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Hospital food handlers in Niterói, RJ, Brazil: intestinal parasitism

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SUMMARY. A survey for intestinal parasites was carried out with food handlers from two private and three public hospitals in Niterói City, RJ, Brazil. The aim of this research was to verify the enteroparasites prevalence in this professional group. The investigation was divided in two phases. The first phase consisted of interviews with the participants; coproparasitological exams using Lutz, Faust et al. and Baermann techniques; under fingernail material analysis, using Mello et al. modified method; and educational lectures to food handlers. In the second phase, coproparasitological exams were repeated. Positive results were observed in 14.2% (17/120) and 17.1% (12/70) of the individuals in the first and second phases respectively. The most frequent parasite was *Entamoeba coli*, detected in 48.5% (16/33) of the samples with positive results. Under fingernail residues were observed in 19.2% (23/120) of the food handlers. *E. coli* cysts were found in one fingernail residue, likewise they were detected in the feces of the same food handler. Such data showed a potential transmission risk of intestinal parasites by food handling, indicating the need of adopting a diagnosis/orientation procedure as a bi-annual routine activity in hospitals, in order to improve the food service quality and population health condition.
Key words: Intestinal parasite, food handler and fingernail material.

RESUMEN. Manipuladores de alimentos de hospitales de Niterói, RJ, Brasil: parasitismo intestinal. Fueron estudiados manipuladores de alimentos de dos hospitales particulares y tres públicos del Ayuntamiento de Niterói, RJ, Brasil, con el objetivo de verificar el predominio de enteroparásitos. Esta investigación fue desarrollada en dos etapas. En la primera se realizó una entrevista; exámenes coproparasitológicos a través de las técnicas de Lutz, Faust et al. y Baermann; análisis del material subungueal por el método de Mello et al. Modificado y fueron ofrecidas charlas educativas a los manipuladores. En la segunda etapa, fueron repetidos los exámenes coproparasitológicos. Se observó parásitos en 14,2% (17/120) y 17,1% (12/70) de las muestras fecales, respectivamente en la primera y la segunda etapas. El parásito más frecuente fue *Entamoeba coli*, evidenciado en 48,5% (16/33) de las muestras positivas. En 19,2% (23/120) de los manipuladores fue observado la presencia de residuo subungueal, siendo evidenciados quistes de *E. coli* en una muestra, igualmente encontrados en las deposiciones de este portador. Este dato demostró el alto potencial de contaminación de alimentos a través del manipulador. Esto sugiere la necesidad de tornar el procedimiento diagnóstico/orientación como una actividad de rutina semestral obligatoria dentro de los hospitales, encaminado a mejorar la calidad de los servicios prestados y las condiciones de salud de la población.
Palabras clave: Parásito intestinal, manipulador de alimento y material subungueal.

INTRODUCTION

At the moment, Brazil is living a period of epidemiological transition. A gradual increase of chronic-degenerative diseases has been observed in its population, but simultaneously there is a high prevalence of infectious diseases caused by parasites in most cities of the country (1). For this reason researches on intestinal parasites are of great importance to the ethiological identification and the necessary information for treatment and infection control (2).

The intestinal parasitic transmission usually occurs due to a passive oral mechanism of cysts and eggs ingestion, mainly through water, food or hands contaminated by human faecal residues (3). Some intestinal parasites, after contaminating the human cutaneous surfaces or being eliminated in the environment, are in condition to infect another carrier or determine external self-infection (4).

Food handling is relevant to epidemiological study of intestinal parasites considering that parasitic structures of human faeces can contaminate food directly in the planting area, or by handling. There is a potential transmission risk of intestinal parasites by food handling, indicating the importance of hygienic procedures to prevent other individuals' infection. Hospitalized patients, eventually in immunodeficiency condition just after a surgical procedure and/or recovering from transplantation, may present a greater susceptibility to enteroparasitic infection (5), justifying the importance of a proper food handling in the hospital environment.

The aim of this study was to verify, by coproparasitological diagnosis and under fingernail material analysis, the prevalence of intestinal parasites in food handlers of hospitals, as well as to treat these professionals and give them some health orientation. Furthermore, this study should improve, not only the performance of Food Service Units, but also the health of the food handlers themselves.

METHODS AND MATERIAL

A survey for intestinal parasitic prevalence was carried out with 140 food handlers, volunteers from five hospitals in Niterói City, Rio de Janeiro State, Brazil: two private hospitals (A and B) and three governmental institutions (C, D and E). This study included different professional categories such as nutritionists, serving maids, cookers and auxiliaries, without considering differences in sex or age. The Ethical Research Committee from the University Teaching Hospital "Antonio Pedro", in its Medical Science Center (CEP, CCM/HUAP n.43/01), approved this project in June 20, 2001.

The survey was divided in two phases. During the first phase, three stool samples were collected from each individual in three separate days, using 25g containers. Two containers had Railliet & Henry (6) preservative solution, being the feces processed by Faust et al. (7) and Lutz (8) methods. One container was used to collect fresh samples, being processed by Baermann (9) method and, if diarrheas, by direct exam for detecting possible intestinal protozoan trophozoites. Material under the workers' fingernails was processed by Mello et al. (10) method, modified by Lourenço, Uchôa & Bastos (11).

Personal interviews were held with the workers to obtain personal data and information about sanitary conditions and sewage system in their houses. The Nutrition/Production section chief also reported information about its work environment and daily service routine. Lectures, including group discussions, were given and the workers also received pamphlets explaining proper food handling, general hygiene and health care.

A proper treatment was indicated and specific drugs were given to each individual who presented positive results to pathogenic agents. Metronidazol and Albendazol were respectively the drugs used for protozoa and nemathelminthe infection. Two weeks after the worker reported the treatment completion, his coproparasitological exam was repeated to verify the therapeutic effectiveness.

The second phase, which included new food handlers that did not participate before, started four months after the first phase was over. All previous information was reviewed and coproparasitological exams were repeated. The under fingernail material was analyzed again, however only for employees that presented positive results in the latest coproparasitological exams. The same treatment procedure was adopted in this phase.

To evaluate the significance of the results, the statistical analysis included: arithmetic average, standard deviation, minimum value, maximum value and frequency distribution. The non-parametric "chi-square" test (X^2) and Fisher's exact test (Fisher) were used for variable association. The 5% probability significance level ($p < 0.05$) was applied according to Rodrigues (12).

RESULTS

The employees' participation rate (Table 1) reached 65.2% (120/184) and 56.9% (90/158) in the first and second phases respectively, being irrelevant the reduction observed ($p > 0.05$). There was no significant difference of participation rate between private and public hospitals ($p > 0.05$). In the first phase, 120 workers were examined. In the second, 70 workers had the exams repeated and 20 new participants were also examined. A total of 140 workers participated in the study, though factors as discharge, shifts, or holiday periods caused variation in the number of handlers between the two phases.

TABLE 1
Food handlers participation rate during 1st and 2nd phases of the study in private and public hospitals of Niterói, RJ, Brazil: intestinal parasitism

Hospital		1st Phase Number of Workers	1st Phase Participating in the study (%)	2nd Phase Number of workers	2nd Phase Participating in the study (%)
Private	*A*	53	32 (60.4)	53	27 (50.9)
	B	12	11 (91.6)	8	8 (100)
	Total	65	43 (66.2)	61	35 (57.4)
Public	*C*	27	19 (70.4)	27	19 (70.4)
	D	48	31 (64.6)	48	24 (50.0)
	E	44	27 (61.4)	22	12 (54.5)
	Total	119	77 (64.7)	97	55 (56.7)
Total		184	120 (65.2)	158	90 (56.9)

Note: A and B = private hospitals; C, D and E = public hospitals
Between the phases: $X^2 = 2.1085$; $p = 0.1465$
Between private and public hospitals: $X^2 = 0.0009$; $p = 0.9758$

The employees' age (Table 2) varied between 20 and 65 years (average + standard deviation, 36.5 + 9.63 years), being 75.7% women. Most of the workers (79.3%) were living in urban regions, with adequate sanitation and sewage system (Table 3). And 30.8% (43/140) reported an unsatisfactory frequency in taking coproparasitological exams (Table 4).

TABLE 2
Frequency according to sex and age of 140 food handlers of the study in hospitals of Niterói, RJ, Brazil: intestinal parasitism

Sex	Age 20 to 30	31 to 40	41 to 50	51 to 65	Total (%)
Male	17	14	1	2	34 (24.3)
Female	23	40	35	8	106 (75.7)
Total	40	54	36	10	140 (100)

(Average ± standard deviation, 36.5 ± 9.63 years).

TABLE 3

Distribution of coproparasitological exam results according to basic sanitary conditions of hospital food handlers' residences in Niterói, RJ, Brazil: intestinal parasitism

Results	Basic sanitary condition of their home places				
	There is only sewerage (%)	There is only water-works (%)	There is none (%)	There are both (%)	Total (100 %)
Positive	4 (14.8)	3 (11.1)	1 (3.7)	19 (70.3)	27
Negative	8 (7.0)	11 (9.7)	2 (1.7)	92 (81.4)	113
Total	12 (8.6)	14 (10.0)	3 (2.1)	111 (79.3)	140

Note: cesspools were considered without sewerage; wells and/or water tank tracks were considered without water-works.

In the first and second phases, positive results were observed in 14.2% (17/120) and 17.1% (12/70) of the individuals respectively (Table 5), being irrelevant the increase observed ($p > 0.05$). Considering only the group of 70 food handlers that participated in both study phases, there was no significant difference of intestinal parasites prevalence ($p > 0.05$). The difference observed in the positive results between private and public hospitals was no significant in both study phases ($p > 0.05$). The 20 handlers added in the second phase, including new hired and senior employees, had their exams observed apart.

TABLE 4

Frequency in taking coproparasitological exams, concerning 140 food handlers from hospitals of Niterói, RJ, Brazil: intestinal parasitism

Frequency of coproparasitological exams		Results			
		Positive (%)	Negative (%)	Total (%)	
Satisfactory	At least once a year	8 (29.6)	42 (37.1)	50 (35.7)	97 (69.2)
	Within a time between 1 to 5 years	7 (25.9)	40 (35.3)	47 (33.6)	
Unsatisfactory	Within a time between 5 to 10 years	5 (18.5)	13 (11.5)	18 (12.9)	43 (30.8)
	For more than 10 years; only in childhood or never	7 (25.9)	18 (15.9)	25 (17.9)	
	Total (100%)	27	113		140

TABLE 5

Results of food handlers' coproparasitological exams during the two phases of the study in private and public hospitals of Niterói, RJ, Brazil: intestinal parasitism

Hospital		1st phase Food-handlers			2nd phase Food-handlers		
		Positive (%)	Negative (%)	Total (100%)	Positive (%)	Negative (%)	Total (100%)
private	*A*	3 (9.4)	29 (90.6)	32	3 (14.3)	18 (85.7)	21
	B	2 (18.2)	9 (81.8)	11	1 (16.7)	5 (83.3)	6
	total	5 (11.6)	38 (88.4)	43	4 (14.8)	23 (85.2)	27
public	*C*	4 (21.1)	15 (78.9)	19	1 (6.7)	14 (93.3)	15
	D	4 (12.9)	27 (87.1)	31	3 (17.6)	14 (82.4)	17
	E	4 (14.8)	23 (85.2)	27	4 (36.4)	7 (63.6)	11
	total	12 (15.6)	65 (84.4)	77	8 (18.6)	35 (81.4)	43
Total		17 (14.2)	103 (85.8)	120	12 (17.1)	58 (82.9)	70

Note: A and B = private hospitals; C, D and E = public hospitals

Between the phases: $X^2 = 0.1164$; $p = 0.733$ Between private and public hospitals: $X^2 = 0.2453$; $p = 0.6204$

E. coli was the most frequent parasite, detected in 48.5% (16/33) of the samples with positive results (Table 6). It was followed by Endolimax nana and E. histolytica, detected respectively in 24.2% (8/33) and 18.2% (6/33). Polyparasitism was detected in 3 samples (3/17) in the first phase (17.6 %) and in 2 samples (2/16) in the second phase (12.5%). Among 33 positive feces samples, 12 cases needed parasitic treatment. The effectiveness of treatment could be confirmed in 100% (12/12) of the cases.

TABLE 6
Parasite species found in 33 positive feces samples of 140 food handlers from hospitals of Niterói, RJ, Brazil: intestinal parasitism

Parasite species	Number of parasite detections	
	Total (%)	% In 33 positive feces samples
Entamoeba coli	16 (11.4)	48.5
Endolimax nana	8 (5.7)	24.2
Entamoeba histolytica	6 (4.3)	18.2
Giardia lamblia	4 (2.9)	12.1
Blastocystis hominis	4 (2.9)	12.1
Ascaris lumbricoides	1 (0.7)	3.0
Trchuris trichiura	1 (0.7)	3.0
Ancilostomídeo	1 (0.7)	3.0

Note: no excluding data

Under fingernail residue was observed in 19.2% (23/120) of the handlers (Table 7) and was found most frequently in male workers ($p < 0.05$). The association between under fingernail residue presence and positive coproparasitological results was significant ($p < 0.05$). E. coli cysts were detected in one of the 23 under fingernail samples, likewise they were found in the feces of the same handler.

TABLE 7
Analysis of under fingernail residue according to sex and coproparasitological exams of 120 food handlers from hospitals of Niterói, RJ, Brazil: intestinal parasitism

Under fingernail residue	Sex		Coproparasitological Exams		Total (%)
	Female	Male	Positive	Negative	
Absent (%)	78 (86.7)	19 (63.3)	10 (58.8)	87 (84.5)	97 (80.8)
Present (%)	12 (13.3)	11 (36.7)	7 (41.2)	16 (15.5)	23 (19.2)
Total (100%)	90	30	17	103	120

Sex variable: $X^2 = 6.4724$; $p = 0.01096$
Coproparasitological Exams: Fisher, $p = 0.02063$; Odds Ratio = 3.75; 95 % Confidence Interval = [1.0499; 12.9245].

DISCUSSION

The positive results rate in the food handlers' exams can be considered small if compared to the results of 62.1% in Arias et al. (3) and of 47.1% in Costa Cruz, Cardoso & Marques (13). However, the intestinal parasitic infection in hospital food handlers should not exist, considering the kind of work that such professionals perform and the usual immunodeficiency of people they attend. During the second phase of study, new parasitic cases were found in employees that were not infected in the first phase. Individuals who had completed the treatment after the diagnosis in the first phase had recurrent infections and there was an alternation of ethiological infection agents in these workers between the two phases. Such data denoted a high level of parasitic exchange in the environment those workers live and/or mistakes in basic procedures for controlling oral-fecal transmission of intestinal parasites.

Costa Cruz, Cardoso & Marques (13) have also noticed in the State of Minas Gerais elementary schools, a high frequency of single parasites in relation to carriers with two or more species. Arias et al. (3), studying hospital food handlers in Chile, reported a high frequency of *E. nana* (46.6%), followed by *E. coli* (41.2%) and Entamoeba histolytica (12.1%). Also examining food handlers in Chile, Reyes; Olea & Hernandes (14) and Dall'Orso et al. (15) detected E. coli as the most frequent parasite, being present respectively in 25.2% (27/110) and 59.3% (100/169) of the stool samples.

Most of the examined individuals lived on the outskirts of Niterói City or in small towns nearby. Many times they reported a close family relationship among workers of different hospitals. This homogeneity among employees from the five hospitals can possibly justify the irrelevant relation between enteroparasites presence and the fact of samples being from private or public institutions. However, Nutrition/Production sections of the five hospitals differed in their service routine and work environment; and one private hospital presented less satisfactory conditions than the public institutions.

The low level of parasitic infections observed in the present study can be explained by the existence of basic sanitary conditions and sewage system in the majority of the employees' residences. During the time between the first and second phases, a sewage system was built in one worker's house. This handler presented positive results only in his first exams what coincided with the period without a system in his house. Ludwig et al. (16) reported a decrease in enteroparasites in Assis, São Paulo State, between 1990 and 1992, the same period of the public sewage system expansion in that region.

The amount of under fingernail residue found in the group was small probably because the material was collected during the work routine and during only one day. Despite showing the service reality, the collect procedure might have con-

cealed hygienic nails caring mistakes due to tasks performed by the worker before the collecting moment, as activities with water, that were not considered. Therefore, it would be more advisable to collect the fingernail material in different days and also in different hours, if possible. Although increasing the volunteer participation, to collect the under fingernail residue by scraping instead of cutting the nails, as it had been suggested by Mello et al. (10), might have made some difference in the small amount of material collected.

The ingestion of parasitic cysts and/or eggs can occurs through contaminated hands (3) and there is usually a direct relation between the presence of enteroparasites under the fingernails and mistakes concerning personal hygiene at the defection moment. So the association between under fingernail residue presence and positive coproparasitological results suggests that incorrect hygienic practices with fingernails may have increased the probability of intestinal parasitic infection in food handlers group. Cases of hand contamination by the food itself or by sanitary elements such as faucets, toilet handles or cords, toilet seats or doorknobs are seldom met (17). The low number of positive feces samples in this study may have interfered with the probable evidence of enteroparasites in the under fingernail material, making the observation of just one positive result extremely relevant. The presence of E. coli cysts in under fingernail material, although being a not pathogenic agent, indicated human feces contamination and showed the potential transmission risk of intestinal parasites by food handling.

Goulart et al. (18) and Mello et al. (10) examined under fingernail residue from elementary school students and they found infecting forms of amoebideous, *Giardia lamblia, Trichuris trichiura* and *Ascaris lumbricoides*. Guilheme et al. (19) examined 49 vegetables producers in Maringá, Paraná State, and found 3 positive results for E. coli. Similarly Lourenço; Uchoa & Bastos (11), by observing under fingernail material from food handlers in Niterói hospitals, found 2 samples (5.4%) with positive results for E. histolytica among 37 samples examined and also detected correspondence in the coproparasitological results.

Torres et al. (20 and 21) did not consider expressive the role of food handlers in *E. histolytica* and *G. lamblia* transmission when they evaluated the presence of such pathogens in servant-maids and day-care children in São Paulo City, Brazil. However, Jonnalagadda & Bhat (22) evidenced enteroparasites eggs and cysts in the food handlers' hand washing water, and on vegetables. As the water was previously free of these agents, that study emphasizes the relevance of handling as a mean of intestinal parasites transmission and the importance of a proper orientation to professionals, especially those who deal with food that is not going to be cooked after handling. The higher frequency of under fingernail residue in male workers can suggest the necessity of a specific orientation to this group.

The Brazilian Ministry of Health - MS (23) stands medical and laboratorial exams as an obligation for all workers in the feeding area. However, 17.9% (25/140) of the professionals interviewed during the study informed they had taken coproparasitological exams approximately ten years ago or when they were little children or that they had never been examined before, even though they have been working as food handlers for many years. This information indicates the need of a specific law on the subject to rule and control workers' exams, considering that health condition of individuals working with food production exerts a direct influence on food quality (24).

In São Paulo State, Brazil, there is an obligation of yearly coproparasitological exams for food handlers (25), based on NR-7 (Regulation Norm) of Ministry of Labor - MT (26). The City Sanitary Code of São Paulo defines a six-month revision time for exams (27). The results of the present study confirm the necessity of bi-annual exams, once workers' infection or re-infection happened in a period of four months. Periodical exams for human carriers' diagnosis are essential to prevent oral-faecal transmission of intestinal parasites (28). Besides becoming a proper treatment possible, the parasitic diagnosis can minimize the non-symptomatic carriers, which largely increase transmission possibilities.

Continuous training under proper food handling techniques, an educational orientation about specific tasks and an alert to the professionals' responsibilities can bring changes in attitude and become an infection control procedure (29 and 24). Nevertheless, only in hospitals A and E the workers had received frequent training or orientations about handling practices, food process, general hygiene and health. The food handlers who were included only in the second phase of this study reported that the orientation lectures they had, made them much more interested in participating. This fact denotes that even being a single procedure, the educative action has done some good to alert the workers to the subject importance.

According to the observations, it seems necessary to enforce standard service procedures to be followed by all hospitals in order to improve food handlers' health and the quality of food service, regardless of being a private or a governmental institution. The results also indicated the necessity of a specific rule in relation to periodic lectures and classes to handlers about satisfactory food handling, with the objective of teaching theory and correct practices of hygienic care of hands and fingernails.

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