PRESENCE OF DOMESTICATED CATS AND VISUAL IMPAIRMENT ASSOCIATED TO *Toxoplasma gondii* SERUM POSITIVE CHILDREN AT AN ELEMENTARY SCHOOL IN JATAIZINHO, STATE OF PARANÁ, BRAZIL

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Toxoplasmosis possess worldwide geographic distribution and high serological prevalence in human beings and animals. Acquired way is, in the majority of the times, light or asymptomatic however, in approximately 15% of the cases can be developed the ocular form. The aim of this study is to research the occurrence of IgG anti-*Toxoplasma gondii* antibodies in children at an elementary school in Jataizinho (PR) and relate some factors with the epidemiology of the toxoplasmosis. A total of 276 samples of blood by using indirect immunofluorescence (IFA) where 128 (46.4%) were detected positives. The analysis of the variables indicated that the presence of domestic cats in the household was an important factor associated to the infection by *T. gondii* (OR= 3.45; 1.61- 7.45) as well as to the children who described any kind of visual impairment (OR= 3.19; 1.11 – 9.35).

KEY WORDS: Toxoplasmosis, schoolchildren, epidemiology, risk factor, cats.

INTRODUCTION

Toxoplasmosis is a worldwide spread infection caused by *Toxoplasma gondii* protozoan, being the human being, other mammals and birds its intermediary hosts (LOPES et al., 2005). The infection in humans can occur by the ingestion of sporulated oocysts in contaminated water and food, by the ingestion of bradyzoites in raw or badly-cooked meat, by transplacental transmission by tachyzoites (ABREU et al., 2001). Also by blood transfusion and organ transplant, being the least important (HILL; DUBEY, 2002).

Toxoplasmosis can develop into a severe systemic illness when in its congenital form, in which the mother, when infected...
for the first time during pregnancy, can present a temporary parasitemy with focal lesions generated within the placenta, thereby infecting the fetus (DUBEY, 1977). Although congenital toxoplasmosis may be asymptomatic at birth, ocular problems may manifest later in life (MONTOYA; LIESENFELD, 2004).

According to Meenken et al. (1995), approximately 80% of children diagnosed with sub-clinical toxoplasmic infection present ocular sequel in some point in their lives. Lesions in the retina are the most frequent sequel, and they can be easily detected in ophthalmological examinations. These signs indicate that the neurological symptoms are possibly involved.

Information about congenital transmission of toxoplasmosis during pregnancy, post-birth or even in first childhood are fundamental for a ready intervention and for soothing the possible consequences of this infection.

In Córdoba, Argentina, a study determine the seroprevalence of toxoplasmosis in infant and young population (0 to 15 years) and the authors found 51.75% of positivity (CHIARETTA et al., 2003). The prevalence status of T. gondii infection in children of the Democratic Republic of Sao Tome and Principe, Western Africa was 21.49% (FAN et al., 2006).

In Rolândia, Paraná (PR) prevalence of 42% of positive serum for T. gondii was found at the urban zone while 43% at the rural one in schoolchildren in their first to fourth year of schooling (GIRALDI et al., 2001) when in Jaguapitá (PR), a prevalence of 44% was found in children and teenagers aged up to 15 years old (GARCIA et al., 1999). In students at High School in São Jerônimo da Serra (PR) the prevalence of positive serum for T. gondii was 50.4% (LOPES et al., 2005).

Due to gravity of the injuries caused for the T. gondii, the precocious diagnosis is important to apply the adequate intervention, mainly in the cases where the clinical symptoms and the serology results are not conclusive (NUSSENBLATT; BELFORT, 1994).

The aim of this study is to determinate the occurrence of IgG anti-T. gondii antibodies in children at an elementary school from the municipal system in Jataizinho (PR) and relate the associated factors with toxoplasmosis.

**MATERIAL AND METHODS**

**Population studied:** 276 blood samples were voluntarily collected from children between 4 and 11 years old at an elementary school in the municipal system of Jataizinho, Paraná, Brazil. Considering that the city possess, approximately, 2300 students on elementary school in the municipal system (IPARDES, 2007), to determinate the sample size was estimate a prevalence of 45%, with precision of 6% and 5% of significance level.

**Material collection:** The blood samples were collected by a professional nurse of Posto de Saúde Central from Jataizinho, using vacutainer® system, by venous puncture in each child. The material was kept at room temperature until coagula retraction. Serum was stored in sterile containers and kept at -20°C until its use.

**Epidemiological Questionnaire:** Factors associated with toxoplasmosis in the group studied were determined through the use of an epidemiological questionnaire to the parents of the children. The following variables were analyzed: gender, age group, school, contact with animals, presence of cats, whether the animal has access to vegetable gardens, habit of playing in sand, ingestion of raw/badly cooked meat, habit of washing food, presence of any eye problems.

**Exams performed:** For antibody anti-T. gondii research, sera samples were submitted to indirect immuno-fluorescence assay (IFA) (CAMARGO, 1964) being considered positive titers ≥ 16 and the reactions were observed in Epifluorescence microscope (LEICA), with increase of 400X.

**Statistical analysis:** The results obtained after the study of the variables were submitted to statistical analysis by chi-square test ($\chi^2$) corrected by Yates or Fisher Test, using Epis version 6.04 statistic program, adopting 95% confidence interval (CI) (DEAN et al., 1994).

**Ethics Committee:** The research was approved by the Ethics in Research Committee of the Hospital Universitário Regional do Norte do Paraná – Decision CEP 142/03.

**RESULTS AND DISCUSSION**

From the analyzed samples, 128 were positive (46.4%). Titer greater than 1024 accounted for 53.10%, the highest being of 16,384 found in three analyzed samples (2.35%) (Figure 1). Similar results were found in the city of Rolândia (PR) (45.4% - schoolchildren aged above ten years old in the urban zone) (GIRALDI et al., 2002) and in the city of Jaguapitá (PR) (44% - children aged 15 years old or younger) (GARCIA et al., 1999). A study released in Fortaleza (CE) showed that the seroprevalence according to age ranges was 40.0% (2 to 9 years) and 60.4% (10-19 years). T. gondii seroprevalence increased rapidly with age, suggesting that most of the primary infection is acquired during childhood (REY; RAMALHO, 1999).

The high titer for toxoplasmosis (higher than 1024 – 53.10%) suggest recent infection. These cases, specifically, need further studies including clinical analysis, seen that these children can present the sub clinical form of the infection and suffer later consequences.
The analysis of the variables indicated that the presence of domestic cats in the household was an important factor associated to the infection by *T. gondii* (OR = 3.45; 1.61 - 7.45) as well as to the children who described any kind of visual impairment (OR = 3.19; 1.11 - 9.35). Chiaretta et al. (2003) found that the coexistence with cats and/or dogs was defined as a risk factor to toxoplasmosis in infant and young children population (0 to 15 years) in Córdoba, Argentina. However, there were no statistically significant differences about residence, consumption water, consumption vegetables raw, ingestion of raw meat/badly cook, presence of vegetable gardens and irrigation of vegetable gardens.

The individuals who had a vegetable garden with any protection prohibiting the entrance of animals presented less chance of being infected (OR = 0.19; 0.04 - 0.82) as well as the children between zero and six years old (OR = 0.37; 0.17 - 0.80).

All students whose sera presented positive results for toxoplasmosis should be submitted to ophthalmologic exams due to the potential risk of developing ocular toxoplasmosis. These cases can be a result of acquired or vertical transmission. Control and prevention measures should be adopted in the city in order to decrease transmission and avoid most severe cases, mainly congenital toxoplasmosis.

**Acknowledgements**: The authors would like to thank the workers of the Posto de Saúde Central at the Municipality of Jataizinho in the state of Paraná, for their attention and constant collaboration.

**REFERENCES**


DUBEY, J.P. Toxoplasma, Hammondia, Besnoitia, Sarcocystis

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**Table 1. Results from Chi-square test (\(\chi^2\)) in relation to variables analysed to determine the associated factors for toxoplasmosis in schoolchildren at elementary school in the municipal system of Jataizinho, PR, 2004.**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Reagents (%)</th>
<th>No reagents (%)</th>
<th>p</th>
<th>(\chi^2)</th>
<th>OR(CI 95%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presence of domestic cat</td>
<td>yes</td>
<td>28 (60.9)</td>
<td>18 (39.1)</td>
<td>0.0008</td>
<td>11.11</td>
</tr>
<tr>
<td></td>
<td>no</td>
<td>37 (31.1)</td>
<td>82 (68.9)</td>
<td></td>
<td></td>
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<tr>
<td>Report any kind of visual impairment</td>
<td>yes</td>
<td>14 (63.9)</td>
<td>8 (36.4)</td>
<td>0.0285</td>
<td>4.79</td>
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<tr>
<td></td>
<td>no</td>
<td>34 (35.4)</td>
<td>62 (64.6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vegetable gardens with protection</td>
<td>yes</td>
<td>5 (20.0)</td>
<td>20 (80.0)</td>
<td>0.0218</td>
<td>5.25</td>
</tr>
<tr>
<td></td>
<td>no</td>
<td>12 (57.1)</td>
<td>9 (42.9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age group</td>
<td>0 - 6 years</td>
<td>13 (24.0)</td>
<td>41 (76.0)</td>
<td>0.094</td>
<td>6.73</td>
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<tr>
<td></td>
<td>&gt; 6 years</td>
<td>52 (46.4)</td>
<td>60 (53.6)</td>
<td></td>
<td></td>
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<tr>
<td>Residence</td>
<td>rural zone</td>
<td>0 (0.0)</td>
<td>2 (100.0)</td>
<td>0.6819</td>
<td>0.16</td>
</tr>
<tr>
<td></td>
<td>urbane zone</td>
<td>57 (39.6)</td>
<td>87 (60.4)</td>
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<td>Consumption water public</td>
<td>system</td>
<td>65 (39.9)</td>
<td>98 (60.1)</td>
<td>0.4206</td>
<td>0.64</td>
</tr>
<tr>
<td></td>
<td>well</td>
<td>0 (0.0)</td>
<td>3 (100.0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consumption vegetables raw</td>
<td>yes</td>
<td>57 (38.5)</td>
<td>91 (61.5)</td>
<td>0.8172</td>
<td>0.05</td>
</tr>
<tr>
<td></td>
<td>no</td>
<td>8 (44.4)</td>
<td>10 (55.6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ingestion of raw meat/badly cook</td>
<td>yes</td>
<td>2 (40.0)</td>
<td>3 (60.0)</td>
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<td>0.19</td>
</tr>
<tr>
<td></td>
<td>no</td>
<td>56 (39.4)</td>
<td>86 (60.3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Presence of vegetables gardens</td>
<td>yes</td>
<td>17 (37.0)</td>
<td>29 (63.0)</td>
<td>0.8514</td>
<td>0.03</td>
</tr>
<tr>
<td></td>
<td>no</td>
<td>46 (40.0)</td>
<td>69 (60.0)</td>
<td></td>
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<tr>
<td>Irrigation of vegetables gardens</td>
<td>public system</td>
<td>16 (38.1)</td>
<td>26 (61.9)</td>
<td>0.6851</td>
<td>0.16</td>
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<tr>
<td></td>
<td>river/stream</td>
<td>1 (50.0)</td>
<td>1 (50.0)</td>
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</tbody>
</table>

* Undefinited Odds Ratio
Domesticated cats associated to Toxoplasma gondii serum positive children at an elementary school in state of Paraná, Brazil


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