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# PREVALENCE OF INTESTINAL PARASITIC INFECTION IN FIVE FARMS IN HOLAMBRA, SÃO PAULO, BRAZIL

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## SUMMARY

A parasitological survey was carried out on 222 inhabitants of five farms in Holambra, located 30 km north of Campinas, São Paulo, Brazil, on October 1992. Approximately 70% of the inhabitants were found to be infected with at least one species of intestinal parasite. The positive rates of 6 helminths and 7 protozoan species detected are as follows: 5.4% *Ascaris lumbricoides*; 8.6% *Trichuris trichiura*; 19.8% *Necator americanus*; 10.4% *Strongyloides stercoralis*; 1.4% *Enterobius vermicularis*; 0.9% *Hymenolepis nana*; 3.2% *Entamoeba histolytica*; 2.7% *E. hartmanni*; 9.9% *E. coli*; 14.0% *Endolimax nana*; 2.3% *Iodamoeba butschlii*; 10.4% *Giardia lamblia*; 37.8% *Blastocystis hominis*. The positive rates of helminth infection were generaly higher in the younger-group under 16 years-old than those in the elder group aged 16 or more, whereas the infection rates of protozoan species were higher in the elder group. The infection rate of *Strongyloides* was found to be 10.4% by a newly developed sensitive method (an agarplate culture methods).

**KEYWORDS**: Parasitic infection; Epidemiology; Prevalence; Brazil.

## INTRODUCTION

In Brazil, various parasitic diseases are still generally considered to be highly prevalent. However, this huge country consists of both highly developed and underdeveloped areas. The parasitic spectrum and its prevalence, therefore, varies widely in different areas due to such factors as differences in climatic, socio-economical, educational and environmental sanitation conditions in each area. There is thus a need for a survey to obtain basic information on parasitological conditions in given areas.

Campinas City, which lies about 120 km north from São Paulo City, is one of the cities in the state of São Paulo. The estimated population in 1992 was more than 1 million and the socioeconomic situation is consistently one of the highest in the country. On the other hand, there are many low-income urban communities around the City and the inhabitants of such communities are generally considered to be highly infected with parasites. However, there has been no exact information on the prevalence of parasitic infection in areas around Campinas City.

The present study was carried out to determine the

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current status of intestinal parasitic infections in five farms in Holambra, a neighboring area of Campinas City.

## MATERIAL AND METHODS

A total of 222 inhabitants from five farms in Holambra, which is located 30 km north of Campinas City, were subjects in the present study. Their age, sex and some sanitary conditions are represented in Table 1.

Stool examination were performed on the stool specimens collected within 3 hours after defecation in the morning. Stool samples were placed in a cooler box, kept at about 20°C and transported to a laboratory. All stool samples were examined by an ordinary formalin-ether concentration method which effectively detects helminth eggs and cysts of protozoa [11,12]. In order to detect hookworm and *Strongyloides* infection, two different methods for faecal culture were applied. One of the methods is a Harada-Mori filter paper culture using a 4 x 16 cm polyethylene bag [5,6] and the other is a newly developed agar-plate culture [1]. In the latter culture method, a faecal mass of about 3 g was placed on the center of a primary agar-plate in a petri dish and incubated at 28°C for 3 days. Then, the surface of the agar-plate was examined under a dissection microscope to find motile larvae. The larvae detected were killed in Lugol's iodine solution and species of the larval parasites were identified morphologically by using a microscope. The faecal cultures were performed within the same day of stool sampling to avoid death of larvae during storage.

Statistical difference was analyzed using the $X^2$ (chi-square) test.

## RESULTS

As shown in Table 1, the inhabitants of all farms examined were drinking treated water and all toilets in three farms (Farms C, D and E) were flushable. The overall distribution of flush toilets was about 70% in the five farms. Other sanitary conditions and the health awareness of the inhabitants were also generally good in the farms.

**TABLE 1**

Sex and distribution, environmental characteristics of five farms

| Farms | A | B | C | D | E | Total |
|---|---|---|---|---|---|---|
| Sex | | | | | | |
| Male | 33 | 13 | 30 | 27 | 13 | 116 |
| Female | 23 | 12 | 33 | 18 | 20 | 106 |
| Age distribution | | | | | | |
| 0-5 | 3 | | 7 | 1 | 3 | 14 |
| 6-10 | 10 | 5 | 11 | 4 | 4 | 34 |
| 11-15 | 10 | 5 | 9 | 7 | 3 | 34 |
| 16-20 | 3 | 5 | 5 | 11 | 4 | 28 |
| 21-25 | 3 | 3 | 6 | 7 | 3 | 22 |
| 26-30 | 7 | 2 | 5 | 8 | 5 | 27 |
| 31-35 | 7 | | 6 | 1 | 1 | 15 |
| 36-40 | 3 | 3 | 5 | | 5 | 26 |
| 41-45 | 3 | | 3 | | 1 | 7 |
| 46-50 | 4 | 1 | 2 | 4 | 2 | 13 |
| 51-55 | | 1 | | 1 | 1 | 3 |
| 56-60 | | | 1 | | | 1 |
| 60- | 3 | | 3 | 1 | 1 | 8 |
| Total | 56 | 25 | 63 | 45 | 33 | 222 |
| Drinking water | | | | | | |
| treatment | 100% | 100% | 100% | 100% | 100% | 100% |
| non-treatment | 0% | 0% | 0% | 0% | 0% | 0% |
| Toilet | | | | | | |
| flush | 0% | 44% | 100% | 100% | 100% | 69% |
| hole | 100% | 56% | 0% | 0% | 0% | 31% |

**TABLE 2**

Infection rates of intestinal parasite among the inhabitants of five farms

| Farms | A | B | C | D | E | Total |
|---|---|---|---|---|---|---|
| Total number of stools examined | 56 | 25 | 63 | 45 | 33 | 222 |
| Number of cases positive for parasitic infections | 43 (76.8) | 21 (84.0) | 36 (57.1) | 30 (66.7) | 23 (69.7) | 153 (68.9) |
| Number of cases positive for helminth infections | 23 (41.1) | 15 (60.0) | 10 (15.9) | 21 (46.7) | 4 (12.1) | 74 (33.3) |
| Number of cases positive for ptotozoan infections | 33 (58.9) | 14 (56.0) | 30 (47.6) | 18 (40.0) | 20 (60.6) | 115 (51.8) |

(%): positive rate

The prevalence of intestinal parasites among the inhabitants is summarized in Table 2. Approximately 70% of them had at least one parasitic infection. Infections were most prevalent among the inhabitants of Farm B, showing that as high as 84% of them were harboring a parasite. The infection rate of helminth species was lower than that of protozoan species. The prevalence was also highest in Farm B for helminth species, but the highest prevalence rate of protozoan parasites was observed in Farm E where the positive rate of helminth infection was lowest. As to protozoan parasites, there was no significant difference in the prevalence rate among the five farms. The prevalence rates of each helminth species are shown in Table 3 by two age groups: less than 16 years old and 16 years old or more. There was no significant difference in infection rates of helminths between the two age groups. *Necator americanus* infection showed the highest

**TABLE 3**

Prevalence of helminth infection among inhabitants of five farms

| Farms | A | B | C | D | E | Total |
|---|---|---|---|---|---|---|
| **less than 16 years-old:** | | | | | | |
| Number of stools examined | 23 | 10 | 27 | 12 | 10 | 82 |
| Number of positive case for helminths infections | 11 (47.8) | 8 (80.0) | 7 (25.9) | 5 (41.7) | 1 (10.0) | 32 (39.0) |
| *Ascaris lumbricoides* | | 4 (40.0) | 3 (11.1) | 2 (16.7) | | 9 (11.0) |
| *Trichuris trichiura* | 8 (34.8) | 1 (10.0) | 4 (14.8) | 1 (8.3) | | 14 (17.1) |
| *Necator americanus* | 7 (30.4) | 6 (60.0) | 1 (3.7) | 1 (8.3) | 1 (10.0) | 16 (19.5) |
| *Strongyloides stercoralis* | 2 (8.7) | 6 (60.0) | | 2 (16.7) | | 10 (12.2) |
| *Hymenolepis nana* | | | | | | 0 (0.0) |
| *Enterobius vermicularis* | | 1 (10.0) | 2 (7.4) | | | 3 (3.7) |
| **16 years-old or more:** | | | | | | |
| Number of stools axamined | 33 | 15 | 36 | 33 | 23 | 140 |
| Number of positive case for helminths infections | 13 (39.4) | 7 (46.7) | 3 (8.3) | 16 (48.5) | 3 (13.0) | 42 (30.0) |
| *Ascaris lumbricoides* | | 1 (6.7) | 1 (2.8) | 1 (3.0) | | 3 (2.1) |
| *Trichuris trichiura* | 2 (6.1) | | | 2 (6.1) | 1 (4.3) | 5 (3.6) |
| *Necator americanus* | 10 (30.3) | 4 (26.7) | 3 (8.3) | 11 (33.3) | | 28 (20.0) |
| *Strongyloides stercoralis* | 5 (15.2) | 1 (6.7) | | 6 (18.2) | 2 (8.7) | 14 (10.0) |
| *Hymenolepis nana* | | 1 (6.7) | | 1 (3.0) | | 2 (1.4) |
| *Enterobius vermicularis* | | | | | | 0 (0.0) |

(%): positive rate

prevalence (19.8%), which was followed by *Strongyloides stercoralis* infection (10.4%), *Trichuris trichiura* infection (8.6%) and *Ascaris lumbricoides* infection (5.4%). Infections with *Eeterobius vermicularis* and *Hymenolepis nana* were rarely detected among the inhabitants. The infection rates of these helminths were generally higher in the younger age group, although there was no significant difference in detection of hookworm infection between the two age groups. In the elder group, the rate of *N. americanus* infection was significantly higher than those of *A. lumbricoides* and *T. trichiura* infections, whereas there was no significant difference in infection rates of these helminths in the younger group.

Table 4 shows the prevalence rates of protozoan infections. The infection rate was also not significantly different between the two age groups for protozoan infection. *Blastocystis hominis* infection (37.8%) was the most prevalent protozoan infection among 7 species detected. *Endolimax nana* and *Giardia lamblia* infections also showed a relatively high prevalence rate of over 10%. Although the difference in detection rate of these protozoan parasites was not so remarkable, generally higher infection rates were observed in the elder group, by contrast with the results of helminth infections. *Entamoeba histolytica* infection was detected with relatively high rates of 6.7% and 9.1% in the elder group of Farms A and B. On the other hand, *G. lamblia* infection was more frequent in the younger group, showing the highest rate of 30% in Farms B.

## DISCUSSION

There was no recent report available on the prevalence of parasitic infection in the Campinas area. When the present data was compared to that of previous reports in other areas in the state of São Paulo, our study revealed a relatively low prevalence of *Ascaris* and *Trichuris* infections [3, 4, 10]. It seems that one of the factors which caused the decrease of these infections may be environmental improvement in these farms

**TABLE 4**

Prevalence of protozoan infection among inhabitants of five farms

| Farms | A | B | C | D | E | Total |
|---|---|---|---|---|---|---|
| **less than 16 years-old:** | | | | | | |
| Number of stools examined | 23 | 10 | 27 | 12 | 10 | 82 |
| Number of positive case for protozoan infections | 14 (60.9) | 6 (60.0) | 8 (29.3) | 3 (25.0) | 5 (50.0) | 36 (43.9) |
| *Entamoeba histolytica* | 1 (4.3) | | | | | 1 (1.2) |
| *Entamoeba hartmanni* | | | 1 (3.7) | | | 1 (1.2) |
| *Entamoeba coli* | 3 (13.0) | 3 (30.0) | 1 (3.7) | | 2 (20.0) | 9 (11.0) |
| *Endolimax nana* | 5 (21.7) | 1 (10.0) | 1 (3.7) | 1 (8.3) | 1 (10.0) | 9 (11.0) |
| *Iodamoeba butschlii* | 2 (8.7) | | | | | 2 (2.4) |
| *Giardia lamblia* | 2 (8.7) | 3 (30.0) | 3 (11.1) | 1 (8.3) | 1 (10.0) | 10 (12.2) |
| *Blastocystis hominis* | 10 (43.5) | 2 (20.0) | 8 (29.6) | 2 (16.7) | 3 (30.0) | 25 (30.5) |
| **16 years-old or more:** | | | | | | |
| Number of stools examined | 33 | 15 | 36 | 33 | 23 | 140 |
| Number of positive case for protozoan infections | 19 (57.5) | 8 (53.3) | 22 (61.1) | 15 (45.5) | 15 (65.2) | 79 (56.4) |
| *Entamoeba histolytica* | 3 (9.1) | 1 (6.7) | | | 2 (8.7) | 6 (4.3) |
| *Entamoeba hartimanni* | 1 (3.0) | 2 (13.3) | 1 (2.8) | | 1 (4.3) | 5 (3.6) |
| *Entamoeba coli* | 5 (15.2) | 2 (13.3) | 3 (8.3) | 1 (3.0) | 2 (8.7) | 13 (9.3) |
| *Endolimax nana* | 4 (12.1) | 2 (13.3) | 6 (16.7) | 7 (21.1) | 3 (13.0) | 22 (15.7) |
| *Iodamoeba butschlii* | 1 (3.0) | | 1 (2.8) | 1 (3.0) | | 3 (2.1) |
| *Giardia lamblia* | 2 (6.1) | 1 (6.7) | 7 (19.4) | 3 (9.1) | | 13 (9.3) |
| *Blastocystis hominis* | 14 (42.4) | 6 (40.0) | 18 (50.0) | 10 (30.0) | 11 (47.8) | 59 (42.1) |

(%): positive rate

because the inhabitants of the farms are drinking treated water and the majority of them are using flush toilets. Soil-transmitted parasitic infections are known to decrease under such sanitary conditions.

On the other hand, hookworm infection and strongyloidiasis were more frequent in the present study than those in the previous studies. This may be due to the fact that the subjects, who were farmers and their families, had a greater chance of contact with infested soil, because these parasitic infections occur by skin penetration by infective larvae. In Japan, where almost all parasitic infections were completely eradicated many years ago, the rapid reduction in the prevalence of *Ascaris* and *Trichuris* infections was followed by a decrease in the number of hookworm infections. It was indicated that the reduction in the prevalence of *Ascaris* and *Trichuris* infection was attributed to the improvement of sanitary condition and then that the decrease of hookworm infection might be accelerated by the subsequent agricultural changes [2, 7].

In Brazil, both species of hookworm, *N. americanus* and *Ancylostoma duodenale*, are known to distribute [9]. Therefore, identification of larvae detected by the culture method was performed morphologically. *A. duodenale* infection, however, could not be confirmed in the present study.

In the case of *Strogyloides* infection, employment of a new sensitive method, an agar-plate culture, might also contribute to the high positivity of *Strongyloides* infection in the present study. The method was proved to be extremely sensitive in the detection of *Strongyloides* infection in a survey in Okinawa, Japan; the positive rates were 0% by direct faecal smear, 0.3% by Harada-Mori faecal culture and 4.5% by agar-plate culture, when stool samples were examined simultaneously by the three different methods [1]. Similarly, when three different methods were applied in the present study, only 16.7% and 20.8% of the strongyloidiasis cases were diagnosed by the formalin-ether concentration method and Harada-Mori culture methods, respectively. The diagnostic efficacy, however, was about 95% by agar-plate culture, showing that more than 70% of the cases were detected only by agar-plate culture (data not shown).

The higher prevalence rate of helminth infection in the younger age group indicates that helminthic infections are currently prevalent in these farms.

The positive rates of protozoan parasites were generally higher than those of helminth infections. The high positivity, however, seemed to be due to the high prevalence rate of *B. hominis* infection which was detected in 37% of the inhabitants. *B. hominis* is known to have pathogenic potential immunocompromised hosts, suggesting that the parasite constitutes an important medical and health problem, as well as *E. histolytica* and *G. lamblia* which also have pathogenic potential in healthy hosts. The prevalence rates of other intestinal protozoa were almost the same as those in previous reports [3, 4, 8, 10]. In a similar survey in which infection rates of intestinal parasites in two social groups in São Paulo were compared, MARZOCHI & CARVALHEIRO [8] reported that soil-transmitted helminth infections were consistently lower among the inhabitants living in relatively high socioeconomic areas, whereas positive rates of protozoan parasites were contrarily higher among then. They suspected that the habit of eating raw fresh vegetables in the high social group might be the cause of the high prevalence of the protozoan infections. The results indicated that protozoan infections often prevail due to existing sanitary conditions.

The present study revealed that the inhabitants of rural areas near Campinas City may still be affected by many parasitic infections. A more comprehensive study to evaluate factors which contribute to the prevalence of soil-transmitted parasites is necessary in these areas.

## RESUMO

### Prevalência de enteroparasitoses em cinco fazendas de Holambra-SP, Brasil

Uma pesquisa coproparasitológica foi realizada em 222 habitantes de cinco fazendas de Holambra, localizada a 30 km ao norte de Campinas, SP, Brasil, em outubro de 1992. Aproximadamente 70% dos habitantes apresentaram pelo menos um tipo de parasitose intestinal. O índice de positividade das 6 espécies de helmintos e de 7 protozoários na população foi o seguinte: *Ascaris lumbricoides* (5,4%); *Trichuris trichiura* (8,6%); *Necator americanus* (19,8%); *Strongyloides stercoralis* (10,4%); *Enterobius vermiculares* (1,4%); *Hymenolepis nana* (0,9%); *Entamoeba histolytica* (3,2%); *E. hartmanni* (2,7%); *E. coli* (9,9%); *Endolimax nana* (14,0%); *Iodamoeba butschlii* (2,3%); *Giardia lamblia* (10,4%); *Blastocystis hominis* (37,4%). O índice de positividade para infecção por helmitos foi

aparentemente maior na população mais jovem (menores de 16 anos) do que no grupo de população com idades acima de 16 anos, ao contrário do índice de infecção pelos protozoários que foi mais elevado na população adulta. Utilizando um novo e sensível método através de cultura em ágar, encontrou-se um índice de infecção de 10.4% para *Strongyloides sp.*

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