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## *Blastocystis hominis* among food vendors in Xochimilco markets

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**ABSTRACT.** *Blastocystis hominis* is a pathogenic protozoon that lives in the human bowel and causes diarrhea: the mode of transmission is a passive one, through the ingestion of stool-contaminated water or foods that contain infective forms of the parasite. The purpose of this study is to report the prevalence of *Blastocystis hominis* among food vendors in the markets within the Xochimilco jurisdiction, Mexico City, Mexico. A cross-sectional study was conducted in which food vendors answered an epidemiological questionnaire and underwent a serial stool culture. The frequency of the intestinal parasitoses reported was estimated and an analysis was carried out associating the presence of *Blastocystis hominis* with socio-economic and hygienic factors using the odds ratio at a 95% confidence interval. The frequency of intestinal parasites and commensals was 50.4%; *Blastocystis hominis* was found in 48 (41.7%) food vendors. The risk analysis showed that *Blastocystis hominis* was associated with: male gender, poor personal hygiene habits, personal history of parasitosis, and family history of parasitosis. The prevalence reported is high when compared with other populations studied. The relevance of this report lies on the fact that food vendors handle foods and could transmit the infection to consumers.

**Key words:** *Blastocystis hominis*, prevalence of *B. hominis*, protozoosis.

**RESUMEN.** *Blastocystis hominis* es un protozoario habitante del intestino humano, causa diarrea y manifestaciones gastrointestinales. El objetivo de este estudio es informar la prevalencia de *Blastocystis hominis* en comerciantes de alimentos de mercados establecidos en la delegación de Xochimilco, Distrito Federal, México. Se realizó un estudio transversal, a los comerciantes de alimentos se les aplicó un cuestionario epidemiológico y se les practicó un estudio coprológico seriado. Se calculó la prevalencia de *Blastocystis hominis* y su asociación con algunos factores utilizando la razón de momios para la prevalencia a un nivel de significancia del 95%. La prevalencia de parásitos y comensales intestinales fue de 50.4%; *Blastocystis hominis* se encontró en 48 (41.7%) de los comerciantes. El análisis de riesgo mostró que *Blastocystis hominis* se asocia con: sexo masculino, deficientes hábitos de higiene personal, antecedente de haber tenido parásitos y el antecedente de tener un familiar que hubiese padecido de parásitos. La prevalencia encontrada es alta, con respecto a otras poblaciones estudiadas. La importancia de este informe radica en el hecho de que los comerciantes manipulan alimentos y podrían transmitir la infección a los consumidores.

**Palabras clave:** *Blastocystis hominis*, prevalencia de *B. hominis*, protozoosis.

### INTRODUCTION

*Blastocystis hominis* is the causal agent of blastocystosis, an intestinal parasitosis with a growing prevalence in different regions of the world. The Panamerican Health Organization recognizes *B. hominis* as an intestinal parasite that causes diarrhea and gastrointestinal manifestations: abdominal pain, vomit and flatulence.<sup>1,2</sup> Its pathogenicity is controversial; however, molecular biology studies show the presence of at least two morphologically identical populations with a different pathogenic capability.<sup>3,4</sup> Pathogenicity is due to circumstances that lead to an imbalance in the host-parasite relation or to the coexistence of another parasite in the bowel.<sup>5,6</sup>

Research in developed countries indicates that the frequency of *B. hominis* ranges between 1.6% and 16%, while in some developing countries it may be as high as 60%.<sup>7-10</sup> Studies on the frequency of *B. hominis* are rather few in Mexico: one of them was conducted by Álvarez et al.,<sup>11</sup> who found a frequency of 7.1% among children with diarrhea treated at the National Institute of Pediatrics. The scant information on the frequency of *B. hominis* among open populations and on the possible factors associated with this infection led the authors of this paper to communicate the results of a parasitologic survey carried out among food vendors in markets of a suburb of Mexico City. The major purpose was to determine the prevalence of intestinal parasites among food-handlers, with special emphasis on *Taenia solium*.

### MATERIAL AND METHODS

The research was conducted during the month of June 2000, and included 115 food vendors who sold: chicken, beef (“*barbacoa*”) and pork (“*carnitas*”) meat, fish and

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shellfish, fruits and vegetables, at eleven markets in the political jurisdiction of Xochimilco in Mexico City, Mexico; in the villages of San Andrés Ahuayucan, San Gregorio Atlapulco, San Luis Tlaxialtemalco, San Mateo Xalpa, Santa Cecilia Tepetlapa, Santa Cruz Alcapixca, Santa María Nativitas, Santiago Tepalcatlalpan, Tulyehualco and downtown Xochimilco. The people studied had worked as food vendors at the vending site where they were interviewed for six months or more and accepted to participate by signing an informed consent letter describing the purpose of the research.

Each vendor was interviewed and answered a questionnaire aimed at identifying the factors associated with the presence of stool parasites, such as: socio-economic indicators, personal hygiene practices, hygienic status of their housing and their work place. Once interviewed, they received a plastic container and were instructed on how to obtain three serial stool samples. As soon as they delivered the samples at the appropriate Health Center, samples were processed using the centrifugation and sedimentation technique with formol-ether, suggested by Ritchie,<sup>12</sup> the preparations were seen under the light microscope in 40x and 100x fields.

Using the Epi Info software, version 6.04,<sup>13</sup> the frequency of the parasites reported was calculated, together with the frequency of each of the variables studied. The odds ratio (OR) with a confidence interval of 95%, and the Mantel-Haenszel X test were used to make the associative analysis between the presence of *B. hominis* as a single infection or its absence (no intestinal parasites) and the studied factors, considering the latter as dichotomous variables, which means that they were either positive or negative, present or absent, and of good or poor quality.<sup>14</sup>

## RESULTS

Median age of the 115 food vendors was 41 years; gender distribution was as follows: 79 (68.7%) were females and 36 (31.3%) were males. Schooling level was: 7 (6.1%) could not read or write; 59 (51.3%) had completed elementary school; 20 (17.4%) middle school; 15 (13.0%) high school or equivalent, and 14 (12.2%) had a college or a technical degree. The households of food vendors had: electrical power, 111 (96.5%); tap water, 111 (96.5%); and sewage, 102 (88.7%); those who did not have sewage reported using a latrine or defecating on the ground. The frequency of households with soil floor was 4.3% and the frequency of overcrowding was 35.7% (more than two people per bedroom). As to water use, 72 (62.6%) vendors drank boiled water or purified bottled water and 43 (37.4%) drank non-boiled tap water. The hand-washing habit before meals and after using the toilet was reported by 112

(97.4%) of the surveyed vendors. When asked if they had ever had parasites, either because they had seen them directly, like "worms" (*Ascaris* sp.) or "tapeworms" (*Taenia* sp.), or as a result of a medical diagnosis, 31 of the vendors (27.0%) reported a history of parasites. They were also asked whether any of their relatives living in the same household had ever had parasites and the answer was that 16 (13.9%) vendors had a relative with a history of parasites. With respect to the conditions of the vending site, 22 (19.1%) of the sites had no electrical power; 33 (28.7%) had no running water, 34 (29.6%) had no sewage system and 32 (27.8%) of the sites had soil floor.

The stool culture found that 58 (50.4%) had parasites or commensals. *B. hominis* was identified in 48 individuals, which represents a frequency of 41.7%, and was followed by two commensals: *Entamoeba coli*, found in 17 (14.8%) and *Endolimax nana* in 10 (8.7%). Other species were found at a lower frequency (Table 1).

As single infection, *B. hominis* was reported in 29 (60.4%) samples; together with another species it was found as follows: with *E. coli* in 7 (14.6%), with *E. nana* in 4 (8.3%), with *Iodamoeba bütschlii* in 2 (4.2%) and with *Entamoeba histolytica* in 1 (2.1%); and with two other species, as follows: with *E. coli* and *E. nana* in 4 (8.3%) samples, and with *E. coli* and *Giardia duodenalis* in one (2.1%) sample.

The following factors were associated with the vendors positive for *B. hominis* or without parasitosis: male gender, low schooling, no hand-washing before meals and after going to the toilet, personal history of intestinal parasitosis, family history of parasitosis, and eating what they sell. However, none of the odds ratios found was statistically significant (Table 2).

**Table 1.** Frequency of intestinal parasites found in the stools of 115 food vendors in Xochimilco markets.

Parasites	Frequency	%
Helminths:		
<i>Strongyloides stercoralis</i>	1	1.0
<i>Hymenolepis nana</i>	1	1.0
Protozoa:		
<i>Entamoeba histolytica</i>	1	1.0
<i>Giardia duodenalis</i>	1	1.0
<i>Blastocystis hominis</i>	48	41.7
Commensals:		
<i>Chilomastix mesnili</i>	1	1.0
<i>Iodamoeba bütschlii</i>	3	2.6
<i>Endolimax nana</i>	10	8.7
<i>Entamoeba coli</i>	17	14.8

**Table 2.** Factors associated with the presence of *Blastocystis hominis* among food vendors in Xochimilco markets.

Factors	<i>Blastocystis hominis</i>				OR	IC <sub>95%</sub>	p*
	positive (n=48)		negative (n=57)				
	N	%	n	%			
Gender							
Male	19	39.6	16	28.1	1.68	0.7-4.1	0.21
Female	29	60.4	41	72.9	-	-	-
Schooling							
low <sup>a</sup>	38	79.2	41	72.9	1.48	0.6-4.0	0.39
high <sup>b</sup>	10	20.8	16	28.1	-	-	-
Housing conditions							
poor <sup>c</sup>	5	10.4	10	17.5	0.55	0.2-1.9	0.30
good <sup>d</sup>	43	89.6	47	82.5	-	-	-
Overcrowding <sup>e</sup>							
Yes	18	37.5	22	38.6	0.95	0.4-2.3	0.90
No	30	62.5	35	61.4	-	-	-
Defecation on the ground							
Yes	4	8.3	7	12.3	0.65	0.2-2.7	0.51
No	44	91.7	50	87.7	-	-	-
Water consumed							
tap water or non-boiled water	14	29.2	24	42.1	0.57	0.2-1.4	0.17
boiled or purified	24	70.8	33	57.9	-	-	-
Hand washing <sup>f</sup>							
No	1	2.1	1	1.8	1.19	0-45.0	0.90
Yes	47	97.9	56	98.2	-	-	-
Personal history of intestinal parasites							
Present	14	29.2	11	19.3	1.72	0.6-4.7	0.23
Absent	34	70.8	46	80.7	-	-	-
Family history of intestinal parasites							
Present	8	16.6	5	8.8	2.08	0.6-8.0	0.22
Absent	40	83.4	52	91.2	-	-	-
Status of the vending site							
poor <sup>c</sup>	10	20.8	21	36.8	0.45	0.2-1.2	0.07
good <sup>d</sup>	38	79.2	36	63.2	-	-	-
Eats from what he (she) sells							
Yes	36	75.0	40	70.2	1.27	0.5-3.3	0.58
No	12	25.0	17	29.8	-	-	-

\* Obtained using the Mantel-Haenszel X Test

<sup>a</sup> Cannot read and write or completed middle school

<sup>b</sup> High school, bachelor's degree or graduate studies

<sup>c</sup> Lack a utility (water, sewage or electric power) or have soil floor

<sup>d</sup> Have all utilities and do not have soil floor

<sup>e</sup> More than two people per bedroom

<sup>f</sup> Before meals and after going to the toilet

## DISCUSSION

The prevalence of *B. hominis* (41.7%) among food vendors found in this study was similar to the figures reported by research conducted in other Latin American countries, where it ranges between 35% and 62%.<sup>8-10</sup> Despite the fact that these studies used a different methodol-

ogy, they coincide in considering *B. hominis* as one of the most frequent species. Reports on this parasite are rather rare in our country, since it is not routinely reported in stool cultures, probably because it is considered as a commensal microorganism. However, the evidence of pathogenicity suggested by several studies worldwide turns it into a new intestinal pathogen. Animal studies report that

the presence of *B. hominis* causes cytopathologic changes in the tissues; moreover, the local cytopathogenic effect of the vacuolar forms of *Blastocystis* has been observed in mice after intramuscular inoculation, which causes an intense inflammatory response.<sup>15-17</sup>

Among the factors associated with this infection, *B. hominis* has been reported more frequently among females.<sup>5</sup> This study found that *Blastocystis* is associated with males, but not significantly (probably due to the sample size), as did the study by Devera et al. conducted in adult patients.<sup>10</sup> Moreover, *B. hominis* has been associated with adult age.<sup>18,19</sup> This study found that more cases of *B. hominis* are found among people ages 56-65. Another factor studied was the association of *B. hominis* with other commensal species (*E. nana* and *E. coli*),<sup>18</sup> as this paper showed too, which reinforces the hypothesis of fecal transmission,<sup>20,21</sup> with the possibility of water and foodstuffs as possible protective vehicles of transmission of this protozoan's cysts, as Rajah et al. observed.<sup>22</sup> The latter found an association between the ingestion of non-boiled water and *B. hominis*, while our study did not find an association with non-boiled water, probably because some vendors answered untruthfully thinking that it was the right answer; the same thing may have occurred with the hand-washing variable. Contrary to this, the factor of history of intestinal parasites seems to be a good indicator to detect individuals infected by *Blastocystis*.

The factors and the population studied (given the frequency of the parasite) may provide us with an opportunity for further research work. It is also important to continue studying this type of populations because food handlers represent an epidemiologically important group for the dissemination of intestinal parasitoses, since most of the latter are transmitted through the fecal route.

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