Clinical and Epidemiological Features of Acute Gastroenteritis Associated with Human Rotavirus Subgroups 1 and 2 in Northern India

VIRENDRA SINGH, SHOBHA BROOR, SAROJ MEHTA, SATISH KUMAR MEHTA
Department of Gastroenterology, Postgraduate Institute of Medical Education and Research, Chandigarh

Abstract
Rotavirus was detected in 111 (15.9%) of 694 children who presented to our hospital with acute diarrhoea over a period of 45 months (1982-1985). Subgrouping for rotavirus was done on 87 children by ELISA using specific monoclonal antibodies to find out any differences in the epidemiology and clinical profile of the two subgroups. Twenty six (29.9%) were found to belong to subgroup 1 and 61 (70.1%) to subgroup 2. Diarrhoea, vomiting and fever were present in both the subgroups in the same frequency. However, the severity of diarrhoea was more in children having subgroup 2 infection. Rotavirus infection showed two peaks, one during the early months of summer and the other during the early months of winter of each year. During most of the study period, infection was predominantly with subgroup 2, except for a few months in 1985 and 1986 when a majority of children had infection with subgroup 1.

Key words: Rotavirus, epidemiology, subgroups, seasonal variation.

Introduction
Rotavirus has been recognized as one of the most important aetiological agents of acute gastroenteritis in infants and young children.1 It has been estimated that over 500,000 deaths occur annually due to rotavirus diarrhoea.2 The mortality rate of rotavirus gastroenteritis is 100 times more in the developing than in developed countries.3

Human rotaviruses have been classified into two well recognized subgroups and four serotypes.4 The clinical and epidemiological features of different rotaviruses are quite variable.5 There is hardly any information available on this aspect from India. The present study was carried out to examine the relative frequency of rotavirus subgroups in children attending our hospital with acute gastroenteritis. The seasonal variation and clinical characteristics of the disease due to different subgroups were also examined.

Material and Methods
The study population consisted of children below 5 years of age with acute gastroenteritis who attended the Paediatric Gastroenterology division of our hospital, which receives patients from the city of Chandigarh and the rural population in its neighbourhood. Eighty stool samples were also collected from children below 5 years of age who were attending the outdoor department for other problems but had no recent history of diarrhoea. Stool samples were tested for rotavirus by immunofluorescence against human rotavirus E2 antigen. All positive specimens were further confirmed by blocking ELISA using pre and post immune rotavirus antisera raised in goats.6 Rotavirus subgrouping was performed by indirect ELISA using subgroup specific monoclonal as detector antibodies (supplied by kind courtesy of Dr T H Fikell, WHO Collaborating Centre for Reference and Research on Rotavirus, Hone ruddish proxidase (HRP) conjugated goat antimouse IgG was used as conjugate. The cut-off value for optical density ratio with the two monoclonal antibodies was ≥ 2.7 Known subgroups 1 and 2 controls were included in each test. The mean monthly minimum and maximum temperature and mean monthly rainfall records were obtained from the office of the Meteorological Survey of India, Chandigarh.

Results
Incidence of rotavirus infection
Six hundred and ninety four children having acute gastroenteritis were studied. One hundred and eleven (15.9%) were found to have rotavirus infection as detected by blocking ELISA. In contrast, rotavirus was detected in only one of 80 control children studied. The annual incidence of rotavirus infection in children with acute gastroenteritis from 1982-1983 was 21.5% 16.3%, 12.8% and 17.5% respectively.

Subgrouping was done in 87 of the 111 rotavirus positive children. Twenty six (29.9%) children belonged to subgroup 1 and 61 (70.1%) to subgroup 2.

Clinical features and age distribution
The mean age of children in subgroup 1 (10.05 ± 7.16 mo) and subgroup 2 (10.07 ± 6.27 mo) was similar. The incidence of diarrhoea, vomiting and fever was the same in both the groups. Severe diarrhoea (>15 stools/day) was seen more frequently in subgroup 2 (23%) as compared to subgroup 1 (7.6%) infection. Severe dehydration was also more common in subgroup 2 (26.2%) compared with subgroup 1 (11.5%) infection. These differences however were not significant (p>0.05).
Temporal pattern and seasonal variation

The annual distribution of rotavirus infection was almost similar throughout the study period of three years and nine months from March 1982 to December 1985. Rotavirus infection exhibited a total of 8 peaks—
one in the summer months and another in the early
winter months of each year (Fig 1).

There was no correlation between the rotavirus
infection rate and mean monthly temperature. Similarly,
the correlation between the frequency of rotavirus
infection and mean monthly rainfall was not significant:
\( r = -0.26; p > 0.05 \).

A sequential pattern of infection was observed with
subgroup 1 and subgroup 2 rotaviruses (Fig 2). In
1982 (March-December) subgroup 2 rotavirus infection
was prevalent; by 1983 summer, subgroup 1 started
appearing and became the predominant subgroup in
the winter months (October-December) 1983. In 1984
subgroup 2 infection again became prevalent and
subgroup 1 was not detected throughout the year.
In 1985 (March to June) both subgroup 1 and subgroup
2 rotaviruses were prevalent in equal frequency, but in
the winter months (November-December) there was
preponderance of subgroup 2 infection (22/27), whereas
subgroup 1 was prevalent at a low level (5/27).

Discussion

The present study shows that rotavirus was prevalent
in 16% of the children below the age of 5 years with
acute gastroenteritis, and that the rate of rotavirus
diarrhoea remained almost the same during four
successive years. These observations point towards the
endemicity of rotavirus in our area. Reports from diffe-
rent parts of India show a considerable variation
in the incidence of rotavirus gastroenteritis, viz:
Calcutta—5%, Vellore—28%, New Delhi—32%, and
Calicut—70%.

Human rotaviruses have been classified into two
subgroups. In the present study infection with
subgroup 2 rotaviruses was encountered more frequently
as compared to subgroup 1. There are no reports
available from other parts of India on the identification
of subgroups. However, our findings are in agreement
with reports from other countries.

The illness in subgroup 2 seemed to be slightly more
severe as manifested by severe diarrhoea and dehydra-
tion. The differences between the two groups were
however not significant. In some of the earlier reports
diarrhoea was more severe in subgroup 2 infection as
compared to subgroup 1 infection, whereas other
workers have reported similar severity of illness in the
two subgroups.

We observed eight peaks of rotavirus infection during
the dry months of summer and winter for four years.
In the report from New Delhi, the rotavirus infection rate
was relatively low during July to September (period of
high rainfall). An increase in rotavirus incidence
during the period of low rainfall was reported from
Calicut, a coastal city in South India. Other workers
have also reported a high incidence of rotavirus infection
during dry weather.

Infection with rotavirus subgroup 2 was detected
throughout the study period but the relative frequency
of subgroup 1 infection varied. Subgroup 1 infection
appeared at intervals of 9 months to one year for a
short time. But during this period the prevalence of subgroup 2 became low. Similar findings have been reported from Sweden, the UK and Chile. There are three serotypes in subgroup 2 but only one in subgroup 1. Thus in subgroup 2, any one serotype keeps the infection alive while in subgroup 1, the development of immunity to its serotype leads to complete elimination of this subgroup from the population. Obviously, there is a need for further characterization of rotaviruses in terms of serotypes and electropherotypes for a better understanding of the epidemiology of this infection.

References