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ROTAVIRUS INFECTION IN CHILDREN WITH ACUTE DIARRHEA IN TEHRAN

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ABSTRACT

The etiology of acute diarrhea was studied in 915 children under 5 years of age between March 1986 and August 1987, in 7 hospitals in Tehran. 65 healthy children in similar age groups served as controls. Rotavirus was found in 25% of the patients and 1.5% of controls with the highest detection rate occurring in the 7-24 month age group (28%) and declining beyond 25 months of age (5%). The infection rate was also high (19%) in the first 6 months of life and breast feeding was not protective. The rate of rotavirus infection was highest during the months of April and May (30% and 37% respectively) and lowest during December and January (7%).

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INTRODUCTION

Diarrheal disease is a major public health problem and a prominent cause of children morbidity and mortality in developing countries.[1] Etiological diagnosis may not be essential in the treatment of individual patients, but is important for the proper management of outbreaks, planning and implementation of control measures.[2]

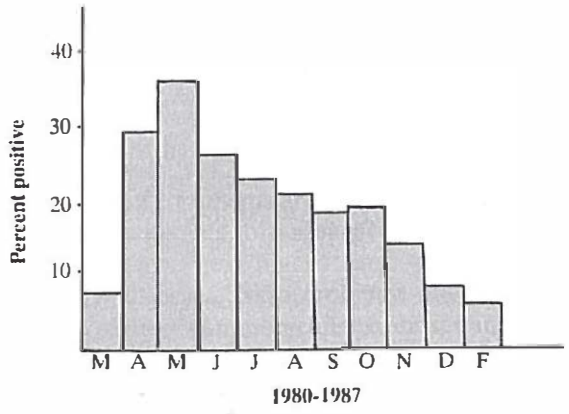


Figure 1. Frequency of isolation of rotavirus from March 1986 to August 1987. No samples were collected during Feburary and March 1987. The samples collected during May-August 1987 were added to those taken during the same months in 1986 for calculation.

In recent years, rotavirus has been recognized as one of the most important causes of childhood diarrhea throughout the world.[3,4] Studies concerning the role of rotavirus in childhood diarrhea has been mostly conducted in developed countries,[5] but only in a few developing countries.[6-8]

However, although acute childhood diarrhea continues to be an important health problem in Iran, rotavirus presumably being among the most important causative agents of this disease, there has not yet been a report concerning the role of this agent in this regard. Therefore an investigation was undertaken to assess the role of rotavirus in childhood diarrhea in Iran, and the results of the first part of this study are reported.

MATERIALS AND METHODS

Stool samples were collected from 915 children under 5 years of age suffering from diarrhea, at seven outpatient clinics in Tehran between March 1986 to August 1987. 65 healthy children of the same age group served as controls.

Diarrhea was defined as the passage of more than 3 liquid or semiliquid stools per day.

Fecal samples were collected after natural defeca-

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tion kept at 4°C and transported to the virology department of the Pasteur Institute of Iran in Tehran on the day of sampling. The samples were stored at -30°C until screened for the presence of rotavirus. Screening was made either by reversed passive hemagglutination (Rota-RPHA Seiken) or latex agglutination (Slidex Rota Bio Me'rieux) according to the manufacturers' instruction.

RESULTS

Of the 915 children studied in Tehran, rotavirus was found in 228 (25%) of the patients, whereas only 1 (1.5%) of the controls was positive. The infection was prevalent throughout the period of this investigation although monthly variations in the rate of infection was observed (Fig. 1). The highest rate of virus infection was during April and May being 30% and 37% respectively (Fig. 1) with a significant difference ($P<0.05$) between the rate of infection in spring: March-May (32%) and other seasons (summer: June-August (24%), autumn: September-November 16% and winter (December-February 7%) and also between summer and winter ($0.01<P<0.05$). The rate of rotavirus infection was highest in the 7-12 month (28%) and 13-24 month age groups (27%) declining to 5% in patients 25 months or older (Fig 2). The difference between the first 3 age groups and that of children older than 25 months was statistically significant ($P<0.02$). The protective effect of breast feeding was evaluated by comparing the rate of infection in the 0-6 month age group which were breast-fed (13/68 = 19%) and those which were not (20/94 = 21%). The difference was not statistically significant.

Rotavirus infection was not related to patients' sex since 26% of the males and 24% of the females of the group under investigation were virus positive.

The available data showed that the duration of diarrhea varied from one to more than 10 days. The maximum rate of infection was observed among children who were examined on the 3rd (39%) and 4th (36%) day of their illness compared with 15% in those examined on days 10 or later (Table I).

In 527 children data for assessing the relation between the number of stools per day and virus detection

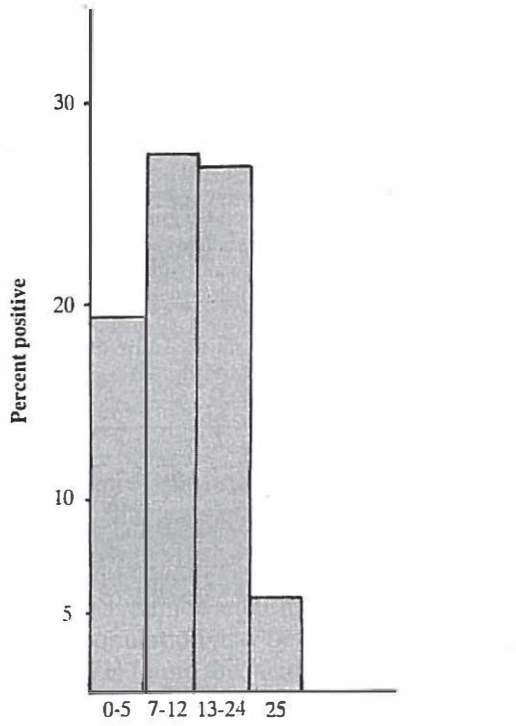


Figure 2. Frequency of isolation of rotavirus in various age groups.

varied between 16% in those with 3 stools per day to 38% in patients with 10 or more stools per day (Table II).

Study of clinical features in 215 rotavirus positive cases showed that fever and vomiting was the most common symptoms since they were observed in 125 (58%) positive cases, with fever present in 23 (11%) and vomiting in 67 (31%) of the patients (Table III).

The diarrheal character related to rotavirus was generally unremarkable. Bloody stools were not seen in association with the infection and color or consistency of stools seemed unrelated with virus positivity.

DISCUSSION

The findings of this study showed that rotavirus accounts for 25% of acute diarrheal attacks among infants and young children in the population under study, a result comparable to those reported by others,[9]

Table I: Detection of rotavirus as related to time of examination in 731 children with diarrhea.

	Day of illness										
	1	2	3	4	5	6	7	8	9	10+	total
No.tested	79	138	127	61	28	16	108	9	7	158	731
No.positive	20	39	50	22	11	3	25	0	1	24	195
Positive %	(25.31)	(28.26)	(39.37)	(36)	(18.96)	(18.75)	(23)	0	(14)	(15)	(26.67)

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Table II. Relation of rotavirus detection to the number of stools per day in 527 children with diarrhea.

	Number of stools per day								
	3	4	5	6	7	8	9	10+	Total
No. investigated	38	52	66	56	66	38	7	204	527
No. positive	6	12	1	15	18	9	2	78	152
Positive %	(15.78)	(23)	(18.18)	(26.78)	(27.27)	(23.68)	(28.57)	(38.23)	(28.84)

although the rate of virus positivity among the controls in the present investigation was lower than that reported in a similar study in Addis Ababa[10] and higher than what was observed in India.[2]

Rotavirus was found endemic throughout the year, a result similar to the findings in tropical countries[8,11] with a peak rate during the months of April and May, a period corresponding to spring in Tehran. Seasonal variation in the prevalence of rotavirus infection is well recognized. Rotavirus detection was extremely low in the summer months in Washington D.C.,[12] and northen Japan[13] but the virus was found during the summer in about 20% of patients with diarrhea in London, England,[14] and Melbourne, Australia.[15] Report from tropical areas are inconsistent. No seasonal variation of rotavirus was observed in Venezuela.[8]

Rotavirus detection increased during the dry season in India [15] and Bangladesh.[17] The reason for the seasonal variations in the rate of rotavirus infection is not clear. Whether it is only related to the temperature variations or other factors such as rainfall and relative humidity play a role needs further carefully controlled studies to be clarified.

Although the majority of cases with rotavirus infection occurred in the 7-24 month age group, a result similar to those obtained in other parts of the world,[18-20] virus detection rate was high even among 0-6 month olds and no significant difference was observed between breast-fed children and those who were not breastfed, suggesting that protection through mother's milk is at best partial. In a prospective study of rotavirus infections and young children in Canada[21] it was shown that neither breast-feeding nor rotavirus antibody in cord blood was protective. Also in a similar report,[22] it was shown that neither maternally acquired serum antibodies to rotavirus nor the antibody in breast milk correlated with protection against rotavirus infection.

Table III. Clinical manifestations of 215 rotavirus positive children.

No. of infections in which the symptom was present	
Symptom	Number (%)
Fever	23 (11)
Vomiting	67 (31)
Fever + vomiting	125 (58)

In our study no absolute characteristic clinical presentation of this infection was observed although vomiting and fever were the most common symptoms (58%) and diarrheal cases associated with vomiting and/or abdominal pain have been attributed to rotavirus infection.[21]

No significant differences between the number of stool passage per day and the rate of virus infection was observed, although from a higher rate of positive cases (38%) among patients passing 10 or more stools per day it might be concluded that rotavirus may cause a more severe diarrheal condition.

In the present study more than 70% of rotavirus positive cases were found among samples collected within the 4th day of illness compared with less than 30% positivity found in samples collected later. This is in agreement with the results reported from Norway.[23] One possible explanation could be that the diagnostic techniques are of more value during the acute phase of the disease or may be an indication of the severity of the disease in relation to virus concentration and the number of stools per day since the highest rate of infection was on the 3rd day of illness with 10 or more stools per day. Another possible explanation could be that patients with more frequent stool passage per day, attend the hospital earlier and more often than those with less frequent stool passage.

In conclusion this study showed that rotavirus contributes to at least one fourth of all acute diarrheal cases in children referring to hospitals. Although determination of the actual role of this organism requires systematic epidemiological studies, this preliminary investigation showed that in the management of this condition especially in children under 2 years of age the role of this pathogen should be taken into account. This should lead to a decrease in misuse of antibiotics and hopefully an increase in oral rehydration therapy.

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Table III- Normal serum IgE by age in international units (I.U.)

Age	Median serum IgE by IU/ml
0-1	3.1
1-2	6
2-3	10
3-9	16
9-12	30
Adults	25

Table IV- Range of IgE in positive and negative skin tests.

	Skin prick test positive			Skin prick test negative		
Age	No	Range IgE IU/ml	Percent	No	Range IgE IU/ml	Percent
1-4	16	189	17	12	62	11
4-9	41	449	36	21	200	19
9-14	12	350	11	7	11	6
Total	72					39

Total serum IgE:

The normal total serum IgE is shown in Table III.[4]

Range of serum IgE relative to age and the skin prick test is shown in Table IV.

Mean peripheral blood eosinophilia is 5 percent. Stool examination for parasites was negative.

DISCUSSION

The impact of asthma on the developing child has been the subject of observation, discussion and research for sometime now. Despite continuing interest there is still no precise description or clear understanding of childhood asthma.[5]

There is evidence that the prevalence and severity of asthma are rising.[6]

The purpose of this article is to review the incidence of allergy as manifested by the skin prick test and total serum IgE in childhood asthma. We believe that allergy is a main factor aggravating childhood asthma. Cough and wheezing are the main presenting symptoms (Table I). A family history of atopy correlated with skin test positivity (Table II).

Blood eosinophilia has also revealed a slight increase in the number of this cell (5 percent in men). Our data would support the concept that allergy is one of the main factors of childhood asthma.

This study supports the concept that allergy in childhood asthma exaggerated bronchial hyperresponsiveness to many different stimuli.[7,8] Our data shares certain similarities with the studies of Zemmerman.[9] We conclude that skin prick test positivity correlated with total serum IgE.

Skin test positivity is more common with a family history of atopy.

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