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Full Length Research Paper

Prevalence and risk factors associated with intestinal parasites in a rural community of central Mexico

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Inhabitants of a rural community in Mexico were analyzed for intestinal parasites, 34% of the 115 people studied were positive by Faust's technique; stream water was also analyzed for parasites, 4/7 sites were positive and these were located near the natural source of drinking water. A questionnaire with social, health and demographic variables was applied to heads of households in search of associations with intestinal parasites. Statistical significant data were having had parasites in the past, being less than 13 years of age and eating unwashed food. A dendogram of Euclidian distances showed two clades; one associated to protection and the other one to risk. Unfortunately, the prevalence of protozoa found in the present study has not changed from previous reports obtained in other rural communities of central Mexico. Our results suggest that health authorities should incorporate health education, anti-protozoa drugs and clean natural water sources as part of the control programs.

Key words: Community study, intestinal parasites, rural Mexico.

INTRODUCTION

Intestinal parasitic diseases remain a serious public health problem in many developing countries especially due to fecal contamination of water and food (Engels and Savioli, 2006; Quihui-Cota et al., 2004). More than 72 species of protozoa and helminth parasites can lodge in humans; most are considered food and water- borne zoonoses. In spite of this, water transmission has been documented only for *Cryptosporidium* sp, *Enterocytozoon bieneusi, Encephalitozoon intestinalis, Giardia lamblia, Toxoplasma gondii* and *Blastocystis* sp. (Slifko et al., 2000; Pozio, 2003; Leelayoova et al., 2004). Multiple socio-geographic and environmental factors determine the prevalence and intensity of a parasitic infection such as weather, that affects the time and intensity of outbreaks(Doligalska and Donskow, 2003; Si ski, 2003).

The present study was performed in 2005 in a commu-nity of 246 inhabitants located at the South-eastern border of the state of Morelos, Mexico, 18°34´54´´N, 98°56´48´´W with a temperature ranging between 28 - 32°C during the spring and summer and 20 - 26°C during autumn and winter; the rainy season begins in late May and ends in late September. The aim was determining the frequency of intestinal parasites in a sample of 47% of inhabitants and in seven samples of water taken during the rainy and the dry seasons from the natural water spring that is enclosed within a cement construction connected to a local water system and from the stream that crosses the whole community, where kids usually play. The spring is the source of drinking water. The purpose of this study was to determine the variables that support the occurrence of parasites in the population and in the natural water source. For this a dendogram of Euclidian

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Table 1. Prevalence (%) of intestinal parasites in fecal samples obtained in 3 nearby rural communities.

Species	2005[a]	2000[b]	1988[c]
Helminths			
Ascaris lumbricoides	0	0.7	8.3
Hymenolepis nana	2.6	4.8	5.0
Trichuris trichura	0	0	2.5
Enterobius vermicularis	0	0	1.1
Taenia sp.	0	0	0.3
Protozoa			
Entamoeba coli	20.8	26.9	23.9
Iodamoeba butschlii	0.9	3.1	17.2
Endolimax nana	1.7	23.1	9.3
Giardia lamblia	6.9	10.0	5.4
Entamoeba histolytica/dispar	1.7	12.8	4.2
Chilomastix mesnili	1.7	1.4	1.9
Enteromona hominis	0	0.3	0

a-Present study, b-Ramos et al., 2005, c-Sarti et al., 1992.

distances allows visualizing the relationship between variables.

RESULTS AND DISCUSSION

The population consisted of 246 individuals distributed in 77 families identified by a questionnaire, of which 32% (79) were less than 15 years of age. Stool samples were provided by 115 people; 34% of these (39) had intestinal parasites and although people of most ages were infected, 44% (17) were 15 or less. Stream water was also analyzed for parasites, 4/7 sites were positive and these were located near the natural source of drinking water. Table 1 summarizes frequencies of the parasites identified in fecal samples. Regarding water sampling, out of 7 collection sites along the stream, in 4 parasites were identified only during the dry season: site 1: *Escherichia coli*; site 4: *E. histolytica*/*E. dispar*; site 5: *E. coli, Giardia lamblia* and *Acanthamoeba* sp; site 7: *Ascaris* sp. Figure 1 shows a map of the community with households having positive cases and contaminated sites along the stream.

Statistical analysis performed to all variables by ^{2} test showed three with significant association to intestinal parasites a) to be under 13 years old, p=0.016 (OR = 2.72, 95% CI = 1.084 - 6.826); b) to eat unwashed food, p = 0.03 (OR = 8.22, 95% CI = 0.762 - 96.71); c) to have had parasites sometime during life, p = 0.026 (OR = 0.32, 95% CI = 0.116 - 0.875). The confidence interval indicates that a) and b) are risk factor while c) is a protector factor. To support this observation a dendogram was elaborated (Figure 2) that includes the 3 significant and the 3 non significant variables (referred in the dendogram).

Interestingly, two clades were obtained; one with two branches that were associated to protection and the other one, with 4 branches, associated to risk. The fact that the only significant variable associated to protection against parasites was having been parasitized sometime during their life, can be explained because people referred that when they identified macroscopic parasites (helminthes) in faeces, or have gastrointestinal malaise, they go to their health center and request anti-parasitic treatment. The grouping of variables in the dendogram allows visualizing the relationship between factors associated to risk or to protection, in spite of not having the same individual weight, which can be seen in the odd ratio values obtained.

The frequencies of parasites found in 1988 (Sarti et al., 1992) and in 2000 (Ramos et al., 2005) in communities close to the one of this study are also shown in Table 1. As it can be seen geohelminthes decreased in our study, only *Hymenolepis nana* was found. The decrease can be explained because of the National Deworming Campaign, established in Mexico since 1993 up to date, in which one dose of albendazole is given to each schoolchild twice a year. This treatment has no effect on protozoa and cestodes, such as *Hymenolepis*, therefore their frequency has remained.

Clusters were found in a study performed in urban Mexico (Cifuentes et al., 2004) and in the present study. Both show grouping of infected children or adults and sites of contaminated water. This information points to the need of control programs in natural water sources not only in big cities but also in rural communities. Furthermore, niches of intestinal parasites in water and school children, suggests that the community has outdoor fecalism, which also needs to be controlled.

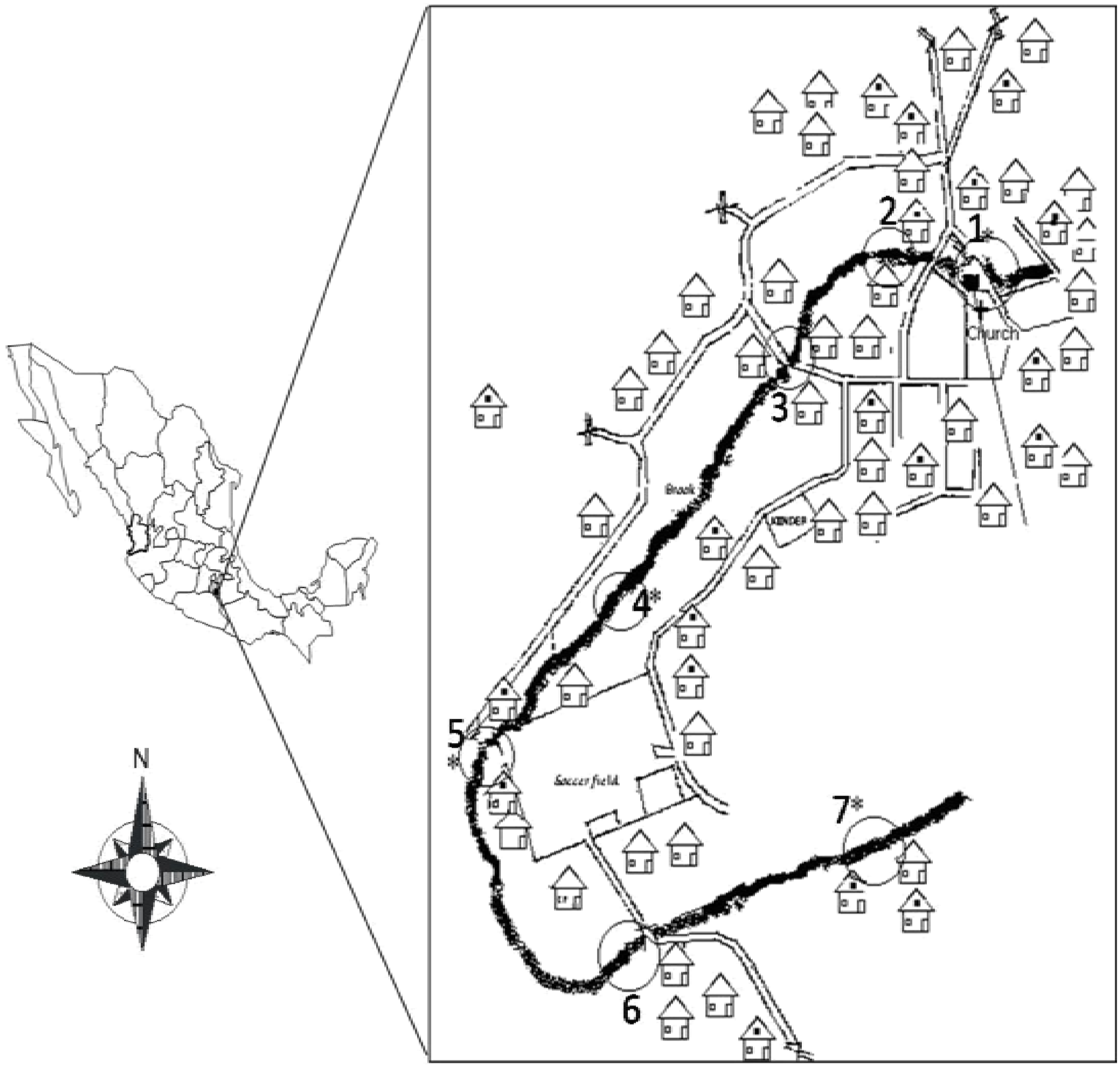

Figure 1. Map of the community showing the distribution of houses, streets, church, soccer field and the stream that crosses the community and flows from the cement construction towards the soccer field. Circles and numbers indicate the sampling sites of the stream. The households marked and circles marked * indicate sites where parasites were found. A research protocol was elaborated and approved by the Ethics and Research Committees at the Hospital General "Dr. Manuel Gea Gonzalez" in Mexico City. Permission to perform the study was obtained from the local authorities. A socio-demographic census was obtained and with the support of the local clinician, every family was interviewed and provided informed consent to perform coprological studies. One stool sample from each person and three 50 ml water samples, collected at seven locations, avoiding strong flushes and puddles, near the stream where children play, were analyzed. Stools and water samples were contained in sterile plastic tubes, were sent to laboratory and were kept refrigerated for one week. Faust technique, following the procedures described by Maya et al. (2006) which demonstrate that helminth eggs can be detected in water, was used. During the second visit to the community, in the rainy season (August), water samples from the same collection sites near the stream were obtained. Data collected during the study were analyzed using *STATISTICA 5.5* (StatSoft, Inc. Tulsa, OK, USA).

Because the impact of parasitic infections may extend far beyond visible human disease into the spheres of chronic non-perceived unwellness or socio-economic losses and missed development opportunities (Engels and Savioli, 2006) and supported by the results obtained in this study, we consider that the health authorities should

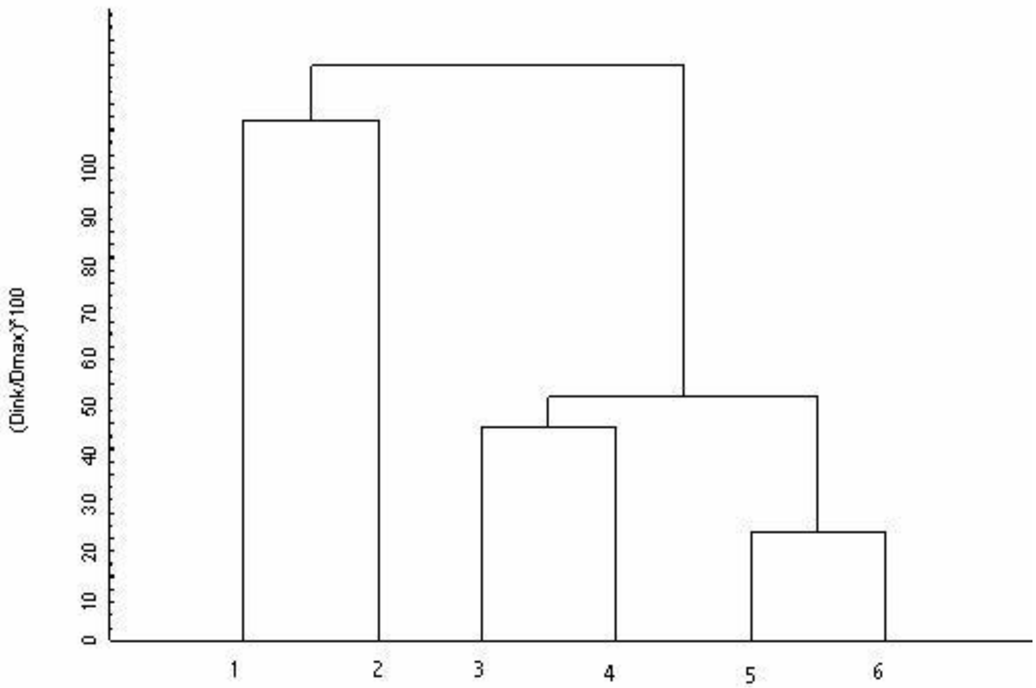

Figure 2. Dendongram of Euclidean distances in order to cluster the main variables studied was constructed by STATA 7 (StataCorp, LP. TX, USA): Numbers in the branches indicate: 1) To have had parasites sometime during life, 2) To drink boiled water, 3) To eat unwashed food, 4) To eat unwashed fruit, 5) To live close to the streamand 6) To be under 13 years of age.

incorporate in their control programs aspects of health education, anti-protozoa drugs and control of natural water sources.

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