conducted to assess the prevalence of rotavirus infections in children with acute gastroenteritis in Isfahan. Also seasonal variations and the effects of environmental conditions, type of nutrition and child care on the prevalence of rotavirus infections are evaluated.

**Method:** A total of 185 hospitalized children with acute diarrhea and 91 controls were selected by simple random sampling. Stool specimens were obtained at the time of admission and checked for rotavirus antigens by ELISA method. Demographic data regarding age, sex, type of nutrition (breast-fed vs. bottle-fed) and child care (at home vs. day care-center) of children with acute diarrhea were also recorded.

**Results:** Rotavirus was detected in the feces of 57 (30.8%) children with acute diarrhea and 11 (12.1%) stool samples from control children ( $p < 0.05$ ). 84.2% of cases with rotavirus gastroenteritis were under 2 years of age with highest prevalence in children 6-12 months of age. The relative frequency of rotavirus gastroenteritis was higher in winter (41.4%) than other seasons. Bottle-fed children and those cared at child care centers showed higher relative frequency of rotavirus gastroenteritis.

**Conclusion:** Rotaviruses are important and prevalent etiologic agents of acute gastroenteritis in young children in Isfahan. Being in day care centers and bottle-feeding can serve as precipitating factors of rotavirus diseases in this age group.

**KEY WORDS:** Rotaviruses, Gastroenteritis, ELISA, Isfahan, Environmental factors.

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## INTRODUCTION

Acute diarrhea is one of the most important causes of morbidity and mortality in young children. Rotaviruses are the main responsible pathogens worldwide especially in developing countries. They result in a large number of hospitalizations, costs and mortalities.<sup>1-4</sup>

The reported prevalence of rotavirus infections in children requiring admission to hospitals ranges from 17.7% to 69% in different countries.<sup>5-10</sup> This wide range of reported prevalence may be due to different climates, environmental conditions and demographic variables. However, surveillance for epidemiology of rotavirus infection and its precipitating factors would help us to have a better control on acute gastroenteritis in young children.

This study was conducted to assess the prevalence of rotavirus infections in children hospitalized with acute diarrhea in Isfahan, a central province of Iran. Seasonal variations and the effects of environmental conditions, type of nutrition and child care on the prevalence of rotavirus infections were also evaluated.

## METHODS

The study was carried out in Isfahan, in the central region of Iran, from December 2003 to November 2004. The study population included 185 children (52% boys and 48% girls) up to 5 years of age hospitalized for diarrhea and 91 controls of the same age and sex admitted for causes other than acute gastrointestinal disease. All subjects were selected by simple random sampling. Acute diarrhea was defined as three or more watery or loose stool daily lasting for at least 3 and maximum 13 days.

Children with drug history of immunosuppressives or documented significant background disease such as immunodeficiency syndromes were excluded.

Stool specimens were obtained at the time of admission and carried to the hospital laboratory within one hour of collection. In case of longer transport time, feces were placed at 4°C until carried to the hospital laboratory. Rotavirus antigen in stool samples was detected with a commercial ELISA kit (Rotavirus ELISA kit, DAKO-patts, Denmark). Demographic data regarding age, sex, type of nutrition (breast-fed vs. bottle-fed) and child care (at home vs. day care-center) of children with acute diarrhea were recorded.

## RESULTS

Of 185 children with acute diarrhea admitted to the hospital, rotavirus was detected in the feces of 57 (30.8%) patients. In 11 stool specimens (12.1%) of control children rotavirus antigen was positive ( $p < 0.05$ ).

The mean age of subjects studied was  $18 \pm 2$  months without significant difference between the case and control groups. A total of 48 patients (84.2%) with rotavirus gastroenteritis

were under 2 years of age. The highest prevalence was observed in children 6-12 months of age consisting one third of all positive cases. The prevalence of rotavirus disease in infants aged 1 to 6 months was 12.3%. Age spectrum of children with rotavirus gastroenteritis was from one month to 5 years with median age of 12 months.

Rotavirus was detected throughout the year but relative frequency of rotavirus gastroenteritis was highest in winter. Prevalence of rotavirus disease was 12.5% in spring, 18.4% in summer, 27.7% in fall and 41.4% in winter with highest prevalence in January (63.6%).

In children up to 2 years of age, 15 out of 71 children (21.1%) who were breast-fed and 30 out of 67 (44.8%) who were bottle-fed had positive stool samples for rotavirus ( $p < 0.01$ ). Breast-fed infant was defined as child at the breast with or without consuming powdered milk. Older children consumed family food. This pattern of nutrition was not significantly different between the case and control groups.

Of 153 children cared at home, 41 cases (26.8%) were positive for rotavirus antigen as against 32 children cared at day care-centers, only 9 subjects (28%) stool specimens were positive for rotavirus antigen ( $p < 0.05$ ).

## DISCUSSION

Our findings show that rotaviruses are important etiological agents of acute diarrhea throughout the year in Isfahan, accounting for nearly one third of all cases with acute gastroenteritis. Previous studies reported higher incidence of rotavirus infections in cooler months of the year,<sup>5,6,9,11,12</sup> although a survey in Saudi Arabia reported a peak for rotavirus isolate during dry, hot season.<sup>13</sup> Overall, it seems that rotavirus disease is correlated with dry, cool climate but its seasonality is less apparent in tropical climates.

Because children in this study were enrolled with random sampling method and not all were included, our study is deficient to show the distribution frequency of admissions for rotavirus gastroenteritis in different months and seasons. However, collected data show

that in winter rotaviruses are responsible for more admissions for gastroenteritis. Similar studies are very limited in Iran, but a previous study in Tehran revealed a prevalence of 15.3% for rotavirus infection in children with acute diarrhea.<sup>15</sup>

Almost all humans experience at least one rotavirus infection by three years of age and circulating rotavirus antibody remains detectable indefinitely.<sup>14</sup> This may lead to protection against rotavirus infection and disease or at least milder forms of disease, which results in lower rate of hospitalizations due to rotavirus gastroenteritis in older children. Most of infected children in our study were under 2 years of age, with highest prevalence between 6 and 12 months. This age distribution is comparable to previous reports.<sup>5-7,15-17</sup>

The low rate of rotavirus disease in infants under 6 months of age has been attributed to higher rate of breast feeding in this age group.<sup>15</sup> In our study the rate of hospitalization in bottle-fed infants was about two folds higher than in breast-fed infants. This data confirms the role of breast feeding in protection against rotavirus gastroenteritis, not only when used exclusively but also even when used in combination with formula milk and weaning foods in children with higher age.

The relative frequency of infected children was higher in children cared at day care centers in comparison with other subjects. This may be attributed to higher risk of virus transmission in day care centers due to more close contacts in these environments or probably lower rate of breast feeding in these children. However, the significant higher prevalence in these children emphasizes the need to pay attention to the route of child care as an important factor in the epidemiology of rotavirus gastroenteritis.

Few reports are available about epidemiology of rotavirus infection in various areas of Iran. Further investigations are needed to provide a more accurate picture of epidemiology of rotavirus disease and also its serotypes in Iran. The latter data is highly needed to design an effective vaccination protocol against

rotavirus in future.

Rotavirus vaccines are at an advanced stage of development; as reported by Cunliffe et Nakagomi, universal introduction of rotavirus vaccines into childhood immunization programs is expected to substantially reduce the mortality from rotavirus gastroenteritis in developing countries (currently estimated at 702,000 annual deaths among children less than 5 years of age).<sup>18</sup> But there are as yet no WHO recommendations on production and quality control to provide regulatory guidance.<sup>19</sup> Hence improvement of rotavirus vaccines and developing alternative vaccines should continue.

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