RESULTS OF SEROEPIDEMIOLOGICAL SURVEYS ON HUMAN HYDATID DISEASE IN CHILE (1977-1994)

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© 2000 Research and Reviews in Parasitology, 60 (1-2): 37-39

ABSTRACT: A seroepidemiological survey was carried out in apparently healthy individuals from urban and rural areas from 12 of the 13 regions of Chile. A total of 15661 serum samples were studied: 9440 from blood banks and other primary urban health care centers, 6221 from rural zones.

INTRODUCTION

Hydatidosis is the most important zoonosis in Chile, not only because of its effects on public health but also for its economic impact, especially in the Southern part of the country.

During the last two decades the incidence remained around 600 to 800 new cases, i.e. 6 to 7 per 100,000 inhabitants. However, according to data from the «Instituto Médico Legal» and various Santiago hospitals, this figure should be above 300; this is most probably the highest incidence in the world. The incidence according to health authorities has decreased to only 200-300 new cases per year during the last decade, i.e. 2.3 per 100,000 inhabitants (see MINISTRY OF HEALTH OF CHILE, 1992).

Precise figures are difficult to obtain due to lack of a standardized diagnostic test, but the reasons for this high incidence are evident: large numbers of animal slaughtering, large numbers of dogs, a low socio-economic level, poor sanitation, and the habit of feeding dogs with infected viscera from slaughtered animals. Although it seems easy to break the life cycle of Echinococcus granulosus, in practice this does not happen (BONIFACINO et al., 1991; PLANCHART et al., 1994).

In order to stress the need for urgent measures by the authorities we felt that more reliable data were needed. Therefore we studied the presence of hydatidosis in apparently healthy people.

MATERIAL AND METHODS

The seroepidemiological survey was carried out from December 1977 through December 1994 in apparently healthy people in 12 of Chile's 13 regions. From each individual 8 ml of blood without anticoagulant were drawn and data were recorded with respect to basic sanitation and the presence of animals in the house. Due to geographical difficulties in reaching some areas it was not always possible to obtain representative population samples in every one of the 12 regions (6221 samples from rural areas versus 9440 samples from blood banks and other urban primary care health centers).

In the immunodiagnosis, double diffusion arc five (005) was used as screening test; and counterimmunoelectrophoresis (CIEF) and immunoelectrophoresis (IE) served for confirmation, in accordance with the Pan American Zoonosis Center protocols (YARZABALIAZACOLTORTI, 1987; VALERADIAZCOLTORTI, 1976; COLTORTI & VALERA, 1987; RETAMAL et al., 1994). The antigen used was prepared from sheep liver hydatid cyst fluid and was standardized (less than 7 arcs of immunoprecipitation including arc 5). Hyperimmune sera were used as controls. For immunoprecipitation the antigen was used at a concentration of 10 mg/200 μl in veronal buffer. The test was considered positive when 2 or more bands were visible.

During the last years of this survey (1993-1994) the indirect haemagglutination test (IH) and an ELISA were also used in 2000 sera from rural areas of the VIIth Region (antigen concentration: 2.5 and 2.0 μg/ml, respectively, source of antigen: pool of sheep lung and liver hydatid cyst fluid) (WATTHELIAZACOLTORTI, 1980; COLTORTI, 1986). The tests were considered positive: for IH when the titer was 1/100 or higher, and for the ELISA test when the calculated average of negative controls plus 3 times the standard deviation was found.
Table 1. Seroepidemiology of human hydatidosis in 12 Regions of Chile. Relationships between positive and confirmed cases.

<table>
<thead>
<tr>
<th>Regions</th>
<th>Studied</th>
<th>Positive</th>
<th>Confirmed cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>II Antofagasta</td>
<td>600</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>III Atacama</td>
<td>328</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>IV Coquimbo</td>
<td>683</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>V Valparaiso</td>
<td>240</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Metropolitan</td>
<td>2583</td>
<td>14</td>
<td>10</td>
</tr>
<tr>
<td>VI O’Higgins</td>
<td>206</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>VII Valdivia</td>
<td>4340</td>
<td>20</td>
<td>14</td>
</tr>
<tr>
<td>VIII Del Bio-Bio</td>
<td>1189</td>
<td>8</td>
<td>5</td>
</tr>
<tr>
<td>IX Araucania</td>
<td>1345</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>X Los Lagos</td>
<td>465</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>XI Aisen</td>
<td>2182</td>
<td>12</td>
<td>5</td>
</tr>
<tr>
<td>XII Magallanes</td>
<td>1500</td>
<td>11</td>
<td>6</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>15661</td>
<td>85</td>
<td>47</td>
</tr>
</tbody>
</table>

Of the 15661 sera studied, 12300 were from the age group 15-68 years, and 3361 from 2 to 14 years. Positive cases were reported to the National Health Services for simple chest radiology and abdominal echography.

RESULTS

At the end of the study 15661 sera had been analyzed, detecting 85 (540/100000 inhabitants) seropositive cases (Table 1) of which 47 (300/100000 inhabitants) were confirmed by X-ray and echography, mainly among individuals from rural areas in the Metropolitan Region, the VIIth, VIIIth, IXth and XIIth Regions. Among the confirmed cases, several were found to belong to the same family group. This occurred in the Metropolitan Region (Lampa, 3 brothers); in the VIIth Region (Cúricó, Cauquenes, Linares); in the VIIIth Region (Yumbel, Hualqui), and in the IXth Region (Malleco, two adults and a child).

Of the surgically confirmed cases together, 20 corresponded to primary lung cysts, 27 to primary liver cysts; 9 of them had surgery more than once. It was not possible to obtain surgical confirmation of the other seropositive cases because people had moved and contacts were lost.

On examining information obtained from the people who tested positive by serology, it was found that in rural families 90% had at least 1 dog, sometimes up to 3. The sanitary facilities at home were deficient (50% of the houses without running potable water or sewerage system); 45% of the families did their own animal breeding and slaughtering.

DISCUSSION

The ELISA technique has excellent sensitivity and specificity, it is easy to carry out and requires a minimum of antigen. For that reason it is very useful for seroepidemiological surveys. On the other hand its specificity is lower and its cost higher than DDS (SHEPHERD & McMANUS, 1987). In a serological survey like this, the quality of the antigenic material is of the utmost importance. The best results were obtained with a pool of sheep lung and liver hydatid cyst fluid (previous trials showed that cattle hydatic cyst fluid was only half as good; horse hydatid cyst fluid might have been better but it is difficult to obtain in Chile).

This investigation reveals that the prevalence of hydatidosis in Chile is much higher than generally accepted. However, taking into consideration the chronic nature of the disease and its presence in children and adults in different organs, resulting in different kinds of immunological reactions, the clinical significance of the data is not easy to prove.

With the exception of a few regional hospitals well linked to the Reference Laboratory of Parasitology of the Chilean Institute of Public Health, an important variable is the lack of standardization with reference the antigen preparation (LORCA et al., 1993).

We have used immunoprecipitation and indirect haemagglutination techniques for 15 years (in 1350 adults and children with confirmed hydatidosis) with an overall sensitivity of 81,2 and 82,8% and an overall specificity of 96,4%. During recent years the ELISA technique has been standardized and resulted in a sensitivity of 91,7% and a specificity of 87,5% with sheep hydatid cyst fluid as antigen (VARGAS et al., 1995).

The fact that only 47 cases out of 85 with positive serology had positive chest X-rays or abdominal echography does not rule out extra-abdominal hydatidosis or even intra-abdominal hydatidosis with small cysts. Computer axial tomography with a chest X-ray applied to all those with positive serology and negative echography could be useful; however, these tests were not performed in our study due to economical constraints.
Since hydatidosis is an endemic parasitic disease in Chile, the problem of eradication has already been put forward (SERRA, ARAYA & ARANEDA, 1993). It is thought that the approach should involve the following two fundamental steps:

1) an educational and economical effort to strictly control the disposal of viscera from infected animals (intermediate hosts) so that they cannot be used as dog food. The municipal health authorities should therefore provide: a) the facilities for the destruction of infected offal, especially in rural areas; b) education of the people so that they stop feeding infected offal to their dogs. It is proposed to introduce «health education classes» in the basic school curriculum with the help of public and private institutions (SERRA, 1986; NEGHME, 1987; SCHENONE et al., 1987);

2) the implementation of programmes of dog treatment with praziquantel, as has been done in Southern regions of Chile (CAMPANO, 1985). Thanks to these programmes of the Agriculture and Cattle Service of the Ministry of Agriculture, echinococcosis in dogs has decreased from 71% in 1979 to 2% in 1994 in the XIlth Region, from 54% in 1981 to 6% in 1990 in the XIlth Region, and in the Xth Region from 55% in 1992 to 13% in 1994 (VIDAL, BONILLA & JERIA, 1992; SERRA et al., 1996).

It is felt that control and eradication programmes are urgently needed. Although the official average prevalence between 1961-1992 was 45 cases per 100000 inhabitants, the result of the present study has revealed that the occurrence is 540 per 100000. Taking into account the morbidity associated with human hydatidosis, the widespread infection of dogs and slaughtered animals, and the overall economic loss this disease causes, it is clear that a multidisciplinary approach is the only way to solve the problem.

ACKNOWLEDGEMENTS

The Echinococcosis/Hydatidosis Control programme in the VIIth Region of Chile was financed by Project No. IN 163031, ABOS, Belgium. We are also very grateful to the many last-year medical students and nursing and auxiliary staff from all over the country who have collaborated anonymously and without whose help this study would not have been possible.

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