INCIDENCE OF ROTAVIRAL INFECTION IN CENTRAL AND EAST PARAGUAY BETWEEN 2002 AND 2003: A SINGLE ELECTROPHORETYPETE DETECTED

ABSTRACT

In Paraguay, acute diarrheal disease is the fourth cause of mortality in children < 5 years of age. Fecal samples from infants of that age range with acute diarrheal disease that was admitted into public and private hospitals in the Capital city (Asunción) and into the Main Health Care Center in Hernandarias city (located on the east border with Brazil) were collected between August 2002 and December 2003. The frequencies of rotaviral diarrhea in both cities were similar; i.e., 31.8 % in Hernandarias, and 28.2 % in Asunción. All of the rotavirus strains detected belonged to the group A, showing the typical long electrophoretic pattern with no apparent variation in the other segments. No sample with short pattern or with more than 11 RNA segments was detected.

Acute diarrheal disease is an important cause of childhood morbidity and mortality throughout the world. According to recent estimates, between 1.7 – 3.0 million fatal diarrheal diseases per year occur worldwide in children under 5 years of age. Most of the cases are observed in developing countries (Parashar et al., 2003). In Paraguay, acute diarrheal disease is the fourth cause of mortality in children < 5 years of age causing 235 deaths in 1999, according to the reports of the Dirección General de Planeamiento y Evaluación - Ministerio de Salud Pública y Bienestar Social, 2002.

Group A rotaviruses are the world most important viral agents of diarrhea in children. Rotaviruses are members of the Reoviridae family, which includes seven groups (A - G). The viral genome consists of 11 segments of double-stranded (ds) RNA, which can be sepa-
rated by polyacrylamide gel electrophoresis (PAGE), producing a migration pattern called electropherotype, which can be used to discriminate between different strains. Group A rotaviruses may exhibit two electropherotypes on the basis of the relative mobility of the segments 10 and 11, named long and short. In human rotaviruses, with few exceptions, the long pattern has been shown to correspond to the subgroup II, and the short pattern to the subgroup I (Desselberger et al. 2001, Kapikian A Z 1996).

Over three consecutive epidemiological studies performed in our laboratory (from 1998 to 2000) only one out of 93 rotavirus-positive samples showed a short pattern, which suggests a minor involvement of the rotavirus A subgroup I in rotaviral acute diarrhea in Paraguay, at least in the area and the time during which the survey was carried out (Candia et al. 2003).

In temperate climates rotavirus infections present a seasonal pattern (with the highest peak during the coldest months of the year), whereas in subtropical and tropical regions they occur all year round (Desselberger et al. 2001). In Argentina, Uruguay and Brazil's central and southern states, seasonal patterns of rotavirus infections were also described (Bok et al. 2001, Hortal M 1986, Pereira et al. 1993), as well as the predominance of the long electropherotype for several epidemic years alternating with the short electropherotype, according to some studies (De Sierra et al. 2002, Hortal M 1986, Pereira et al. 1983).

The variation of rotavirus strains is dependent upon the fitness of the circulating strains or upon host factors (i.e., age or immunological status of the individual). The knowledge of the rotavirus epidemiology is important before an immunization program is implemented in a country (Gouveia & Brantly 1995).

Epidemiological studies carried out in children with acute diarrhea in different hospitals in Asunción, the capital city of Paraguay, have shown the presence of group A rotavirus in 23 – 32 % of the cases, and a seasonal pattern with an incidence peak during the coolest months of the year (Candia et al. 2003, Coluchi et al. 2002).

Asunción and both the Central and Alto Paraná Departments rank among the regions with the highest cases of reported deaths of children due to diarrhea (Central and Alto Paraná are two of the 18 departments into which the geography of Paraguay is divided).

Since all molecular epidemiological studies of rotavirus had been carried out in Asunción, as a first attempt to assess the epidemiology of rotaviral infections at the national level we studied the frequency of cases in public and private Hospitals of Asunción and Hernandarias – the latter being the second largest city of the Alto Paraná Department, located at approximately 360 km from Asunción, on the east border with Brazil.

A total of 755 fecal samples from infants (up to 5 years of age) with acute diarrhea were collected between August 2002 and December 2003, 689 of which came from Hospitals from Asunción (Hospital de Clínicas, Instituto Privado del Niño, and San Roque Hospital) and 66 from the Main Health Care Center in Hernandarias. The screening for rotavirus-positive samples were done by PAGE as described elsewhere (Candia et al. 2003), and/or latex agglutination assay (Rotación, BiosChile IGSA) according to the manufacturer's instructions.

Out of the 755 samples, 215 (28.5 %) were rotavirus-positive. As shown in Table 1, the frequencies of rotavirus in both cities were similar, namely, 31.8 % in Hernandarias and 28.2 % in Asunción. Also, a quarterly distribution of rotavirus-positive samples was observed in both cities. As previously shown (Candia, et al., 2003, Coluchi, et al., 2002), the highest frequency of rotavirus-positive cases in Asunción were observed during the coldest months of the year (i.e., the third quarter). Although no samples were collected in Hernandarias between November 2002 and May 2003, it seems that this city also shows a rotaviral infection peak during the coolest seasons. This notion is supported by the absence of rotavirus-positive cases in the second quarter of 2003, a high incidence in the third quarter, and a decrease in the fourth quarter of both years of 2002 and 2003. Further surveys with continuous sampling shall allow us to confirm this hypothesis.

All of the rotavirus strains detected showed the typical 4-2-3-2 gene segment pattern, which is characteristic of group A. All of them belonged to the long pattern with no apparent variation in the other segments. Between 1998 and 2000, ten different rotavirus electropherotypes were recognized in Asunción (Candia et al. 2003). On the other hand, the present study suggests that a single electropherotype circulated between 2002 and 2003 in the two cities mentioned above. No sample with more than 11 segments was detected, which correlates with the finding of a single electropherotype pattern. However this fact
does not rule out possible mixed infections that were not detectable by PAGE. Although the rotavirus epidemiological features of the two regions examined in this study were the same, it would be interesting to conduct studies to compare the epidemiological behaviours in the Southern and the Northern regions of the country, which exhibit greater climatic differences.

Table 1 - Quarterly distribution of rotavirus-positive samples collected in hospitals of Asunción and the Main Health Care Center of Hernandarias, from August 2002 to December 2003.

<table>
<thead>
<tr>
<th>Quarters</th>
<th>Asunción</th>
<th>Hernandarias</th>
</tr>
</thead>
<tbody>
<tr>
<td>III - 2002</td>
<td>23/48 (48%)(^1,2)</td>
<td>4/4 (100%)</td>
</tr>
<tr>
<td>IV - 2002</td>
<td>13/76 (17%)</td>
<td>2/8 (25%)</td>
</tr>
<tr>
<td>I - 2003</td>
<td>5/94 (5.3%)</td>
<td>NC(^3)/NC</td>
</tr>
<tr>
<td>II - 2003</td>
<td>8/163 (4.9%)</td>
<td>0/7 (0%)</td>
</tr>
<tr>
<td>III - 2003</td>
<td>141/260 (54.2%)</td>
<td>12/30 (40%)</td>
</tr>
<tr>
<td>IV - 2003</td>
<td>4/48 (8.3%)</td>
<td>3/17 (17.6%)</td>
</tr>
<tr>
<td>Total</td>
<td>194/689 (28.2%)</td>
<td>21/66 (31.8%)</td>
</tr>
</tbody>
</table>

\(^1\) Values shown are number (%) of positive samples / number of samples.
\(^2\) Boldface numbers indicate the quarter with the highest % of positive samples per year.
\(^3\) No sample was collected.

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REFERENCES


