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Parasitological profile of residents of a maroon community

Perfil parasitológico de moradores de uma comunidade quilombola

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Abstract

Objective: Analyzing data on prevalence and species of intestinal parasites among residents of a maroon community. **Methods:** A non-probabilistic sample survey for accessibility or convenience was used. The sample consisted of 153 individuals who answered an epidemiological investigation form and underwent parasitological examination of feces by sedimentation technique of Hoffman-Pons-Janer and analysis of water, according to the multiple tube technique to estimate medium density of microorganisms. The selection of the sample collection sites took into consideration the environmental and sanitary criteria.

Results: The proportion of infested individuals was 16.8% and the statistically significant variables were the municipality of residence ($p = 0.048$) and hygiene habits of hand washing ($p \leq 0.001$). Variables such as piped water, presence of thermotolerant coliforms in the water ($p = 0.038$) and treatment of drinking water ($p \leq 0.001$) were statistically associated with the variable of diarrheal episode in the last month ($p = 0.008$).

Conclusion: The results indicated infestations by different species of parasites related to diarrheal episodes associated with poor hygiene conditions, especially the lack of drinking water treatment.

Resumo

Objetivo: Analisar dados sobre prevalência e espécies de parasitos intestinais entre moradores de uma comunidade quilombola.

Métodos: Foi utilizado levantamento amostral não probabilístico por acessibilidade ou conveniência. A amostra constituiu-se de 153 indivíduos que responderam uma ficha de investigação epidemiológica e que realizaram exames parasitológicos de fezes, por meio da técnica de sedimentação de *Hoffman-Pons-Janer* e da análise da água, segundo a técnica de tubos múltiplos, para estimativa da densidade média dos microrganismos. A seleção dos locais de coleta das amostras levou em consideração critérios ambientais e sanitários.

Resultados: A proporção de infestados foi de 16,8% e as variáveis estatisticamente significativas foram município de moradia ($p=0,048$) e hábito de higiene de lavagem das mãos ($p \leq 0,001$). As variáveis água encanada, presença de coliformes termotolerantes na água ($p=0,038$) e tratamento da água de beber ($p \leq 0,001$) associaram-se estatisticamente à variável episódio diarreico no último mês ($p=0,008$).

Conclusão: Os resultados indicaram infestações por diferentes espécies de parasitos relacionados a episódios diarreicos associados às condições de higiene precárias, destacando-se a falta de tratamento da água para consumo humano.

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Introduction

This study is based on the concept of health in its social determinants interface. The health of populations is defined as a result of the forms of social organization and production, which can generate large inequalities in living standards. This complex network of factors is interrelated and affects the health-disease process in the individual specificity and scope of the collective way of life.⁽¹⁾

Intestinal parasitosis is a public health problem and considered a disease closely related to socio-sanitary conditions.^(2,3) In data from the Brazilian Federal Government, the Kalunga territory is described as possessor of the lowest human development index in the state of Goiás, with notable problems related to housing, low educational level, frailty and even the total absence of basic sanitation and/or distribution of drinking water.⁽⁴⁾

The scenario of social vulnerability justifies studies in the area of health and its social determinants, as well as the fact that in Brazil there are insufficient references on the topic of incidence of parasitism in the population, despite its relevance in the epidemiology and public health.⁽⁵⁾ Therefore, the question of parasitic infestations demands attention when it comes to specific minority groups.

This study aimed to analyze data on the prevalence of intestinal parasites among Kalunga residents, describing the species of greater prevalence and medical-social interest.

Methods

The study was carried out in the state of Goiás, in the municipalities of Cavalcante, Teresina de Goiás and Monte Alegre, in the west-central region of Brazil. Historically and numerically, Kalunga is considered the most important remaining maroon community of the region, with about 5,000 inhabitants.⁽⁶⁾

The cross-sectional design, with non-probabilistic sample survey was chosen in the composition of the sample. Socioeconomic information and other data regarding the source of drinking water, sanitation and hygiene habits were collected. Stool

examination was performed by the sedimentation technique of Hoffman-Pons-Janer and analysis of water, according to multiple tube technique to estimate the average density of microorganisms. The selection of the sample collection sites took into consideration environmental and health criteria.

Statistical analyzes were performed with the *IBM Statistical Package for the Social Sciences application* version 21, in partnership with the *University College London*. The chi-square test at a significance level of 5.0% and a confidence interval of 95% were adopted.

The development of the study met national and international standards of ethics in research involving human beings.

Results

The investigation form was answered by 67 families and 153 individuals (Table 1). It was observed that only two (1.3%) residents had permanent formal employment, while the remaining 151 (98.7%) survived with informal activities. The illiteracy rate was 51.0% (n = 78) and the monthly family income lower than minimum wage (n = 91, 59.5%) prevailed. In homes, the adobe was the most common material used for construction (n = 79, 51.6%), and burnt cement (n = 89, 58.2%) or dirt (n = 64; 41.8%) were used for indoor flooring. The earthen floor comprised 100 per cent of peridomestic space. The diet was based on subsistence cultivation of local (n = 91, 59.5%) crops. All residents were using water from rivers in the region, whether through capture by hoses (n = 87, 56.9%), wells (n = 38, 24.4%) or river water search with gallons (n = 28, 18.3%). Almost half of the residents (n = 76, 49.7%) did not carry out any treatment in the drinking water. Some level of thermotolerant coliforms was detected in 42.5% (n = 65) samples.

Only 64.7% (n = 99) of the residents had a bathroom inside the house. The use of septic tank occurred in 21.6% of cases (n = 33), the remaining residents were using black sump (n = 89, 58.2%) or open sewage discharge (n = 31, 20.3%). As for the household waste disposal, 95.4% of Kalunga com-

munity (n = 146) accumulated it on the ground for burning later. The presence of domestic animals was found in all residences. The occurrence of diarrhea in the previous two months was reported by 88.2% of respondents (n = 135) and 64.7% in the last month (n = 99).

Table 1. Sanitary socioeconomic characteristics observed in Kalunga community

Variables	Yes n(%)	No n(%)
Formal employment	2(1.3)	151(98.7)
Education level (literacy)	75(49.0)	78(51.0)
Monthly income (lower than minimum wage)	91(59.5)	62(40.5)
Type of material used for construction of the house (adobe)	79(51.6)	74(48.4)
Type of indoor flooring (burnt cement)	89(58.2)	64(41.8)
Peridomicile (earthen floor)	153(100.0)	-
Provenience of the water (river)	153(100.0)	-
Piped water inside the house	87(56.9)	66(43.1)
Treatment with drinking water	76(49.7)	77(50.3)
Water with presence of thermotolerant coliforms	65(42.5)	88(57.5)
Presence of bathroom in peridomicile	99(64.7)	54(35.3)
Presence of septic tank at home	33(21.6)	120(78.4)
Destination of household waste (burned)	143(95.4)	10(4.6)
Presence of any animal	153(100.0)	-
Grown food predominating in last meal	91(59.5)	62(40.5)
Case of diarrhea in the previous two months in the residence	135(88.2)	18(11.8)
Case of diarrhea in less than a month in the residence	99(64.7)	54(35.3)

The prevalence of intestinal parasites was 16.8%. Table 2 shows the distribution of the sample according to the presence of infestation. The municipality of Cavalcante had 13.3% of positive results for intestinal parasites, all *Endolimax nana*. Teresina de Goiás had 26.0%, of which 42.9% of *Entamoeba coli*, 28.6% of *Iodamoeba butshilii*, 14.3% of *E. nana*, 7.1% of *Entamoeba histolytica* and 7.1% of hookworms. Monte Alegre lot had 10.2% of positive results, of which 40.0% of *E. coli*, 20.0% of *E. nana*, 20.0% of *E. histolytica*, 10.0% of *I. butshilii* and 10.0% of hookworms. The variables gender, age and education showed a similar distribution, not constituting determinant for infestation. Among infested people, 14.1% reported diarrhea in the last month; 10.2% used water with the presence of thermotolerant coliforms; and 91.7% did not wash their hands regularly after physiological

eliminations. There was a statistically significant association with the last two variables, with $p = 0.031$ and $p = 0.001$, respectively.

Table 2. Distribution of infestation according to municipality, gender, age group and educational level

Variables	Infestation	
	Yes n(%)	No n(%)
Municipality		
Cavalcante	2(13.3)	13(86.7)
Teresina de Goiás	13(26.0)	37(74.0)
Monte Alegre de Goiás	9(10.2)	79(89.8)
Gender		
Male	10(15.6)	54(84.4)
Female	14(15.7)	75(84.3)
Age group (years)		
<18	13(16.3)	67(83.8)
18-50	7(13.7)	44(86.3)
>51	4(18.2)	18(81.8)
Educational level		
Literate	13(17.3)	62(82.9)
Illiterate	11(14.1)	67(85.9)
Diarrheal episode in the last month		
Yes	14(14.1)	85(85.9)
No	10(18.5)	44(81.5)
Thermotolerant coliforms in water		
Yes	9(10.2)	79(89.8)
No	15(23.1)	50(76.9)
Do you always wash your hands after using the toilet?		
Yes	2(3.5)	55(96.5)
No	22(22.9)	74(77.1)

Table 3 shows the results of the percentage distribution of the sample by occurrence of diarrhea in the last month.

It was evident that among the infected individuals (n = 24), 58.3% reported diarrhea episodes in the previous month. However, only 14.1% of the residents without infestation reported such reference.

The education variable inferred that there were no significant differences between literate and illiterate regarding the occurrence of diarrheal episode in the previous month. In the association between the occurrence of diarrhea in the last month and parasite species responsible for the infestation, the values were: 33.3% (n = 1) with *E. nana*, 60% (n = 6) with *I. butshilii*, 100.0% (n = 3) with *E. coli*, and 50.0% (n = 3) with *E. histolytica*; 100.0% (n = 2) of

Table 3. Distribution of cases of diarrhea in the last month according to sanitary conditions of households and infestations by parasites

Variables	Diarrheal episode in the last month	
	Yes n(%)	No n(%)
Infestation		
Yes	14(58.3)	10(41.5)
No	85(65.9)	44(34.1)
Education level		
Illiterate	52(66.7)	26(33.3)
Literate	47(62.7)	28(37.3)
Type of parasite		
Cysts of <i>Endolimax nana</i>	1(33.3)	2(66.7)
Cysts of <i>Iodamoeba butshilii</i>	6(60.0)	4(40.0)
Cysts of <i>Entamoeba coli</i>	3(100.0)	-
Cysts of <i>Entamoeba histolytica</i>	3(50.0)	3(50.0)
Eggs of ancilostomideo	2(100.0)	-
<i>Entamoeba histolytica</i> + eggs of hookworms	-	1(100.0)
Tap water inside the house		
Yes	64(73.6)	23(26.4)
No	35(53.0)	31(47.0)
Presence of bathroom inside the house		
Yes	66(66.7)	33(33.3)
No	33(61.1)	21(38.9)
Water with presence of <i>Thermotolerants Coliforms</i>		
Yes	63(71.6)	25(28.4)
No	36(55.4)	29(44.6)
Treatment of drinking water		
Yes	36(46.8)	41(53.2)
No	63(82.9)	13(17.1)
Do you always wash your hands after using the toilet?		
Yes	41(71.9)	16(28.1)
No	58(60.4)	38(39.6)

those infested by *E. histolytica* and hookworm also reported diarrhea in the previous month.

Piped water showed a statistical significance in association with diarrheal episode in the last month ($p = 0.008$). Both in homes with indoor bathroom and in others, there was a high percentage of affirmative responses for the occurrence of diarrheal episodes: 66.7% ($n = 66$) and 61.1% ($n = 33$), respectively. There was a statistically significant association ($p = 0.038$) between the variables diarrheal episodes and presence of thermotolerant coliforms in the water, while 71.6% ($n = 63$) of households supplied by water with thermotolerant coliforms reported diarrheal episodes in the previous month. Treatment with drinking water expressed strong association ($p \leq 0.001$) with the occurrence of diarrhea in the last month. The group that did not treat the drinking water had 82.9% ($n = 63$) of cases of diarrheal episode in the previous 30 days. Washing

hands after using toilets or equivalent was not statistically significant regarding the diarrheal episode variable; however, the non-occurrence of diarrheal episodes was lower in percentage among Kalunga residents who reported regularly washing the hands ($n = 16$, 28.1%) compared with those who reported no such regularity ($n = 38$, 39.6%).

Discussion

The limit of the results of this study refers to the cross-sectional design, in which the possible associations between variables are known only during analysis of data, thus not allowing a temporal knowledge of when a certain fact would have occurred, or even how a certain evolution would have happened.

It is relevant to know the parasitological profile of such a singular community, because it can contribute to the planning and programming of local and regional actions that address the real needs of the Kalunga community, taking into account cultural considerations, the tradition, the customs and values. The results of this study may have practical applicability in the field of public health, which is a vast practice area of nurses.

The exposure of the Kalunga community to predictors of occurrence of intestinal parasite infestations was observed. This is because the risk factors for intestinal parasites are the poor sanitary, educational, social and economic conditions; lack of water treatment for human consumption; the high rate of agglomeration of people; inappropriate soil use, as well as its contamination and of the food.⁽⁷⁾

These results suggest that intestinal parasites diseases can arise as a disorder capable of illustrating the interface between health and social conditions, demonstrating by means of the high proportion of infestation, the risk of exposure of residents and diarrhea cases,⁽⁸⁾ and taking into account that water comes from rivers, through hoses, wells or active uptake in gallons. In most homes, it does not receive treatment before consumption. This is heightened in serious problem, since untreated water can

be a source of transmission of diseases, including intestinal diseases.⁽⁹⁾

Most of this group had no permanent formal employment, surviving through activities at the margins of existing labor standards in the country. Many families were below the poverty line or even indigence.⁽¹⁰⁾ Educational level was low because among the literate, 45.1% had only incomplete primary education; illiterates accounted for 51.0%. This reality revealed discrepancy relative to other regions because according to the Brazilian Institute of Geography and Statistics (IBGE – *Instituto Brasileiro de Geografia e Estatística*), the illiteracy rate is twice the national average of 8.6% among residents of rural areas.⁽¹¹⁾

In the studied villages, there was no demarcation of streets and there was certain isolation between houses. These followed the traditional style used by black ancestors who built their houses with local materials.⁽¹²⁾ Such physical, simple and rustic structure (adobe walls, burnt cement floor or earthen floor) associated with the sanitary standards of the population reflects the precarious socioeconomic conditions.⁽¹³⁾

The sanitary infrastructure is one of the main health demands of the community. Not all residents had a bathroom; 64.7% reported having bathroom just around the homes; and 34.3% used rivers or the soil for physiological eliminations. In houses with presence of excreta disposal system, 78.7% open sewage discharge and black sumps were predominant. The community had no regular waste collection and in 95.4% of cases this accumulation occurred on the ground to burn later. In every home, there were domestic animals, both within domestic space as around the houses. This situation of absence of toilet in most homes, accumulation of solid waste and disposal of human waste and household animals, favors not only the proliferation of vectors and microorganisms that cause endemic diseases and parasites, but also contamination of surface water sources.⁽¹³⁾

The presence of thermotolerant coliforms in waters that supplied 42.5% of homes reinforces the hypothesis that the effluent waste produced can

reach the sources of drinking water when they percolate the soil.⁽⁹⁾

Intestinal parasites are an important indicator of the hygiene and sanitation conditions of the entire population.⁽¹⁴⁾ This corroborates the findings in the Kalunga community described so far, supporting the statistical significance ($p = 0.031$) found between the variables presence of thermotolerant coliforms and infestation by enteropathogens.

The parasites identified in the study have mechanisms of fecal-oral transmission, with prevalence of the non-pathogenic over the pathogenic.⁽¹³⁾ This indicates contamination with fecal waste, which is plausible of understanding when considering the poor sanitary conditions of the Kalunga community.⁽⁶⁾ The finding reinforces the need of investment in preventive actions to promote health, especially in education and health, in infrastructure and basic sanitation.⁽¹⁵⁻¹⁷⁾

The close relationship between hygiene habits and enteroparasite infestation⁽¹⁸⁾ supports the statistical significance ($p = 0.001$) found between handwashing and infestation variables. Our hands serve as a vehicle of fecal-oral contamination, therefore, the lack or failure of principles of hygiene such as handwashing is a predisposing factor to infestation by intestinal parasites.^(5,19)

Diarrhea has approximately 88% of its occurrence attributed to water supply, inadequate sewage and hygiene.⁽²⁰⁾ This fact justifies the high rates of diarrheal episodes in previous months to conducting the study: 64.7% in first month and 88.2% in the second. Although these conditions are not directly responsible for the occurrence of diarrhea, they favor the proximity of its determinants.⁽¹⁾ Furthermore, the diarrheal event is related to the action of the parasite, with clinical manifestations proportional to the harbored parasite load.⁽⁵⁾

The presence of infestation showed a similar pattern across the variables of municipality, gender, age and education. The proximity of the data can be related to the fact that Kalunga habitants live in towns / villages with no exact boundaries and similar living conditions.⁽²¹⁾ The statistical significance ($p = 0.048$) of the municipality variable confirmed the proposed.

The occurrence of diarrhea had statistical significance in the association with presence of thermotolerant coliforms and piped water. The unavailability of piped water is a determinant factor of diarrheal disorder because easy access to water contributes to personal, domestic and food hygiene, without which it is impossible to break the cycle of intestinal parasites transmission.⁽²²⁾ In addition, water quality is a potentiating factor of interruption of the chain.⁽¹⁸⁾

As previously described by other authors, the study also showed that in the Kalunga community sanitation conditions were deficient, public services of water treatment non-existing, and living conditions were inadequate in terms of infrastructure and Quality of Life.^(6,23,24) This scenario is aggravated by the disposal of human and solid waste in peridomestic areas close to rivers; by the consumption of untreated water; and the contamination of water by thermotolerant coliforms. All these are associated with the prevalence of insufficient hygiene habits, high percentage of parasites and poor sanitation.⁽²⁵⁾

Such environmental fragility negatively impacts on the social determinants of health and keeps the Kalunga community prone to intestinal parasites.⁽⁹⁾

Conclusion

The Kalunga community showed infestation by different parasites associated with diarrheal episodes. Cases of diarrhea were associated with precarious hygiene conditions, especially the lack of drinking water treatment.

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Collaborations

Rangel DLO contributed to project design, execution of the research, drafting the article and relevant critical revision of the intellectual content. Oliveira

C; Kyaw CM and Caldeira Júnior AM contributed to the execution of the research. Monteiro PS contributed to the final approval of the version to be published.

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