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## Prevalence of intestinal parasites among children from 0.6 to 4 years at CMEI Edileusa Maria Pulquerio Vieira, Buriti de Goiás, Brazil, 2019

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### Abstract

Intestinal parasitosis represent a serious public health problem in Brazil and worldwide. Endoparasites affect children especially in the preschool and school years, jeopardizing development and learning. This cross-sectional work aimed to evaluate the prevalence of enteroparasitoses by analyzing fecal samples from 45 children and 13 employees regularly enrolled at CMEI Edileusa Maria Pulquerio Vieira, in Buriti de Goiás, Goiás, Brazil. An epidemiological, anthropometric and nutritional assessment, as well as social and environmental conditions were also carried out. It was observed that 24.45% of children samples were positive for intestinal parasites, especially male children (30.44%) and aged between 1 and 2 years (44.45%). *Giardia lamblia* cysts were observed with higher prevalence for male children (63.63%), and polyparasitism in the samples of female children, being *Entamoeba coli* cysts the second to be found. Concerning to employees, 23.08% were positive for *Giardia lamblia* and *Endolimax nana*, with inhomogeneous distribution among age groups. Sociodemographic and sanitation data showed all individuals lived in the urban area of Buriti de Goiás, in brick houses and 88.88% with paved streets. Everyone had access to treated water, stored this water mostly in tanks (95.55%), 72.42% filtered the drinking water in clay filters and all dispensed biological waste in sanitary cesspits. Parents had heterogeneous education. However, most attended elementary school (35.55%). And, about children's nutritional status, no case of malnutrition or obesity were detected. All analyzes  $p < 0.001$ . It is concluded the prevalence of endoparasites in the analyzed samples was low. A limitation was the non-adherence of all children enrolled at the CMEI. Finally, the engagement of all to implement educational actions for employees, parents and the community informed about the methods of preventing, controlling and combating parasites is highly necessary.

**Keywords:** Intestinal parasites, daycare center, children, Buriti de Goiás, Goiás, Brazil

### Introduction

Intestinal parasites represent a serious public health problem, affecting about 3.5 billion people worldwide [1]. In Brazil, parasitic infections caused by *Giardia lamblia*, *Entamoeba histolytica*, *Entamoeba coli*, *Ascaris lumbricoides*, *Trichuris trichiura*, *Taenia solium*, *Taenia saginata* and *Enterobius vermicularis* are among the most prevalent, and especially affect preschool and school children. At this age group, enteroparasitosis ranges from asymptomatic to diverse symptomatology with the occurrence of inappetence, anorexia, diarrhea, and impaired development and learning [2, 3].

Intestinal parasites are transmitted mainly by the feco-oral route, through the ingestion of contaminated water and/or food and occur with greater prevalence in regions where hygienic-sanitary conditions are deficient for water and sewage treatment [4]. The precariousness of basic sanitation favors the spread of eggs, cysts and larvae, in the same way that the conglomeration of people in closed environments such as daycare centers and nursing homes, since the individual-individual contact, often associated with insufficient hygiene, favors the spread of intestinal parasites [5]. With all these associated factors, it is common knowledge that parasites occur more frequently in underdeveloped regions [6].

Daycare centers are especially characteristic establishments for the epidemiological recognition of intestinal parasites, as they shelter and provide assistance to children of preschool age collectively, a fact that causes infectious diseases transmission [7]. Children who attend daycare centers are more susceptible to acquiring intestinal parasitosis, with a risk of infection 1.5 times greater than those who do not attend these establishments. The prevalence is higher for both protozoa and helminths [8].

In municipalities at the interior of Brazil, the lack of systematic epidemiological studies for the occurrence of intestinal parasites and the real impact that these diseases cause on the population are worrying factors. In the municipality of Buriti de Goiás, located 150 km from the capital of the state of Goiás, with 2,560 inhabitants, a demographic density of 12.85 inhabitants per km<sup>2</sup> and a Municipal Human Development Index (HDIM) of 0.687 [9] there is no notification of enteroparasitosis in children attending daycare centers, a fact that motivated this study. In this context, the present work aimed to evaluate the prevalence of intestinal parasites and the socio-environmental conditions of children from 0.6 to 4 years of age regularly enrolled at the CMEI Edileusa Maria Pulquerio Vieira, in the municipality of Buriti de Goiás, Goiás, Brazil, in the year 2019.

## Material and Methods

### Ethics

The study was approved by the Institutional Research Ethics Committee of the Serra da Mesa Education Center (FaSeM), report: 022789/2019; registered at Plataforma Brasil, CAAE: 09403119.0.0000.8025, and conducted according to the precepts of research in human beings (Operational Norm 001/13 and Resolution 466/12 and 510/2016, National Health Council - Ministry of Health, Brazil). Researchers were responsible for conducting the study in strict compliance with the approved protocol, the research information followed the current ethical aspects, in addition to the norms established in the Statute of the Child and Adolescent (ECA) and scientific principles, guaranteeing participants not exposure of any information that could embarrass them.

### Study site and sampling

This was a cross-sectional study carried out from April to June 2019 with children aged 0.6 to 4 years regularly enrolled at the CMEI Edileusa Maria Pulquerio Vieira, in the municipality of Buriti de Goiás, Goiás, Brazil. All parents or guardians were invited to participate in meetings in which the research objectives and methods were described. To obtain data, an Informed Consent Form (ICF) was explained in detail and applied to the parents and/or guardians of the participating volunteers, and a copy of the ICF was offered. A Term of Assent (TA) was also prepared in accessible language for minors and applied, whereby the research objectives and procedures were explained in detail. All research volunteers were asymptomatic at the time of parasitological investigation and sample collection. Furthermore, an epidemiological approach and nutritional assessment were carried out using a standardized questionnaire. And, to determine chronological age (in years and months), as well as gender, the registration form at the daycare center was used.

## Techniques and Evaluations

Anthropometry was performed as recommended by the World Health Organization (WHO) [10]. Height (meter) was measured in an orthostatic position (vertical anthropometer) and weight (kilogram) on a platform-type scale with a precision of 100 gram. Nutritional assessment was accomplished based on criteria of the National Center for Health Statistics (NCHS) [11], which considers weight/height (W/H) and height/age (H/A) ratios, with Z scores  $\leq -2$  and  $\geq 2$  to define malnutrition and obesity, respectively.

The investigation of intestinal parasites was effectuated through the Stool Ova and Parasite Test (O&P) by the spontaneous sedimentation method [12], with research of parasites in three slides for each sample under optical microscope, objective of 40X. Stool samples were collected in the morning by parents and/or guardian previously trained by two researchers. The collected material was placed in a standard bottle (80 mL sterile universal collector bottle with a white cap, without preservative), and immediately transported in a hermetically closed polystyrene container at 2-8 °C temperature for analysis at the Laboratory of Parasitology in the University Center Brasília de Goiás.

**Riskiness:** There was minimal discomfort and risk during the collection of biological material (feces) for laboratory evaluation. However, all possible measures were taken to avoid major inconveniences. In addition, an anamnesis and interview were fulfilled to collect information relevant about volunteers' general health status.

**Benefits:** Participating volunteers were offered the possibility of carrying out an O&P at no cost.

### Inclusion Criteria

- Children duly enrolled and regularly present at the CMEI;
- Authorization to participate in the study confirmed by parents and/or guardians signature in the ICF.
- Authorization to participate in the study through TA.

### Exclusion Criteria

- Use of antiparasitic drugs by the last 3 months;
- Children without prior authorization from parents and/or guardians;
- Children unable to regularly attend classes during the period of data collection, as in cases of leave of any nature;

**Data analysis:** Results were expressed as absolute frequency, relative frequency and mean  $\pm$  standard deviation. To execute statistical tests, Windows version of the GraphPad Prism 5.01 software was used. And, for statistical analysis, one- or two-way ANOVA followed by Bonferroni post-tests, with *P* values  $< 0.05$  were applied.

## Results

Parasitological evaluation of the 45 samples from children regularly enrolled at the CMEI Edileusa Maria Pulquerio Vieira, in the municipality of Buriti de Goiás, state of Goiás, Brazil, detected that 24.45% were positive for intestinal parasites ( $p < 0.001$ ). From those, a higher percentage of positivity was observed in male children (30.44%). And, as to age group, the highest positivity occurred among children between 1 and 2 years old (44.45%,  $p < 0.001$ ) (Table 1).

**Table 1:** Frequency of parasitic infection according to children gender and age group

	Parasites presence			
	Negative		Positive*	
	n	%	n	%
<b>Gender</b>				
Male	16	69.56	7	30.44
Female	18	81.81	4	18.19
<b>Age</b>				
0.5 to 1 year-old	3	100	0	0
1 to 2 years-old	10	55.55	8	44.45
2 to 3 years-old	9	81.81	2	18.19
3 to 4 years-old	12	92.3	1	7.7
* $P < 0.001$				

Apropos of the employees of the CMEI Edileusa Maria Pulquerio Vieira, from the 13 samples analyzed, 23.08% were positive for intestinal parasites ( $p < 0.001$ ), with a non-homogeneous distribution between age groups (Table 2).

**Table 2:** Frequency of parasitic infection according to employees' gender and age group.

	Parasites presence			
	Negative		Positive*	
	n	%	n	%
<b>Gender</b>				
Male	0	0	0	0
Female	10	76.92	3	23.08
<b>Age</b>				
20 to 30 years-old	5	83.33	1	16.67
30 to 40 years-old	2	100	0	0
40 to 50 years-old	1	50	1	50
50 to 60 years-old	2	66.66	1	33.33
* $p < 0.001$				

According to the verified parasites, *Giardia lamblia* cysts were found in the samples of male and female children, with a higher prevalence for males (63.63%,  $P < 0.001$ ). Furthermore, the occurrence of polyparasitism was observed in samples from female children, with *Entamoeba coli* cysts being the second to be found (Table 3).

**Table 3:** Parasites presence according to children gender.

Parasites	Gender			
	Male*		Female*	
	n	%	n	%
<i>Entamoeba coli</i>	0	0	2	100
<i>Giardia lamblia</i>	7	63.63	4	36.37
* $p < 0.001$				

At employees' O&P, *Giardia lamblia* cysts were also found in two samples ( $p < 0.001$ ), in addition to another sample containing cysts and trophozoites of *Endolimax nana* (Table 4).

**Table 4:** Parasites presence according to employees' gender.

Parasites	Gender			
	Male*		Female*	
	n	%	n	%
<i>Endolimax nana</i>	0	0	1	100
<i>Giardia lamblia</i>	0	0	2	100
* $P < 0.001$				

Sociodemographic and basic sanitation data showed that 91.11% of the children surveyed lived in the urban area of Buriti de Goiás; all lived in brick houses and 88.88% with paved streets. Parents and/or guardians had a very heterogeneous level of education. However, the majority presented elementary education (35.55%). Referring to the water consumed, everyone had access to treated water and stored it mostly in water tanks (95.55%). Only two children's parents stated that the water for consumption came from a cistern. From this consumed water, only one participant reported the habit of using the boiling method to remove possible microorganisms. Most of those surveyed responded they filter drinking water in clay filters before drinking (72.42%), and 14 participants drink water directly from the taps. About waste destination, there is no public sewage system in the city, therefore, everyone stated the waste is disposed of in sanitary cesspools. For children to have fun outdoors, the backyard was the most reported place (71.11%), followed by the sidewalk at home (26.66%) and the public square (2.22%). Interestingly, most families do not have a pet (57.77%), and of those who do, the dog is the preferred animal (Table 5, all  $p < 0.001$ ).

**Table 5:** Sociodemographic and basic sanitation data.

Variables	n	%
<b>Zone of residence*</b>		
Urban	41	91.11
Rural	4	8.89
<b>Street pavement*</b>		
Asphalt	40	88.88
Land road	5	11.12
<b>Type of housing</b>		
Brickwork	45	100
Wood	0	0
Cob wall	0	0
<b>Parents education*</b>		
Elementary School	16	35.55
High school	15	33.33
University education	14	31.11
<b>Water treatment</b>		
No	0	0
Yes	45	100
<b>Water storage*</b>		
Tank	43	95.55
Cistern	2	4.45
<b>Water consumed by the family*</b>		
Filtered	30	66.66
Straight from the tap	14	31.11
Boiled	1	2.22
<b>Waste destination</b>		
Sanitary cesspool	45	100
Sewerage system	0	0
<b>Outdoor place for children to have fun*</b>		
Sidewalk	12	26.66
Square	1	2.22
Yard	32	71.11
<b>Pet*</b>		
No	26	57.77
Yes	19	42.23
Mean ± SD		
Children's age	2.18	0.94
Employees' age	36.07	12.13
Family monthly income	1.613,00	578,13
Residents at the same home	3.91	1.09
* $P < 0.001$		

On the subject of children's nutritional status, no cases of malnutrition or obesity were detected (Table 6,  $p < 0.001$ ).

**Table 6:** Children's nutritional status.

Nutritional status	n	%
Eutrophy	45	100
Malnutrition	0	0
Obesity	0	0
* $p < 0.001$		

## Discussion

The epidemiological description of intestinal parasites provides information on the management and assessment of a population healthcare situation, identifies the characteristics of the disease and evaluates control and treatment methods [4]. Endoparasitoses systemic approach allows knowledge from the basic region sanitation to the description of this population hygiene habits [13].

The epidemiology of intestinal parasites can provide data for healthcare planning and evaluation, can identify diseases determining factors and evaluate methods for their control, by describing the course of their natural history [14, 15]. An epidemiological study of parasitic infections provides data such as the degree of unhealthy environment, level and extent of basic sanitation in a region, as well as the population hygiene habits [16].

Although intestinal parasitic infections among children remain a global problem, current information on these infections in children attending daycare centers in Brazil is very limited [2, 17]. There is a consensus among health professionals that there are no consistent morbidity and mortality data regarding intestinal parasites; due, many times, to not being notified or underreported by health services [3], as they consider parasites "minor problems" [18]. Currently, daycare centers are the first educational establishment in the lives of thousands of children in Brazil, especially for underprivileged children [19]. It is in the nursery that children reach the first stages of development, and it is also in the nursery that they are more prone to contracting infections due to the immune system immaturity, accumulation of feces in diapers for even extended periods and direct and massive contact with other children and adults who practice different hygiene habits [20, 21]. Amongst intestinal parasites identified in this study, *Giardia lamblia* cysts were the most frequent, followed by *Entamoeba coli* and *Endolimax nana*. Such data corroborate with studies carried out in Brazil by Gonçalves *et al* (2011) [19], Magalhães *et al* (2013) [20], and Reuter *et al* (2015) [22], and even foreign studies such as Mehraj *et al* (2008) [23] and Cañete *et al* (2012) [24], in which giardiasis was the most prevalent endoparasitosis. Regarding the polyparasitism observed in the fecal samples of female children, it is to be assumed that the cysts of *Giardia lamblia* and *Entamoeba coli* were acquired by the same route of infection, for example, through contaminated water or food. The same is suggested for the presence of *Endolimax nana* present in the sample of a CMEI employee, which makes the need to implement effective measures to prevent the spread of these pathogens even more relevant.

The low prevalence of endoparasitoses observed in this study may be associated with satisfactory hygiene and eating habits, the use of a non-specific parasitological method, as well as the inconstant regional dispersion of the etiological agents (*Giardia lamblia*, *Entamoeba coli* and

*Endolimax nana*). However, even though the positive result for parasitosis was lower than the data often presented in similar scientific works, our data demonstrate how important it is to carry out parasitological evaluations in children who attend daycare centers, as they indicate that parasitized children have entered the transmission cycle of parasites, and what actions regarding educational activities and control of parasites are necessary. It is common knowledge that low socioeconomic status, presence of animals in households, lack of sanitation, direct child-child relationship and constant contact with the soil can increase the prevalence and incidence of endoparasitosis [19, 21]. However, they were not aggravating factors in this study.

In recent decades, a change in the nutritional standards of the Brazilian population has been observed. The nutritional transition has shown a decrease in malnutrition and an increase in the prevalence of obesity, most often related to inadequate eating habits [25, 26]. This fact is a worrying factor in terms of Public Health, since it is known that the increase in the prevalence of obesity is directly related to the increase in morbidity and the occurrence of diseases such as hypertension, diabetes, dyslipidemia and psychological and social disorders [27]. In this work, children anthropometric data analysis demonstrated that all were eutrophic, with no prevalence of malnutrition or obesity. Studies performed by Biscegli *et al* (2009) [18], Santos & Leão (2008) [28], Sousa *et al* (2016) [29] demonstrated a nutritional situation different from that found in this research, with a predominance of obesity over malnutrition in children who attended daycare centers.

## Conclusion

In view of the obtained results, it is concluded that the prevalence of endoparasitosis was low in children regularly enrolled at the CMEI Edileusa Maria Pulquerio Vieira, in the municipality of Buriti de Goiás, Goiás, Brazil, in the year 2019. A limitation of this study was the non-adherence of all of children enrolled to perform the analyses. Finally, it is extremely important to engage everyone to implement educational activities for employees, parents and the community, informing them about methods of preventing, controlling and combating parasites to improve the health conditions of the population.

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## Declaration of interest statement

Authors report no conflicts of interest.

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