References


Seasonality of Cryptosporidiosis in Children

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The seasonal distribution of cryptosporidiosis in children in Aragón, a region in northeastern Spain, was determined. Over a period of six years (October 1988 to September 1994), 10,034 stool samples from 4,508 children with gastrointestinal symptoms were analyzed for this purpose. The age of the patients ranged from 1 month to 14 years. Cryptosporidium oocysts were identified in 87 (1.93%) patients. Prevalence was highest (6.20%) in children aged 1 to 3 years old. The prevalence was significantly higher in the autumn-winter period (October to March) than in the spring-summer period (April to September) in the whole population (2.41% vs. 1.35%, p = 0.010) and in the 1- to 3-year-old age group (8.44% vs. 3.20%, p = 0.002), but not in the other age groups. A possible relationship of this pattern to attendance at child care centres is suggested.

Cryptosporidiosis is a common parasitosis in Aragón (Spain), the prevalence in patients with gastrointestinal symptoms being 1–2% (1). Similar rates, significantly lower than those found in some developing countries (2, 3), have been reported in other Spanish regions (4, 5). Seasonal variations in the occurrence of cryptosporidiosis seem to be common. However, published data are contradictory: higher rates have been reported in cool months (6), hot months (7, 8), or the rainy season (2, 3), and in some cases no seasonal differences have been found (5). The objective of this study was to assess the prevalence and seasonal distribution of cryptosporidiosis in children in the region of Aragón in northeastern Spain.

Materials and Methods. The study population included all HIV-negative children aged between 1 month and 14 years with gastrointestinal symptoms whose physician requested parasitological examination of stools. The children were seen at the Department of Pediatrics, University Hospital of Zaragoza, in the period from October 1988 to September 1994.

Examination of stool samples for the presence of Cryptosporidium oocysts was carried out in the Department of Microbiology using a formalin-ethyl acetate sedimentation technique (9) and a modified Ziehl-Neelsen stain (10).

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Table 1: Seasonal prevalence of cryptosporidiosis in the period from October 1988 to September 1994.

<table>
<thead>
<tr>
<th>Age group</th>
<th>No. of subjects</th>
<th>Fall-</th>
<th>Spring-</th>
<th>P value</th>
<th>Odds ratio (95% confidence interval)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A (&lt; 1 year)</td>
<td>470</td>
<td>2.53</td>
<td>2.59</td>
<td>1.000</td>
<td>0.97 (0.26-3.96)</td>
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<tr>
<td>Group B (≥ 1 to &lt; 4 years)</td>
<td>806</td>
<td>8.44</td>
<td>3.20</td>
<td>0.002</td>
<td>2.79 (1.35-5.88)</td>
</tr>
<tr>
<td>Group C (≥ 4 to &lt; 15 years)</td>
<td>1,956</td>
<td>0.77</td>
<td>0.98</td>
<td>0.633</td>
<td>0.79 (0.28-2.25)</td>
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<tr>
<td>Overall</td>
<td>2,41</td>
<td>1.35</td>
<td>0.010</td>
<td></td>
<td>1.80 (1.12-2.91)</td>
</tr>
</tbody>
</table>

Meteorological data for the study period, including mean, maximum, and minimum daily temperatures, relative humidity, and rainfall, were obtained from the local meteorological station, which is integrated into the national meteorological service. More than 90% of the population of the geographical area covered by the hospital live in the city of Zaragoza or within 30 km of it, an area in which the weather is consistent.

Data were analyzed using Statview II (version 1.01) software (Abacus Concepts, USA). Statistical methods used were the Kolmogorov-Smirnov test, Pearson's coefficient of correlation, and multiple regression analysis. For quantitative data not following a normal distribution we used the Mann-Whitney test for comparison of two groups, and the Kruskal-Wallis test for non-parametric analysis of variance comparing more than two groups. Qualitative analysis was done with the \( \chi^2 \) test for independent variables, or with Fisher's exact test when some expected value was less than 5. Results were considered statistically significant when a value of \( p < 0.05 \) was obtained.

Results and Discussion. During the study period, 10,034 stool samples from 4,508 children (2,576 male and 1,932 female) were processed. *Cryptosporidium* oocysts were detected in 177 samples (1.76%) corresponding to 87 patients (1.93%), 49 of whom were male (1.90%) and 38 female (1.97%; \( p = 0.94 \)). In the same period samples were received from 85 HIV-positive patients (excluded from the study), including 2 positive for *Cryptosporidium*. Prevalence in this group was not significantly different from that in immunocompetent patients (\( p = 0.68 \)).

Age data were available for 3,232 children, 79 of whom were positive (2.44%); this rate was not significantly different from the overall prevalence (\( p = 0.12 \)). The age of the positive patients ranged from 13 weeks to 14 years. The prevalence by age is shown in Figure 1.

Significant differences between the prevalence in contiguous one-year age groups were sought. On the basis of the results, three broader age groupings were defined: Group A (< 1 year: 470 patients, 2.55% positive), Group B (1 to 3 years: 806 patients, 6.20% positive), and Group C (≥ 4 years: 1,956 patients, 0.87% positive). The prevalence in each one-year group was not significantly different from that in its corresponding broader grouping.

No significant associations were found between mean monthly rates of cryptosporidiosis and the meteorological variables analyzed.

When mean monthly rates were subjected to analysis by second-degree polynomial regression, statistically significant results were obtained for the overall data (\( r = 0.71, p = 0.041 \)), with a better correlation (\( r = 0.81, p = 0.008 \)) for Group B (1 to 3 years).