

ORIGINAL ARTICLE

DETECTION OF INTESTINAL PARASITES IN THE ENVIRONMENTS OF A PUBLIC SCHOOL IN THE TOWN OF DIAMANTINA, MINAS GERAIS STATE, BRAZIL

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SUMMARY

Intestinal parasites are a major public health problem in developing countries, most prevalent in areas where sanitation is poor and the population's hygiene is inadequate. They affect people of all ages, although school-age children are the most susceptible. In this study, we investigated the presence of intestinal parasites in the shared environments of a public school in the town of *Diamantina*, *Minas Gerais* State. From December 2012 to February 2013, samples were collected for three months (once a month) by using the Graham method (1941), in duplicate, by affixing a 6 x 5 cm clear tape, six times in each collection site, in a space of about 30 cm<sup>2</sup>. Then, each tape was positioned longitudinally on a microscope slide and the identification of the biological forms of the parasites was performed with the aid of a 40X objective from an optical microscope. Eleven sites were selected for sampling. Cysts of *Entamoeba coli* were the most frequently found in this study (50%), followed by *Hymenolepis diminuta* eggs (27.6%), *Iodamoeba butschlii* cysts (5.6%), *Ascaris lumbricoides* eggs (5.6%), *Taenia* species eggs (5.6%) and hookworm eggs (5.6%). The highest positivity rates were found in the samples drawn from the cafeteria's eating table. The results have indicated the need to improve the cleaning in the school environments, as well as the development of educational practices that may help in the preservation of public health.

**KEYWORDS:** Intestinal parasites; Enteroparasitoses; School environment; Students; *Diamantina*.

INTRODUCTION

Intestinal parasites or enteroparasites are organisms (helminths or protozoa) that live in the gastrointestinal tract of animals and humans, and are strongly related to the lack of basic sanitation and personal hygiene. They represent a serious public health problem especially in under developed countries<sup>1,2</sup>. In some developing countries, the prevalence of these diseases could reach 90%<sup>3</sup>. In Brazil, the prevalence of these parasites is variable, depending on climate, socioeconomic, health and education conditions of the studied area<sup>4</sup>.

Enteroparasites affect people of all ages, although school-age children are the most susceptible age group, due to a greater contact with contaminated environments during play time, and also inadequate hygiene<sup>5,6,7</sup>.

Intestinal parasites can be considered co-factors in infant mortality, since they can cause complications in children, affecting their nutritional balance, inducing intestinal bleeding and bad absorption of nutrients, and competing for the absorption of micronutrients, reducing the food intake, and thus affecting the school performance as well as the cognitive development in children<sup>8,9,10,11</sup>.

Nobre *et al.* (2013)<sup>12</sup> estimated the prevalence of intestinal parasitic infections among preschoolers in *Diamantina*, *Minas Gerais* State, at 27.5%, and identified the associated risk factors. The presence of infective forms of intestinal parasites in the school environments is a risk factor for the occurrence of such diseases. In this sense, this study aimed to investigate the presence of intestinal parasites in the shared environments by users of a public school in the town of *Diamantina*.

MATERIAL AND METHODS

Study area

The town of *Diamantina* (Lat 18°14'58" S - Long 43°36'01" W) located in the *Jequitinhonha* River Valley, in *Minas Gerais* State, has become nationally famous as the hometown to the Brazilian's former president Juscelino Kubitschek de Oliveira. Historically famous for its mineral wealth, such as gold and diamond, *Diamantina* is currently one of the most visited cultural and tourist spots in *Minas Gerais* State, Brazil. It has a population of 45,880 inhabitants<sup>13</sup>, with an estimated altitude of 1200 m, built on large quartzite formations composing the *Espinhaço* Mountain Range. The institution selected for the development of this research was the *Escola Estadual Professor Gabriel Mandacaru*, located

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in a district called *Palha*, one of the poorest in the town. The school offers elementary education (6-15 years) and secondary education (15-18 years) to an approximate number of 750 students divided into 26 classes.

### Site collection

The environments shared by users selected for this study were as follows: I) the school yard railing; II) one toilet in the girls' restroom; III) one toilet in the boys' restroom; IV) one girls' restroom faucet; V) one boys' restroom faucet; VI) one girls' restroom doorknob; VII) one boys' restroom doorknob; VIII) the cafeteria's bench; IX) the cafeteria's table; X) a classroom chair and XI) the teachers' room table. All sampling sites were in use, and sampling was performed without previous cleaning.

### Collection and identification of samples

From December 2012 to February 2013, samples were collected for three months (once a month) using the Graham method (1941)<sup>14</sup>, in duplicate, by affixing a 6x5 cm clear tape, six times on each collection site, in a space of about 30 cm<sup>2</sup>. Samples were collected after the students had used the environments and before they were cleaned by workers, so as to avoid false results. Thereafter, each tape was placed longitudinally on a smooth microscope slide and the morphological identification of parasites (eggs, larvae or cysts) was performed with the aid of a 40X objective from an optical microscope.

## RESULTS

A total of 66 slides were analyzed, of which 18 (27.3%) were positive for at least one intestinal parasite. Cysts of *Entamoeba coli* were the most frequent in this study (50%), followed by *Hymenolepis diminuta* eggs (27.6%), *Iodamoeba butschllii* cysts (5.6%), *Ascaris lumbricoides* eggs

(5.6%), *Taenia* species eggs (5.6%) and hookworm eggs (5.6%). Table 1 shows the frequency and distribution of different species of intestinal parasites in shared environments of the school. The cafeteria's table had the highest number of identified parasites (Table 1).

## DISCUSSION

The prevalence of intestinal parasites depends essentially on the degree of children exposure to infective forms of parasites (cysts, eggs and larvae)<sup>15</sup>. The places where the highest number of parasites was found are related to the regular presence of students and/or employees, indicating poor hand hygiene and inadequate cleaning of the environment, considering that the flow of the school community is high.

Commensal parasites, as *E. coli* and *I. butschllii*, which inhabit the human gut, although not considered pathogenic, are indicators of human fecal contamination in the school environment<sup>16,17</sup>. Intestinal cestodes, as *H. diminuta*, which were found in the cafeteria, have rodents as main hosts and some arthropods as their intermediate hosts. They are very rarely found parasiting humans<sup>18</sup>. The detection of eggs from this parasite may suggest the presence of rats and/or arthropods such as cockroaches and fleas in the studied locations. Therefore it is necessary to implement insecticide spraying and elimination of rats in the school environment, as well as cleaning on regular bases using more efficient disinfectants.

Other intestinal parasites found were *Taenia* species and hookworms. These organisms, in general, can cause weakness, anemia and malaise in infected individuals<sup>19</sup>. The eggs of these parasites have been found on the cafeteria's table. One possible reason to explain this finding is that employees who handle food at school are the same working in other areas such as toilets, and probably do not always practice proper hand

**Table 1**  
Parasite species found in different shared environments of the *Escola Estadual Professor Gabriel Mandacaru, Diamantina-MG*, from December 2012 to February 2013

Environments	Species						TOTAL
	<i>E. coli</i>	<i>I. butschllii</i>	<i>A. lumbricoides</i>	<i>H. diminuta</i>	<i>Taenia</i> sp.	Hookworms	
I. school yard railing	+	-	-	-	-	-	1
II. toilet in the girls's restroom	+	-	-	-	-	-	1
III. toilet in the boys's restroom	+	-	+	-	-	-	2
IV. girls's restroom faucet	+	-	-	+	-	-	2
V. boy's restroom faucet	+	-	-	-	-	-	1
VI. girls's restroom doorknob	-	+	-	-	-	-	1
VII. boys's restroom doorknob	-	-	-	-	-	-	0
VIII. cafeteria's bench	+	-	-	+	-	-	2
IX. cafeteria's table	+	-	-	+	+	+	4
X. classroom chair	+	-	-	+	-	-	2
XI. teacher's room table	+	-	-	+	-	-	2
<b>TOTAL</b>	<b>9 (50%)</b>	<b>1 (5.6%)</b>	<b>1 (5.6%)</b>	<b>5 (27.6%)</b>	<b>1 (5.5%)</b>	<b>1 (5.6%)</b>	<b>18</b>

(+) positive; (-) negative

hygiene before handling food. This hypothesis was also supported by Rezende *et al.* (1997)<sup>20</sup>.

Eggs of *Ascaris lumbricoides* were found in the boys' toilet. The prevalence of ascariasis in susceptible groups such as children, is markedly related to the socioeconomic parameters of the country. Its occurrence has been commonly associated with inadequate sanitary conditions and it is an important identifier of the health status in a population<sup>21</sup>.

Delabrida (2010)<sup>22</sup> and Guinan *et al.* (1997)<sup>23</sup> have shown that people do not wash their hands after using the toilet and when they do so the spent time is less than five seconds, which may explain the high frequency of the *E. coli* protozoan. Another factor that contributes to this high frequency of protozoa is the lack of sanitary materials, such as toilet paper and soap, in the restrooms, and these facts occur in schools<sup>24</sup>.

The exposure of individuals to different chronic intestinal infections can lead to growth failure and impairment of the cognitive development in children<sup>25</sup>. From the results obtained, it seems that children from this school receive little instruction about good hygiene habits, favoring the transmission of pathogens through water, food, dust, or even contaminated fomites or body parts brought to the mouth. In addition, a close person-to-person contact due to household crowding, high prevalence of infected adults, leads to an increase in the risk of childhood infection<sup>11</sup>.

The fact that deserves to be highlighted is the need to improve the cleaning of the shared environments in the school so as to preserve the well-being of students and staff. In addition, the development of educational practices that help in the preservation of public health can promote the acquisition of basic knowledge on the prevention of parasitoses, and thus minimize their occurrence<sup>25</sup>. As students spend much of their time at school, and parents most likely do not have the necessary knowledge on the transmission of parasites, it is necessary that the school fill this gap by creating learning opportunities geared to both, the individual and the collective health.

Therefore, education on health is a fundamental process for people to acquire knowledge aimed at disease prevention, and the health educator has an important role, favoring the reflections of students about reality, although each person is autonomous to choose alternatives that could be adopted to promote the collective well-being<sup>26</sup>.

## CONCLUSION

We investigated the presence of intestinal parasites in the shared environments of a public school in the town of *Diamantina, Minas Gerais* State. Cysts of *Entamoeba coli* were the most frequently found in this study, followed by *Hymenolepis diminuta* eggs, *Iodamoeba butschlii* cysts, *Ascaris lumbricoides* eggs, *Taenia* species eggs and hookworm eggs. The results have indicated the need to improve the cleaning in the school premises environments, as well as the development of educational practices that may help in the preservation of public health.

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## CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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