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FREQUENCY OF INTESTINAL PROTOZOAN INFECTIONS DIAGNOSED IN PATIENTS FROM A CLINICAL ANALYSIS LABORATORY

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Abstract

This study aimed to determine the frequency of infection by intestinal protozoa diagnosed in patients from a clinical analysis laboratory in Maceió, Alagoas, Brazil. This was a retrospective descriptive study, using a database of stool examination results from July to December 2015. The study population consisted of males and females of all ages, from the greater area of Alagoas. Data on epidemiological variables such as age and gender were obtained using a collection instrument. Protozoan species were identified from stool examinations. Results on the prevalence of intestinal parasites are described as simple and relative frequencies. We examined a total of 1277 stool samples, of which 12.69% were positive for one or more protozoa. 43.83% were from men and 56.17% were from women. *Endolimax nana* was the most prevalent (59.22%) protozoan species followed by *Entamoeba coli* (23.45%). Although non-pathogenic, they indicate fecal contamination of drinking water. The highest number (23.46%) of infected individuals was observed among children in the 0 to 11 years age group. A high prevalence (93.83%) of monoparasitism was noted. We concluded that there was a high frequency of infection and a high prevalence of *E. nana*. Infections were more common in women than in men. Our results emphasize the need for preventive measures to control intestinal parasitic infections.

Keywords: Epidemiology. Parasitic Diseases. Protozoan Infections.

1. Introduction

Intestinal parasitosis is an infection caused by protozoa or helminths. At a specific stage of their biological life cycles, these parasites attach to and live within the human intestine. The fecal-oral route of transmission is the most common. However, infection may also occur through food, water, or flying insects, and is associated with sanitation and hygiene facilities in the community (Thamizhmani et al. 2017).

Intestinal parasitic infections are an ongoing serious public health problem worldwide, that needs to be addressed. In Brazil, slow economic development, lack of basic sanitation and hygiene facilities, and poor living conditions are risk factors associated with approximately 51% of the population being infected with at least one species of intestinal parasites (Prieto-Pérez et al. 2016).

An estimated 2.5 billion people are infected globally by intestinal parasites. In Brazil, millions of people are infected with at least one species of parasite (possibly helminths or protozoa). Several infected individuals reside in areas that lack basic sanitation facilities and are considered to be of low socioeconomic status (Soares et al. 2018). Etiological agents reported to be involved in transmission include *Entamoeba histolytica/Entamoeba dispar*, *Giardia lamblia, Endolimax nana, Iodamoeba buetschlii* (Pajira et al. 2017).

Patients commonly develop complications such as chronic malnutrition, diarrhea, nausea and vomiting, protein loss, bowel obstruction and colitis, iron deficiency anemia, and reduced physical activity (Turner et al. 2016). The precariousness of health is evident from the lack of knowledge regarding personal hygiene, sanitation, and other factors (Pullan et al. 2014).

Intestinal parasitosis is one of the primary causes of nutrient malabsorption. Parasites have an exploitative relationship with their hosts. They deplete nutrients from host tissues, causing malnutrition and prolonged diarrhea that affects the nutritional status of the host (Pajira et al. 2017).

Despite existing data and research on the effect of parasitic infections on human health, there is a lack of public investment and educational programs such as extension projects, aimed at controlling its rising incidence (Humphries et al. 2017). Intestinal parasitosis is considered a minor issue and therefore neglected by healthcare services. Consequently, healthcare agencies also neglect the harmful effects on intellectual and physical development, as well as mortality resulting from parasitic infections (Anselmi et al. 2015).

Few papers have been published on the prevalence of intestinal parasites in the State of Alagoas (AL) in Brazil. Rocha et al. (2019) examined 2,194 stool samples from the municipality of Pilar, AL. 67.14% of samples were positive, representing a broad age distribution, and high frequency of *Entamoeba histolytica/Entamoeba dispar.* Bezerra et al. (2019) assessed 1,336 individuals from the municipality of Atalaia, AL. 2.7% were positive for at least one species of intestinal parasites, with a high frequency of *Entamoeba coli.* Considering the importance of prevention and early treatment of this disease, we aimed to evaluate the frequency of intestinal protozoa detected in patients from a clinical analysis laboratory.

2. Material and Methods

This study was approved by the Research Ethics Committee (COEPE) of Cesmac University Center, protocol number: 1.080.029. We conducted a retrospective descriptive study using a cross-sectional, quantitative design. A parasitological analysis of 1,277 stool samples was conducted using the spontaneous sedimentation technique (Hoffman, Pons, and Janer (HPJ)), to determine the presence of protozoan cysts. We examined two replicates (blades) per sample per individual. Data on age, gender, etiologic agent (protozoan) as well as results of the parasitological analysis were collected using a collection instrument. All data were recorded in logbooks maintained for our study, at the Parasitology Laboratory. Since we did not specifically distinguish between *Entamoeba histolytica* and *Entamoeba dispar*; these species are referred to as *E. histolytica/E. dispar* in this paper.

Our objective was to evaluate the frequency of intestinal protozoa diagnosed in patients from a clinical analysis laboratory. We included all patient records from June to December 2015 and excluded those where patients had reported helminth infections. All data were entered into a spreadsheet, Microsoft Office Excel®, version 2013. We then conducted a descriptive analysis and reported the results as percentages.

3. Results and Discussion

We examined 1,277 stool samples, of which 162 (12.69%) were positive for one or more protozoa. 38 (23.46%) cases were detected among children aged 0 to 10 years, 30 cases (18.51%) among teenagers aged 11 to 20 years, 23 cases (14.20%) among adults aged 21 to 30 years, 15 cases (9.26%) among adults aged 31 to 40 years, 20 cases (12.35%) among adults aged 41 to 50 years, and 25 cases (15.43%) among adults aged 60 years and above. Thus, we observed a high frequency of cases in children aged 0 to 11 years.

Our results indicated that infection occurred more frequently in females (91 cases (56.17%)), than in males (71 cases (43.83%)). Table 1 depicts the species distribution of intestinal protozoa detected in our samples. *E. nana* was the most prevalent (59.22%), followed by *E. coli* (23.45%). These percentages are similar to those reported by Melo et al. (2015). However, the number of cases that we detected was lower, than that reported by Menezes et al. (2013) and Seixas et al. (2011). This difference could be due to the diverse patient populations examined.

Our results are similar to those reported by Ferreira et al. (2013), who observed a higher frequency of infections in women (65.4%) than in men (34.6%). More frequent infections in females can be attributed to the fact that, women are more exposed to environments that are conducive to transmission of infection. In addition, they also seek health services more often than men and are therefore more likely to be diagnosed (Menezes, 2013).

Several studies have examined the occurrence of intestinal parasitic infections in various age groups. A high frequency of infections is observed in children aged 0 to 11 years. Our results corroborate this observation (Almeida-Filho et al. 2017; Bezerra et al. 2019; Rocha et al. 2019; Lima et al. 2020). Zaratin et al. (2018) also report similar results, and further demonstrate that intestinal parasitosis is more frequent among children in whom personal health and hygiene habits are not well developed.

Table 1. Species Distribution of various intestinal protozoa, detected in patients from a clinical analysis laboratory in Maceió (AL), Brazil, between July and December 2015.

Protozoan Species	Absolute Frequency	Relative Frequency (%)
Endolimax nana	96	59.26
Entamoeba coli	38	23.46
Giardia lamblia	18	11.11
Entamoeba histolytica/Entamoeba díspar	10	6.17
Total	162	100

According to Oliveira et al. (2015), the frequency of intestinal parasitic infections decreases with increasing age. This agrees with our results, where we observed a higher number of infections in children compared to other age groups. Punsawad et al. (2017) attribute this decrease to acquired immunity against intestinal parasites, and modifications in habits and hygiene practices.

Further, we also observed associations between various parasites. Monoparasitism was detected in 93.83% (152) of cases, biparasitism was detected in 4.55% (3) of cases, and polyparasitism was detected in 1.62% (1) of cases (Table 2).

Table 2. Parasitic associations of intestinal protozoa detected in patients from a clinical analysis laboratory in Maceió (AL), Brazil, between July and December 2015.

Protozoan Species	Absolute Frequency	Relative frequency (%)
E. coli + E. nana	02	2.93
G. lamblia + I. buetschlii	01	1.62
E. coli + E. nana + E. histolytica + G. lamblia	01	1.62
Total	04	6.17

It should be noted that, *E. nana* and *E. coli* were the two most common species detected. However, these species do not pose any health risks. Rather, they are indicators of transmission by the fecal-oral route, and thus denote the individual's susceptibility to acquired pathogens (Poulsen and Stensvold, 2016). Our observations are similar to those reported by Dudlová et al. (2018).

The frequency of the pathogenic protozoa, *E. histolytica*/*E. dispar* was observed to be 6.17%, which is different from the results of other studies (Costa et al. 2018). Despite the implementation of regulations and increasingly stringent water treatment measures, the incidence of waterborne intestinal parasitic infections, especially those caused by protozoa, has risen in the last 25 years, thus becoming a major public health problem (Hafiz et al. 2015).

Our results are consistent with the findings by Lima et al. (2020) on the prevalence of intestinal parasites in patients from the Clinical Analysis Laboratory of University Hospital in Santa Cruz, RN. They detected monoparasitism in 75.5% of samples, and polyparasitism in 24.5% of samples. Further, Almeida Filho et al. (2017) reported a prevalence of parasitic diseases in the metropolitan region of Fortaleza, Ceará; polyparasitism was detected in 0.47% of individuals. The prevalence of parasitic infections caused by various etiological agents is primarily associated with inadequate sanitation facilities (Liao et al. 2017; Humphries et al. 2017).

Our results corroborate the observation that, frequency of parasitic infections varies with geographical location, even within the same municipality (Rocha et al. 2010; Rocha et al. 2011; Silva et al. 2018; Almeida Filho et al. 2018; Lima et al. 2020). The frequency of intestinal parasites observed in our study depicts a low socioeconomic status of the study population. In addition, it denotes a lack of education among children, as indicated by the highest frequency of infections in this age group (Zaratin et al. 2018). Inadequate personal hygiene practices are possibly the primary factor contributing to the transmission of intestinal parasites (Dudlová et al. 2018; Costa et al. 2018).

4. Conclusions

We detected a high frequency of intestinal protozoan infections, with a predominance of cases in women. Infections caused by *E. nana* were the most prevalent, followed by *E. coli*. The highest number of cases was observed in the age group between 0 to 20 years. Our results emphasize the need for implementation of preventive measures against intestinal parasitosis. The high frequency of cases observed, suggests a need to develop public health measures promoting good hygiene practices. In addition, educational programs aimed at lowering the incidence and impact of intestinal parasitosis, should primarily be targeted towards needy populations.

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References

ALMEIDA FILHO, M.A., et al. Prevalência de enteroparasitas na região metropolitana de Fortaleza, Ceará. *Acta Biomedica Brasiliensia*. 2017, **8**(2), 91-100. https://doi.org/10.18571/acbm.143

ANSELMI, M., et al. Mass Administration of Ivermectin for the Elimination of Onchocerciasis Significantly Reduced and Maintained Low the Prevalence of *Strongyloides stercoralis* in Esmeraldas, Ecuador. *PLoS neglected tropical diseases.* 2015, **9**, e0004150. https://doi.org/10.1371/journal.pntd.0004150

BEZERRA, M.M., et al. Ocorrência de parasitoses intestinais em um laboratório privado do município de Atalaia, estado de Alagoas, Brasil. *Biomedicina e Farmácia: Aproximações.* 2019, **3**, 162-169. https://doi.org/10.22533/at.ed.22419140417

COSTA, J.O., et al. Prevalence of *Entamoeba histolytica* and other enteral parasitic diseases in the metropolitan region of Belo Horizonte, Brazil. A cross-sectional study. *Sao Paulo Medical Journal*. 2018, **136**(4), 319-23. https://doi.org/10.1016/10.1590/1516-3180.2018.0036170418

DUDLOVÁ, A., et al. Prevalence of non-pathogenic types of gastrointestinal protozoa in population in Slovakia and their potential importance in the aspect of public health. *Acta Parasitologica*. 2018, **63**, 819–825. https://doi.org/10.1515/ap-2018-0100

FERREIRA, V.S., et al. Estudo comparativo das enteroparasitoses ocorrentes em duas áreas de Barreiras, Bahia. *Natureza online.* 2013, **11**(2), 90-95.

HAFIZ, I., et al. School-based mass distributions of mebendazole to control soil-transmitted helminthiasis in the Munshiganj and Lakshmipur districts of Bangladesh: an evaluation of the treatment monitoring process and knowledge, attitudes, and practices of the population. *Acta Tropica*. 2015, **141**, 385-390. https://doi.org/10.1016/j.actatropica.2013.12.010

HUMPHRIES, D., et al. Effectiveness of Albendazole for hookworm varies widely by community and correlates with nutritional factors: a cross-sectional study of school-age children in Ghana. *The American Journal of Tropical Medicine and Hygiene*. 2017, **96**(2), 347-354. https://doi.org/10.4269/ajtmh.16-0682

LIAO, C.W., et al. Intestinal parasitic infections: Current prevalence and risk factors among schoolchildren in capital area of the Republic of Marshall Islands. *Acta Tropica.* 2017, **176**, 242-48. https://doi.org/10.1016/j.actatropica.2017.08.021

LIMA, E.C.S., et al. Prevalência de parasitoses intestinais em usuários de um hospital universitário, Santa Cruz-RN, Brasil. *Revista de Atenção à Saúde*. 2020, **18**(63), 21-30. https://doi.org/10.13037/ras.vol18n63.6218

MELO, A.R., et al. Ocorrência de parasitas intestinais em laudos parasitológicos de fezes de um laboratório privado do município de Bacabal-MA. *Enciclopédia Biosfera, Centro Cientifico conhecer*. 2015, **11**(21), 3420-3430.

MENEZES, R.A.O. Caracterização epidemiológica das enteroparasitoses evidenciadas na população atendida na unidade básica de saúde Congós no município de Macapá – Amapá. Dissertação (Mestrado em Ciência da Saúde) – Universidade Federal do Amapá, Macapá, 2013. Available from: http://repositorio.unifap.br/bitstream/123456789/191/1/Dissertacao_CaracterizacaoEpidemiologicaEnteroparasitoses.pdf

OLIVEIRA, D., et al. Infection by intestinal parasites, stunting and Anemia in school-aged children from southern Angola. *PLoS One*. 2015, **10**(9), e0137327. http://dx.doi.org/10.1371/journal.pone.0137327

PAJIRA, S.C., CHIDAMBARAM, M. and MANDAL, J. Epidemiology and clinical features of soil-transmitted helminths. *Tropical Parasitology*. 2017, **7**(2), 81-85. http://dx.doi.org/10.4103/tp.TP_27_17

POULSEN, C.S. and STENSVOLD, C.R. Systematic review on *Endolimax nana*: A less well studied intestinal ameba. *Tropical Parasitology.* 2016, **6**, 8-29. http://dx.doi.org/10.4103/2229-5070.175077

PULLAN, R.L., et al. Global numbers of infection and disease burden of soil transmitted helminth infections in 2010. *Parasites & Vectors.* 2014, **7**(37), 1-19. https://doi.org/10.1186/1756-3305-7-37

PUNSAWAD, C., et al. Prevalence of intestinal parasitic infection and associated risk factors among village health volunteers in rural communities of southern Thailand. *BMC Public Health*. 2017, **17**(1), 564. http://dx.doi.org/10.1186/s12889-017-4486-2

PRIETO-PÉREZ, L., et al. Geohelmintos. *Enfermedades Infecciosas y Microbiología Clínica.* 2016, **34**(6), 384–389. http://dx.doi.org/10.1016/j.eimc.2016.02.002

ROCHA, T.J.M., et al. Frequência e aspectos epidemiológicos dos parasitos intestinais em pacientes de um laboratório particular do município do Pilar-AL. *Farmácia interativa.* 2019, **1**, 862-875.

ROCHA, T.J.M., et al. Relação entre aspectos socioeconômicos e a ocorrência de ectoparasitoses e enteroparasitoses em uma comunidade do litoral norte alagoano. *Revista Brasileira de Análises Clínicas.* 2011, **43**(4), 271-276.

ROCHA, T.J.M., BRAZ, J.C. and CALHEIROS, C.M.L. Parasitismo intestinal em uma comunidade carente de Barra de Santo Antônio, Estado de Alagoas. *Revista Eletrônica de Farmácia*. 2010, **7**(3), 28-33. https://doi.org/10.5216/ref.v7i3.12893

SEIXAS, M.T.L., et al. Avaliação da frequência de parasitos intestinais e do estado nutricional em escolares de uma área periurbana de Salvador, Bahia, Brasil. *Revista de Patologia Tropical*. 2011, **40**(4), 304-314. https://doi.org/10.5216/rpt.v40i4.16762

SILVA, A.A., SILVA, P.V.R. and ROCHA, T.J.M. Parasitos intestinais: frequência e aspectos epidemiológicos em usuários de um laboratório particular. *Diversitas Journal.* 2018, **3**, 245-256. https://doi.org/10.17648/diversitas-journal-v3i2.628

SOARES, A.L., OLIVEIRA, E.A.N. and SOUZA, I.F.A.C. A importância da educação sanitária no controle e prevenção ao *Ascaris lumbricoides* na infância. *Caderno de Graduação Ciências Biológicas e da Saúde-FACIPE*. 2018, **3**(3), 1-13.

THAMIZHMANI, R., et al. Intestinal parasitic infestation among paediatric diarrhoea patients attending hospitals in Port Blair, Andaman and Nicobar Islands. *Journal of Parasitic Diseases*. 2017, **41**(2), 584-589. http://dx.doi.org/10.1007/s12639-016-0814-1

TURNER, H.C., et al. Cost-effectiveness of scaling up mass drug administration for the control of soil-transmitted helminths: a comparison of cost function and constant costs analyses. *Lancet Infectious Disease*. 2016, **16**, 838–846. http://dx.doi.org/10.1016/S1473-3099(15)00268-6

ZARATIN, A.C.M., et al. Análise protoparasitológica e microbiológica em amostras de crianças de 0 a 6 anos de idade atendidas por creche em Campinas-SP. *CuidArte. Enfermagem*. 2018, **12**(2), 223-227.

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