Original Article

INTESTINAL PARASITISM AND RELATED RISK FACTORS FOR PRIMARY SCHOOL STUDENTS IN THE MUNCIPALITY OF JOÃO PESSOA, NORTHEAST BRAZIL

PARASITISMO INTESTINAL E FATORES DE RISCO RELACIONADOS ENTRE OS ESCOLARES DO ENSINO FUNDAMENTAL I E II NA CIDADE DE JOÃO PESSOA, NORDESTE DO BRASIL

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ABSTRACT: The goal of the present study was to determine both prevalence and risk factors associated with intestinal parasitism in school students. A cross-sectional study was conducted in a single primary school located in João Pessoa, from February to August in 2016. The students were selected from the age group of 5-16 years. Of the school total of 341 students, 150 fecal specimens (from participants) were collected and were evaluated by three methods: Hoffman, Pons, and Janer (HPJ); Rugai; and the Paratest® Kit. A questionnaire concerning socio-demographic, environmental and behavioral variables was also applied. A logistic regression model was used to explain the occurrence of intestinal parasitism and the associated risk factors. The prevalence was 38.7% of students, with positive samples being more prevalent in the male students (47.0%). The most common parasite was *Giardia lamblia* 13 (14.8%), followed by *Entamoeba histolytica/dispar* 8 (9%), *Enterobius vermicularis* 5 (5.7%), *Strongyloides stercolaris* 2 (2.3%), *Ascaris lumbricoides* 2 (2.3%) and *Trichuris trichiura* 2 (2.3%). Among the enterocommensals, the most frequent was *Endolimax nana* 36 (40.9%) followed by *Entamoeba coli* 20 (22.7%). The variables that presented statistical significance (p-value<0.05)) together with the Odds Ratio (OR) were: gender (female) (OR=2.4; 95% CI, 0.19-0.98), family allowance participant (yes) (OR=4.4; 95% CI, 1.84-10.66), number of rooms in the residence (OR=3.5; 95% CI, 1.13-10.64), family nucleus (OR=7.0; 95% CI, 1.46-12.43), fruit and vegeTable hygiene (OR=2.0; 95% CI, 1.23-3.36), use of anthelmintic (OR= 0.02; 95% CI, 0.001-0.30) and detection of worms (OR=25.0; 95% CI, 20.6-30.10). Diseases caused by protozoa were more prevalent. The analyzed risk factors demonstrate that disease transmission happens through differing routes. Thus, appropriate health intervention strategies should be implemented to reduce the burden of intestinal parasites for school students and their families.

KEYWORDS: Students. Parasitic Diseases. Nutritional Status. Prevalence. Basic Sanitation.

INTRODUCTION

Intestinal parasites are a major public health problem, and since they correspond to a group of diseases that predominantly affect the poorest and most vulnerable populations, they are considered as neglected diseases or as neglected tropical diseases (PEREIRA et al, 2010; AGUIAR-SANTOS et al, 2013).

According to the World Health Organization – WHO (2009), a great many people are parasitized by helminths and protozoa worldwide. Roughly speaking, 1.450 billion individuals are affected by *Ascaris lumbricoides*, 1.300 billion by hookworm, 1.050 billion by *Trichuris trichiura*, and around 200 million are parasitized by *Giardia lamblia.*

In Latin America, studies show that 20% to 30% of the population is infected with some type of enteroparasite (BISCEGLI et al, 2009). In Brazil, estimates suggest that 55.3% of students present enteroparasite infections, chiefly in the northeastern regions (VASCONCELOS et al, 2011).

School students constitute an at risk group for intestinal parasitic infections. In addition to age, other factors are relevant to transmission dynamics, such as conditions of inadequate hygiene, immunity, daily living interaction density (personal contacts), soil contact, and lack of both basic sanitation and health education (MATHEWOS et al, 2014; KATTULA et al, 2014).

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Diarrhea, anemia, colitis, malnutrition, interference in cognitive and physical development, psychosocial changes and even death are among the symptoms. Such complications may affect attention spans and school performance, hampering both learning and the nutritional development of the child. Though deaths from parasitic infections are rare, morbidity negatively effects socioeconomic development (VIEIRA et al, 2010; MBUH, NEMBU, 2013).

The problem of intestinal parasitic diseases in Brazil is even more serious since unfortunately there is no comprehensive and efficient health education policy (GELATTI et al, 2013). Associations between entero-parasitoses and nutritional and socioeconomic profiles in school students are of great interest to public health.

Thus, the objective of this study was to determine the prevalence and risk factors associated with intestinal parasitic diseases in elementary and Junior High school students.

MATERIAL AND METHODS

Research design and location

This cross-sectional study was conducted in a single primary school located in the city of João Pessoa, from February to August of 2016. João Pessoa is the capital of the state of Paraíba, in the Northeast region of Brazil. With 801,718 inhabitants, it is the eighth most populous city in the Northeast and the 23rd most populous city of Brazil.

Data collection occurred at the Lions Tambaú Elementary School, which is a public school in the municipal network that provides elementary school education through junior high. The school is located in the "University City" neighborhood, well-populated and diversified. Stool analyses were performed at the Laboratory of Parasitology, in the Department of Pharmaceutical Sciences, of the Health Sciences Center at Paraíba Federal University.

Population and sample

The school population consisted of 341 students (including adolescents) enrolled from February to August 2016. The samples analyzed were obtained with approval of the parents/responsible parties to participate in the research. Of the 341 students enrolled, 150 accepted participation in the research. The study included students enrolled at the school of both genders and from 5 and 16 years old. Students refusing participation in the study, or being outside of the ages of from 5 to 16 years were not included, with a loss of 191 (56%) of the study population.

Recruitment and data collection

Initially, to prepare a calendar for research activities respecting the hours of the institution, a visit to the school was made. On the occasion, a lecture was scheduled for the parents and responsible parties who received a verbal explanation and an informational pamphlet concerning the research. Those who agreed were included by signing an Informed Consent Form and/or Assent Form.

After the lecture, the parents or responsible parties responded to a questionnaire assessing the social, economic, and demographic conditions of the family in which the student(s) was inserted. The questionnaire included questions related to: income, socio-demographic data, housing conditions, alimentary conditions, and evaluation of the child. Paratest® kits were provided by the company *Dk diagnostics*, and stool and collection vials, duly identified by name, were delivered to the parents or responsible parties.

The feces were sent to the Parasitology Laboratory. They were evaluated using three methods: Method of Hoffman, Pons and Janer (HPJ); Rugai, and the Paratest® Kit. HPJ is a spontaneous sedimentation method that detects morphological protozoan and helminth phases in the feces. The Rugai method is a qualitative method that allows investigating helminth larvae in the feces, chiefly *S. stercolaris*. Paratest® is parasitological test kit developed in Brazil, using a method of spontaneous sedimentation.

The anthropometric evaluation determined the students' nutritional status using weight and height measures. For the nutritional evaluation, the body mass index (BMI) was calculated, which evaluates for age and according to gender. The indicators were expressed as a "z" score defined by WHO 2007. The BMI/I were classified according to the z score values as seen in Table 1.

After performing the parasitological exams, the parents/responsible parties received the results. For positive cases, the researchers instructed the parties to seek the nearest Basic Health Unit for correct treatment according to the entero-parasitosis diagnosed.

Table 1. Nutritional status classification of the children for BMI by age, according to SISVAN recommendations

Score z	Nutritional Diagnosis
$z \leq -2$	Underweight
$-2 < z \leq +1$	Eutrophy (Normal)
$+1 < z \leq +2$	Overweight
$+2 \leq z$	Obesity

Source: WHO, 2007

Statistical analysis

Initially, the data was typed into an Excel 2013 database, categorized, and then analyzed using R statistical software (The R Project for Statistical Computing, version 3.3.1). In the bivariate analysis, Pearson's Chi-square test (χ^2) or the Fisher's exact test were used according to suitability. To explain the joint effect of the independent variables on the dependent variable, whether the student was parasitized or not, the Logistic Regression Model (LRM) was used.

Cavalcante et al (2010), suggest that the LRM model has the ability to establish dependency between a single binary response variable and a set of independent variables. This allows aiding the decision-making process in the proposed outcome. In logistic regression, a series of graphs, adjustment tests, and other measures help to assure the validity of the model. Among them, we highlight the Hosmer-Lemeshow Test and the Odds Ratio, which were used in this study (along with the other tests required) to construct the model. The inclusion criterion for the variables in this logistic model was association with socioeconomic characteristics and reproductive aspects in the bivariate analysis at $p < 0.20$. In the model itself, association was considered at $p < 0.05$. This was set with the purpose of identifying which variables best explain the child being parasitized, while permitting a decision making process that might explain entero-parasitoses occurrence probabilities in João Pessoa municipality school students.

Ethical considerations

The research was approved by the Research Ethics Committee of the Health Sciences Center of UFPB under Protocol # 1.222.756 following all ethical recommendations of Resolution 466/12, which concerns research involving human beings.

RESULTS

Of the 150 participants evaluated, 58 (38.7%) had positive parasitological stool examinations; 92 (61.3%) were negative.

Concerning parasite distribution, of the 58 positive samples, 36 (62.0%) were mono-parasitism, 15 (25.9%) were bi-parasitism, and 7 (12.1%) were poly-parasitism, with 10 (17.2%) positive for helminths, and 50 (86.2%) being positive for protozoa, showing bi or poly-parasitism. Regarding species distribution, the most frequent parasite was *Giardia lamblia* 13 (14.8%), followed by *Entamoeba histolytica/dispar* 8 (9%), *Enterobius vermicularis* 5 (5.7%), *Strongyloides stercolaris* 2 (2.3%), *Ascaris lumbricoides* 2 (2.3%) and *Trichuris trichiura* 2 (2.3%). Among the entero-commensals, the most frequent was *Endolimax nana* 36 (40.9%) followed by *Entamoeba coli* 20 (22.7%).

Table 2 shows the demographic characteristics of the participating students. The distribution of the 150 students studied was 83 (55.3%) male and 67 (44.7%) female. Among those with a positive result, 39 (47%) were male and 19 (28.4%) were female. Analysis of the students' gender, yielded a statistically significant difference between the dependent and independent variable (p= 0.030). In addition, the other variables, such as: family nucleus, number of rooms in the residence, formal education of family head, family income, Family Allowance Program recipient, and household sanitation type, also presented a statistically significant associations for the studied students, as seen in Table 2.

Table 3 presents variables related to the home environment, such as hygiene and health of the students. The variables presenting statistically significant associations with the presence, or absence of the parasite were washing of fruits and vegetables (p= 0.048) (p= 0.104), washing hands before meals (p= 0.035), walking barefoot (p= 0.037) and use of anthelminthics (p= 0.184).

Table 2. Socio-demographic characteristics of students (n=150) from a Primary School in the municipality of João Pessoa – PB, Brazil, 2016 (p-value<0.20)

Variable	Parasitized Students (%)	Non-parasitized students (%)	Total (%)	p-value
Gender				0.030
Male	39 (47.0)	44 (53.0)	83 (100)	
Female	19 (28.4)	48 (71.6)	67 (100)	
Family Nucleus				0.032
≤ 3	9 (23.1)	30 (76.9)	39 (100)	
≥ 4	49 (44.1)	62 (55.9)	111 (100)	
Number of rooms in				0.191
residence	19 (48.7)	20 (51.3)	39 (100)	
≤ 3	39 (35.1)	72 (64.9)	111 (100)	
≥ 4				
Head of Family Education				0.179
Elementary I	14 (35.0)	26 (65.0)	40 (100)	
Junior High	30 (43.5)	39 (56.5)	69 (100)	
High school	12 (30.8)	27 (69.2)	39 (100)	
Head of Family				0.271
Employed?	43 (42.2)	59 (57.8)	102 (100)	
Yes	15 (31.3)	33 (68.7)	48 (100)	
No				
Family income				0.038
< 1 minimum wage	5 (25.0)	15 (75.0)	20 (100)	
= 1 minimum wage	40 (17.6)	44 (52.4)	84 (100)	
≥ 2 minimum wages	13 (28.3)	33 (71.7)	46 (100)	
Family Allowance Program recipient Yes	39 (48.8)	41 (51.2)	80 (100)	0.010
No	19 (27.1)	51 (72.9)	70 (100)	
Type of housing				0.323
Owned	37 (35.6)	67 (64.4)	104 (100)	
Rented	21 (45.7)	25 (54.3)	46 (100)	
Piped water				0.324
Yes	50 (37.3)	84 (62.7)	134 (100)	
No	8 (50.0)	8 (50.0)	16 (100)	
Basic sanitation				0.177
None	9 (40.9)	13 (59.1)	22 (100)	
Sewage system	29 (33.0)	59 (67.0)	88 (100)	
Cesspool	20 (50.0)	20 (50.0)	40 (100)	

Source: Research data, 2016

Table 3. Distribution of stool samples according to home environment variables of the students (n=150), from a Primary School in the city of João Pessoa – PB, Brazil, 2016 (p-value<0.20)

Variable	Parasitized Students (%)	Non-parasitized students (%)	Total (%)	p-value
Domestic animal				0.237
No	41(42.7)	55 (57.3)	96 (100)	
Yes	17(31.5)	37 (68.5)	54 (100)	

Fruit and vegetable Hygiene				0.048
None	3 (13.0)	20 (87.0)	23 (100)	
Washing / water	19 (46.3)	22 (53.7)	41 (100)	
Washing / vinegar	25 (43.1)	33 (56.9)	58 (100)	
Washing / bleach	11 (39.3)	17 (60.7)	28 (100)	
Leisure Activity				0.104
Swims in rivers/	12 (32.4)	25 (67.6)	37 (100)	
swimming pool	42 (44.7)	52 (55.3)	94 (100)	
Plays in parks / beach	4 (21.1)	15 (78.9)	19 (100)	
Hand-washing before meals				0.035
No	7 (70.0)	3 (30.0)	10 (100)	
Yes	51 (36.4)	89 (63.6)	140 (100)	
Walking barefoot				0.037
No	32 (32.7)	66 (67.3)	98 (100)	
Yes	26 (50.0)	26 (50.0)	52 (100)	
Frequency of stool examinations				0.267
Occasionally	16 (32.0)	34 (68.0)	50 (100)	
Less frequently	35 (44.9)	43 (55.1)	78 (100)	
Never	7 (31.8)	15 (68.1)	22 (100)	
Anthelmintic Use				0.184
No	44 (42.7)	59 (57.3)	103 (100)	
Yes	14 (29.8)	33 (70.2)	47 (100)	

Table 4 presents possible symptoms that students had experienced during the previous 6 months. Students with decreased appetites, fever, vomiting, and nausea were not statistically associated with infections, whereas headaches, weight loss, anal pruritus, constipation, worm detections, and abdominal cramps presented statistically significant associations.

Table 4. Distribution of stool samples according to general and intestinal symptoms (n=150), in students from a Primary School in the municipality of João Pessoa – PB, Brazil, 2016 (p-value<0.20)

Variable	Parasitized Students (%)	Non-parasitized students (%)	Total (%)	p-value
Lessened appetite				0.206
No	33 (34.4)	63 (65.6)	96 (100)	
Yes	25 (46.3)	29 (59.7)	54 (100)	
Fever				0.206
No	33 (34.4)	63 (65.6)	96 (100)	
Yes	25 (46.3)	29 (59.7)	54 (100)	
Headache				0.037
No	47 (35.6)	85 (64.4)	132 (100)	
Yes	11 (61.1)	7 (38.9)	18 (100)	
Weight loss				0.027
No	42 (34.1)	81 (65.9)	123 (100)	
Yes	16 (59.3)	11 (40.7)	27 (100)	
Constipation				0.071
No	56 (40.9)	81 (59.1)	137 (100)	
Yes	2 (15.4)	11 (84.6)	13 (100)	

Vomiting				0.379
No	51 (37.2)	86 (62.8)	137 (100)	
Yes	7 (53.8)	6 (46.2)	13 (100)	
Anal pruritus				0.060
No	50 (36.4)	88 (63.8)	138 (100)	
Yes	8 (66.7)	4 (33.3)	12 (100)	
Worm detection				0.013
No	52 (36.4)	91 (63.6)	143 (100)	
Yes	6 (85.7)	1 (14.3)	7 (100)	
Nauseas				0.250
No	47 (36.4)	82 (63.6)	129 (100)	
Yes	11 (52.4)	10 (47.6)	21 (100)	
Abdominal cramping				0.035
No	31 (32.0)	66 (68.0)	97 (100)	
Yes	27 (51.0)	26 (49.0)	53 (100)	

Source: Research data, 2016

In accordance with the nutritional and anthropometric data (BMI/I) evaluation, a normal nutritional status (eutrophy) prevailed in non-parasitized students or 76 (82.6%) of the students, followed by 13 (14.1%) over-weights, and 2 (2.2%) obese. Only one (1) student (1.1%) (non-parasitized) was in the underweight nutritional status. In parasitized students, the nutritional status of eutrophy prevailed in 51 (88%) of the students, followed by 6 (10.3%) over-weights, and 1 (1.7%) obese; the underweight nutritional status was not present in any parasitized child. There were no statistically significant associations with the presence of entero-parasitosis (p-value 0.896).

The variables that remained statistically associated with the presence of enteroparasites and were adjusted by means of Logistic Regression analysis were: gender, Family Allowance Program recipient, number of rooms in the residence, family nucleus, washing of fruits and vegetables, walking barefoot, use of anthelmintics, and detection of worms.

Table 5 shows the odds ratios for presenting an intestinal endoparasite. Among the variables presented in this model; protection factor variables such as (gender, and use of anthelmintics), and risk factor variables (Family Allowance Program recipient, number of rooms in the residence, family nucleus, washing of vegetables and fruits, walking barefoot, worm detection) are included.

Table 5. Final logistic regression model for factors associated with entero-parasitosis in a Primary School in the municipality of João Pessoa – PB, Brazil, 2016 (p-value<0.05)

Variable	Estimated parameters	OR	CI (95%) Inferior limit	Upper limit	p-value
Gender (female)	-0.8450	2.4	0.19	0.98	0.0435
Family Stipend (yes)	1.4881	4.4	1.84	10.66	0.0009
Rooms in the house (≤3)	1.2425	3.5	1.13	10.64	0.0300
Family nucleus (≥ 4)	1.4489	4.3	1.46	12.43	0.0080
Washing Fruit and vegetables (water)	0.7088	2.0	1.23	3.36	0.0058
Walking barefoot (yes)	1.9438	7.0	2.42	20.17	0.0003
Use of Anthelmintics (yes)	-4.0074	0.02	0.001	0.30	0.0051
Worms detected (yes)	3.2156	25	20.6	30.10	0.0114

Source: Research data, 2016.

The Hosmer-Lemeshow model "goodness-of-fit" test was performed; its p-value (0.245) being higher than the 5% significance level and with 8 degrees of freedom, the null hypothesis was not rejected, so the model passed the goodness-of-fit test. Thus, the research model, as well as the deviance statistic for the adjusted LRM (150.42) proved lower than the chi-square reference value (169.71), and were considered adequate. In addition, the model presented a sensitivity of 56.9%, specificity of 93.5% in an area of 0.817 (81.7%), and was thus considered a good decision-making model.

DISCUSSION

Intestinal parasitism is among the most common infections in the world, and to identify high-risk communities for implementation of control measures, prevalence studies are critical (GELAW et al, 2013; ALEMU et al, 2011). In the present study, 58 (38.7%) of the students were positive for at least one enteroparasite or entero-commensal species. In relation to enteroparasites, protozoan infections were more prevalent than helminth infections. The data corroborate the results presented by Pereira[1] for primary school students in the city of Divinópolis - MG, with 1.4% of students positive for helminthes, and 37.8% for protozoa.

The species *Giardia lamblia* presented the highest occurrence, a fact justified by the target population analyzed, since it is a frequent intestinal parasite in student feces samples (NKRUMA, NGUAH, 2011). The second most prevalent species was *Entamoeba histolytica/Entamoeba dispar*. *Entamoeba histolytica* is the causative agent of intestinal amebiasis; however, differential diagnosis by microscopy is not possible since *Entamoeba dispar* is morphologically similar (GRAGA et al, 2001).

Although our study did not use a specific method to reveal *Enterobius vermicularis*, (such as the Graham method), it was the most prevalent helminthic parasite. The use of the Rugai method facilitated finding *Strongyloides stercoralis* larvae. Recent epidemiological data suggest that strongyloidiasis is under-reported. Nevertheless, accurate data remain essential to support control and elimination intervention programs (AMOR et al, 2016).

Soil-transmitted helminths (STHs), such as *Ascaris lumbricoides*, *Trichuris trichiura* and hookworms are highly prevalent in students living in areas with poor sanitary conditions (AMOR et al, 2016). Despite not finding hookworms in this study, geo-helminthiases such as ascaridiasis and trichuriasis were detected. This is most likely because though hookworms are distributed worldwide in both urban and rural areas, *Ascaris lumbricoides* and *Trichuris trichiura* are chiefly found in urban areas (BROOKER, CLEMENTS, BUNDY, 2006).

Although the entero-commensals *Endolimax nana* and *Entamoeba coli* do not cause disease, they present the same mechanism of transmission as many pathogenic protozoa such as *Giardia lamblia* and *Entamoeba histolytica*. Infection may indicate poor personal hygiene, sanitary, or socioeconomic conditions. In order to plan preventive measures, diagnosis and description (to avoid commensal infections) remain important (PEREIRA et al, 2010).

The parasitoses found in this study are among the most common in the world and require prevention and control measures (ALEMU et al, 2011). A corroborating study by Belloto et al (2011) in the municipality of Mirassol, São Paulo, Brazil reported similar results; (at 30% of the total population) where 30.32% (94/310) had at least one pathogenic intestinal parasite: *G. lamblia* (15.16%), *E. histolytica/ Entamoeba dispar* (0.64%), *A. lumbricoides* (3.55%), *S. stercoralis* (0.32%) and *Taenia sp.* (0.32%); the commensal enteroparasites discovered were *E. coli* (14.5%) and *E. nana* (3.9%).

Our results demonstrated a higher occurrence of positive entero-parasitosis test results for male students. Outdoor play and leisure is more common for boys and may promote greater predisposition to parasitic infections. Female gender was considered a protective factor, since they presented 2.4 times less chance of being positive for entero-parasitosis in relation to the male students. Several other studies involving enteroparasites also describe this gender-related result, such as Biscegli et al (2009) finding that 52% of their analyzed samples were of the male gender, while 48% were of the female gender. Silva E. et al (2009) investigated entero-parasitoses in students in the Coari municipality in Amazonas, and their corroborating results involving student leisure activities were also statistically significant.

To control entero-parasitoses, adequate basic sanitation and health education are important prophylactic measures. Areas presenting poor socioeconomic conditions are more susceptible to increased individual contaminations (PEREIRA et al, 2010; BIASI et al, 2010; FERREIRA, LALA, 2008).

The spread of parasites can occur through interpersonal contact with infected individuals which are a risk factor for the transmission of intestinal parasites. Students with four or more people in the family nucleus were 4.3 times more likely to have positive entero-parasitic results, and residences with three or less rooms presented increased chances of presenting enteroparasites by 3.5 times. Thus, larger families that inhabit the same residence are more likely to be affected by parasites; this is particularly true of small houses, which favor social confinement (FONSECA et al, 2010). In our study, most of the students had 4 or more people in their family nucleus

Transmission of enteroparasites can occur through water, food and soil contaminated with the feces of humans and animals (SILVA, J. et al, 2011). Therefore, households that present animals, and where fruits and vegetables are consumed unwashed may become statistically relevant. In this study, the domestic animal variable had no statistically significant association.

Regarding washing of fruits and vegetables, we observed statistically significant results in that most of the parasitized students washed their fruits and vegetables only with water. The chance of having a positive test among students who did not adequately wash fruits and vegetables was 2.0 times higher than those who adequately washed their fruits and vegetables. In this way, washing with water alone was considered a risk factor. Studies have demonstrated increased parasite transmission through consumption of unwashed fruits and vegetables, since vegetables growing on polluted soils are often contaminated with eggs and larvae of helminthes and protozoan cysts (SILVA, A. et al, 2013).

Students who go barefoot presented a 7.0 times higher chance of positive exam results than students who use shoes. In our study, the parasite *Strongyloides stercoralis* whose transmission occurs through filarid larvae that penetrate the skin or mucous membranes presented a significant number of occurrences.

Affecting data specifically related to intestinal parasite transmission modes, the use of anthelmintics is commonly adopted by the public municipal authorities in Brazil (SILVA, A. et al, 2013). The use of an anthelmintic during the 6 months previous to testing was considered a protection factor, since the child who uses an anthelmintic is 50 times less likely to present enteroparasites.

Symptoms related to intestinal parasites are usually non-specific, and carriers may be asymptomatic; the presence or absence of symptoms may depend on the parasite load. Thus, clinical diagnosis is often difficult (QUADROS et al, 2009). In enterobiosis, anal pruritus associated with worm detection in the anal or perianal region confirms the disease, even in the absence of laboratory examination. In ascariasis, elimination of adult worms through the mouth, nose or anus, with identification of the parasite is confirmative. In this study, worm detection was considered a risk factor, since those who had detected worms in their feces presented were 25.0 % more likely to present as positives. The risks associated with certain enteroparasite/entero-commensals include Family Allowance participation, a federal government program for families living in poverty and extreme poverty that grants monthly cash benefits. According to our data, students who participated in the Family Allowance program were 4.4 times likely to carry some enteroparasite; a risk factor that reflects poor living conditions: housing, healthcare, and hygiene.

Analysis of the students' anthropometric data revealed that above the nutritional status of those who were overweight, obese, or underweight, most presented eutrophy or normal weight. These results corroborate results reported by Almeida, Berne e Villela (2013), concerning the prevalence of entero-parasitoses and nutritional status of hospitalized students in Pelotas - RS, in which a eutrophic nutritional status prevailed in most students even those with positive stool results.

In accordance with this study, intestinal parasites are still an important public health problem, affecting 38.7% of the students analyzed. There was a high protozoan prevalence with *Giardia lamblia* as the most prevalent species. Using varied laboratory techniques and including a *Strongyloides stercoralis* study in the routine was important.

The present study brings an important contribution to science, especially benefiting Epidemiology and Public Health systems. Public health managers may rely on these results to create and/or improve preventive services to eradicate enteroparasites.

Sanitary and hygienic guidelines should be a part of education in school classrooms (especially in the poorest regions) so that students may avoid contamination and recurrences of these parasitic diseases. Education should also be extended to their parents to promote correct action.

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RESUMO: O presente estudo tem como objetivo determinar a prevalência e os fatores de risco associados ao parasitismo intestinal em escolares. Este estudo transversal foi conduzido em uma escola primária localizada na cidade de João Pessoa, de fevereiro a agosto de 2016. As crianças foram selecionadas entre 5 a 16 anos de idade. De 341 alunos, foram coletados 150 espécimes fecais e foram avaliados por três métodos: Método de Hoffman, Pons e Janer (HPJ); Kit Rugai e Paratest®. Foi preenchido um questionário sobre dados de variáveis sociodemográficas, ambientais e de comportamento. O modelo de regressão logística foi utilizado para explicar a ocorrência de parasitismo intestinal e os fatores de risco associados. A prevalência foi de 38,7% das crianças, sendo a amostra positiva mais predominante nas crianças do sexo masculino (47,0%). O parasita mais comum foi *Giardia lamblia* 13 (14,8%), seguido de *Entamoeba histolytica / dispar* 8 (9%), *Enterobius vermicularis* 5 (5,7%), *Strongyloides stercolaris* 2 (2,3%), *Ascaris lumbricoides* 2 (2,3%) e *Trichuris Trichiura* 2 (2,3%). Entre os enterocomensais, a maioria das freqüências foi *Endolimax nana* 36 (40,9%) seguido de *Entamoeba coli* 20 (22,7%). As variáveis que apresentaram significância estatística (p-valor <0,05) foram: gênero (feminino) (OR = 2,4; IC 95%; 0,19-0,98), recebe subsídio familiar (sim) (OR = 4,4; 95% CI, 1,84-10,66), número de quartos na residência (OR = 3,5; IC 95%, 1,13-10,64), núcleo familiar (OR = 7,0; IC 95%; 1,46- 12,43), higiene das frutas e legumes (OR = 2,0, IC 95%, 1,23-3,36), uso de vermifugio (OR = 0,02, IC 95%, 0,001-0,30) e visualização de vermes (OR = 25,0; IC 95%, 20,6-30,10). As doenças causadas por protozoários foram mais prevalentes. Os fatores de risco analisados demonstram que a transmissão de doenças ocorre por rotas diferentes. Portanto, as estratégias de intervenção em saúde devem ser implementadas para as crianças da escola e suas famílias para reduzir o peso dos parasitas intestinais.

PALAVRAS-CHAVE: Crianças. Doenças parasitárias. Estado nutricional. Prevalência. Saneamento Básico.

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