Correlation between nutritional status and the prevalence of enteroparasitosis in children from a quilombola community in the city of Caetés, Pernambuco

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Abstract

Intestinal parasitic infections affect a large part of the world population, especially in underdeveloped countries that have precarious living conditions. Brazil has a high prevalence rate and a high number of deaths, representing a major problem in children's health, as it can lead to a state of malnutrition with consequential impairment of physical and intellectual development. The objective of this study was to verify the association between intestinal parasitosis and the nutritional status of children from the Atoleiro quilombola community in the city of Caetés-PE. This was a cross-sectional study, of a quantitative nature, with the participation of 155 children, carried out between April and October 2019. The data obtained were statistically evaluated using Pearson's chi-square (X2) test in order to obtain correlation of children with the presence or absence of protozoa and helminths, reporting significant (p-value <0.05) or marginally significant (p-value <0.10) values. Those responsible were asked about the socioeconomic conditions in which they lived. Parasitological examination of feces was carried out using the techniques of Hoffmann and Kato-Katz and the nutritional status was assessed using a portable stadiometer and digital scale and classified using the weight/age, height/age, weight/height, and body mass index/age according to the Ministry of Health. Most of the children were female (n=80; 52%) and the general mean was ±5 years old. Altogether there were 110 (70.97%) positive parasitological analyses. Of these results, 77 children (70%) presented some type of protozoan, 32 (29.09%) helminths, and 1 child had polyparasitism (0.91%). It was also noticed that most children obtained an adequate height when compared to age (n=110; 70.97%). A booklet and a video in the form of a string were created with the aim of bringing information about prevention and health promotion to the community. It became evident that there are major problems related to the health conditions of the community, which is one of the factors that contributed to the emergence of parasitic infections. The high prevalence of parasitized children was associated with socioeconomic, cultural, and environmental determinants. It was noticed that the nutritional findings, such as thinness and substantial thinness, were significant, with nutritional deficiencies being a significant problem; even though there was no statistically significant association between nutritional status and parasitized children.

Keywords: Parasitic Diseases. Nutritional Assessment in Children. Sanitary Conditions.

INTRODUCTION

Intestinal parasitosis has been affecting humanity for many years and is still highly prevalent even in the face of globalization. Such diseases affect an average of 30% of the world population, thus placing them as the third most common cause of human infections, reaching values above 90% in underdeveloped countries[1]. The main risk factors are the living conditions of the populations, insomuch as the cases increase as the socioeconomic level decreases[2]. The prevalence of individuals with enteroparasitosis in the Brazil varies between 2 to 36%, with a greater emphasis within

the municipalities that have a low Human Development Index (HDI). In the school age population this prevalence can reach70%[3].

In Brazil, given its large geographical distribution and social disparity among urban or rural populations, these diseases have a strong epidemiological spread and can develop in any region, state, municipality or community in the country[4]. Social and environmental factors such as precarious living conditions, consumption of contaminated water, and poor handling of food, stand out as the main risk factors, with children being the most susceptible group[5]. Research shows that children who live in precarious living conditions and who have inadequate hygiene habits are most exposed to falling ill due to infectious-parasitic diseases[6].

Communities in situations of social vulnerability imply certain characteristics, resources, and skills inherent to these individuals or groups, which may be scarce or inadequate. Therefore, the "remaining quilombo" population stands out as a vulnerable ethnic group that faces an environment of discrimination, prejudice, and disrespect, constantly claiming their rights and social responsibility. Quilombola communities are marked by historical processes of discrimination and exclusion and experience a marginalized socioeconomic reality in relation to the Brazilian population in general. Thus, it is essential to develop DSS studies, especially in populations of social vulnerability. Parasitic diseases are common in these communities[7].

The main etiologic agents are protozoa and helminths that develop in the environment and/or in the host's organism, from ovulation to adulthood, and pass through the human intestinal tract[8]. Parasitic chronic non-communicable diseases (CNCDs) are emerging indicators and stand out as important contributory factors for the emergence of nutritional disorders, which can lead to an increase in child morbidity and mortality rates in the country[5]. Thus, the present study aimed to verify whether there would be a correlation between intestinal parasites and the nutritional status of children in a quilombola community.

METHODS

Ethical considerations

It was a study that involved human beings and is legally based on the resolution 466/12 of the National Council of Ethics in Research (CONEP), before Resolution 510 of April 2016 that elaborates the norms applicable to research in Human and Social Sciences. Prior to submission to the ethics committee, authorization was obtained to conduct the study from the Municipal Health Secretariat of Caetés, PE, after signing the Term of Approval for Research by the municipal manager. Then, the study was submitted to the evaluation of the Research Ethics Committee (CEP) of the Federal University of Vale do São Francisco, where it obtained approval under opinion CAAE: 06629419.2.0000.5196.

Study Type

This was a cross-sectional study of a quantitative nature carried out with 155 children aged 2 to 10 years old in a Quilombola Atoleiro Community in the city of Caetés, PE in the period between April and October 2019.

Study location

The city of Caetés is a Brazilian municipality in the state of Pernambuco, located in the agreste region of the Borborema Plateau. The population was estimated at approximately 28,500 inhabitants in the last geographic census.

Study population and development

There are about 196 children between 2 to 10 years old in this community, and 155 children adhered to the study, while the others did not want to participate. The justification, objectives and procedures that were carried out in the study were explained to the legal guardians of the children, in clear and easy-to-understand language in both written and audible forms. Moreover, all aspects of the study, such as, detailed information on methods that would be used, as well as possible harm resulting from their participation, were explained in addition to the procedures and precautions to be used to avoid possible harm. Those responsible then signed the Informed Consent and Form.

In order to assess the socioeconomic conditions of the families, a semi-structured form was applied during visits to the community. Then, a questionnaire was sent to the children in order to obtain answers regarding their habits and life routines.

Parasitological analysis

The respective guardians of the children received a container identified with the child's identification and a leaflet with information on the correct procedures for the collection of stool samples, as well as their proper storage. Once collected, the samples were taken in a thermal box with ice with a temperature between +4 to +8°C to the Laboratory of the municipality of Caetés, PE. For the analysis of the samples, two techniques were used: the spontaneous sedimentation by Hoffmann, which is a qualitative technique. In this technique, the dilution of feces in water is necessary to homogenize and obtain a suspension, the filtration of the suspension of feces in surgical gauze, and sedimentation for two hours. With the aid of a cannula, a small portion of the formed sediment was removed and transferred to 5 slides. Lugol's iodine solution was added followed by a coverslip for better fixation and was immediately read on an Olympus CX31® microscope as well as a qualitative diagnosis.

Nutritional status

Categorized based on the indicators of weight/age, height/age, weight/height and BMI/age of the children, according to the techniques established by the Ministry of Health. The children's height and weight were evaluated in an orthostatic position. The BMI assessment was calculated using the Z score, which is referenced by the Ministry of Health.

Statistical analysis

Pearson's chi-squared test (with an exact or simulated p-value, depending on the case) was used to determine whether there was a correlation between positive cases and nutritional status, as well as socioenvironmental factors. The significant results of Pearson's chi-squared tests (with exact or simulated p-values) were either statistically significant ($p<0.05$) or marginally significant ($p<0.10$).

RESULTS

A situational survey of the community was carried out, based on an analysis of social determinants. To obtain these data, 155 guardians of the children were interviewed, 132 of whom were mothers (85.16%) and 23 (14.84%) fathers. The overall average age was ±36 years old, and females were ±35 years old and males were ±41 years (table 1).

Regarding the type of home, it was found that 131 (84.52%) were made of clay. 77 (49.68%) families used cisterns as the main form of water reservoir, followed by 55 (35.48%) through water trucks, 16 (10.32%) used artisanal wells, and 7 (4.52%) used a plumbing network.

As for water treatment, about 101 (65.16%) of the families performed chlorination, while 19 (12.26%) filtered, and 35 (22.58%) did not perform any type of treatment. Regarding the way of draining the bathroom from the residences, it was identified that 83 (53.55%) had a rudimentary cesspool, while in 72 (46.45%) the waste was eliminated in the open. Regarding the destination of garbage, 87 (56.13%) burned their garbage, 32 (20.65%) disposed of in the open, 23 (14.84%) collected it, and 13 (8.39%) buried it. As for food hygiene, 90 (58.06%) stated that they performed it, 64 (41.29%) did not perform it, and 1 (0.65%) did not answer.

Of the 155 participating children, 80 (52%) were female and 75 (48%) were male. The general mean age was ±5 years old; males were ±6 years old and females were ±5 years old. Figure 1 depicts the distribution of children by age and sex.

Regarding the current EPF, 110 (70.97%) were positive and 45 (29.03%) were negative as shown in figure 2. The positive results were more significant at some specific ages. 22 children were 3 years old (16%), 18 were 8 years old (15%), and 16 were 4 years old (14%), as shown in figure 3. The females demonstrated the highest rate of positivity for worms (n=62; 57.3%), as shown in figure 4.

In figure 4, there is a dependent relationship between the variables of the child's sex and their corresponding FEP result. Therefore, a Pearson chi-squared test was performed, obtaining a p-value of 0.0643. Using a significance level of 0.10 (marginally significant, $p < 0.10$), it may be stated that the variables are dependent. In the laboratory analysis, the following parasites were identified: *Ascaris lumbricoides, Giardia intestinalis, Entamoeba coli and Entamoeba histolytica*. 77 children (70%) presented some type of protozoan (Giardia intestinalis, Entamoeba coli and Entamoeba histolytica) and 32 (29.09%) had helminths, which were represented by Ascaris lumbricoides, and 1 child (0.91%) displayed polyparasitism (figure 5).

Pearson's chi-squared test (with an exact or simulated p-value) was also used to assess whether there would be an association between weight (W/A), body mass (BMI/A), and height (H/A) as nutritional indices with the parasitological exam results. However, no statistically significant association was found. Therefore, this indicates that the presence or absence of parasites did not influence the nutritional status of children, thus, all test results were equivalent (table 2).

It was identified that some factors were associated with intestinal parasites, such as water treatment at home, water intake, and gender ($p < 0.05$) or ($p < 0.10$) (table 3).

Table 1– Profile of those responsible for the children involved in the research carried out in the Quilombola Atoleiro Community in 2019.

Variable	N	%
SEX		
Male	23	14.84
Female	132	85.16
PROFESSION		
Farmer	155	100.00
SCHOOL		
Illiterate	11	7.10
Literate	48	30.97
Incomplete elementary school	61	39.35
Complete primary education	5	3.23
Incomplete high school	14	9.03
Complete high school	16	10.32
MONTHLY INCOME		
Less than one minimum wage	20	12.90
One minimum wage	135	87.10
Total	155	100

Table 2– Association of positive parasitological tests and the nutritional status of children from the Quilombola Atoleiro Community in 2019.

Variable	Statistic	P value
W/A	2.3700	0.5317
BMI/A	3.3100	0.6547
H/A	0.8404	0.8511

Table 3– Risk factors that are associated with intestinal parasites in the Quilombola Atoleiro Community in 2019.

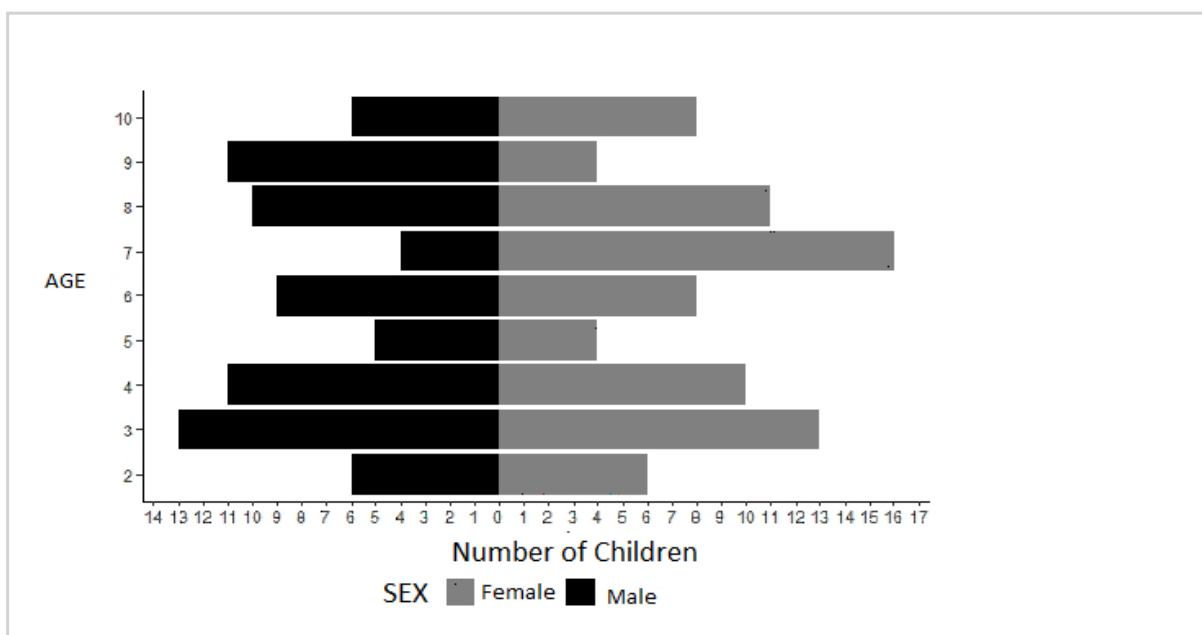| Variable	Statistic	Result
Water treatment at home	9.2231	$p < 0.05$
Gender/Child	2.8002	$p < 0.10$
Water intake	9.3683	$p < 0.05$

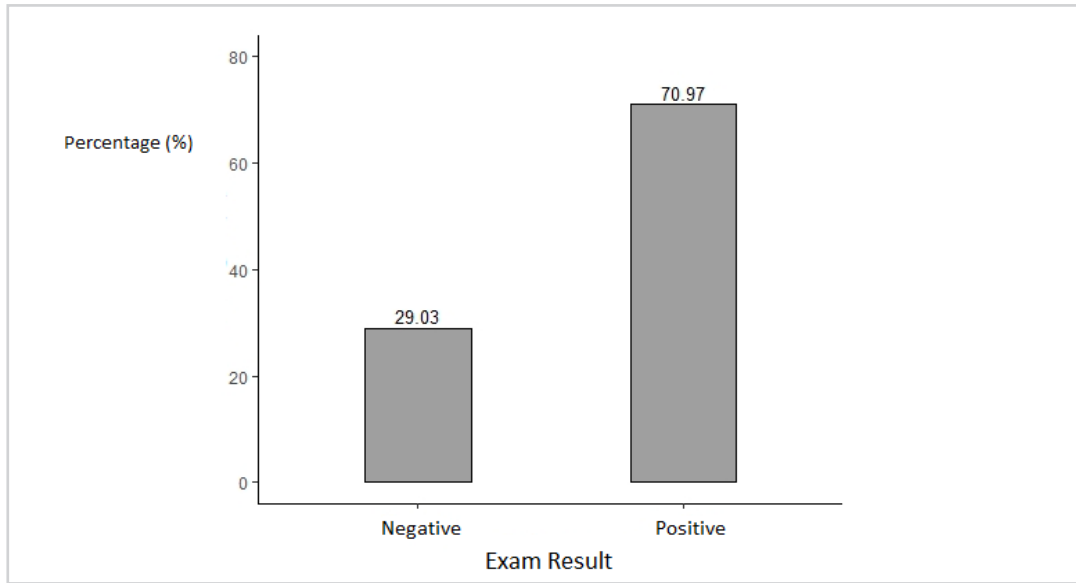**Figure 1–** Analysis of the distribution of children by age and sex.

Figure 2 – Results of children's parasitological exams.
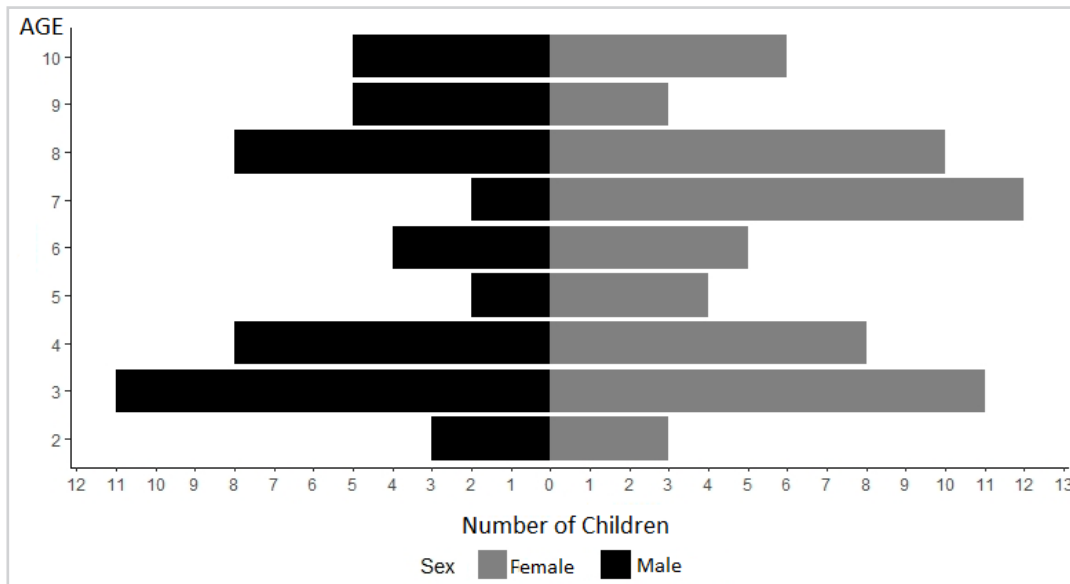

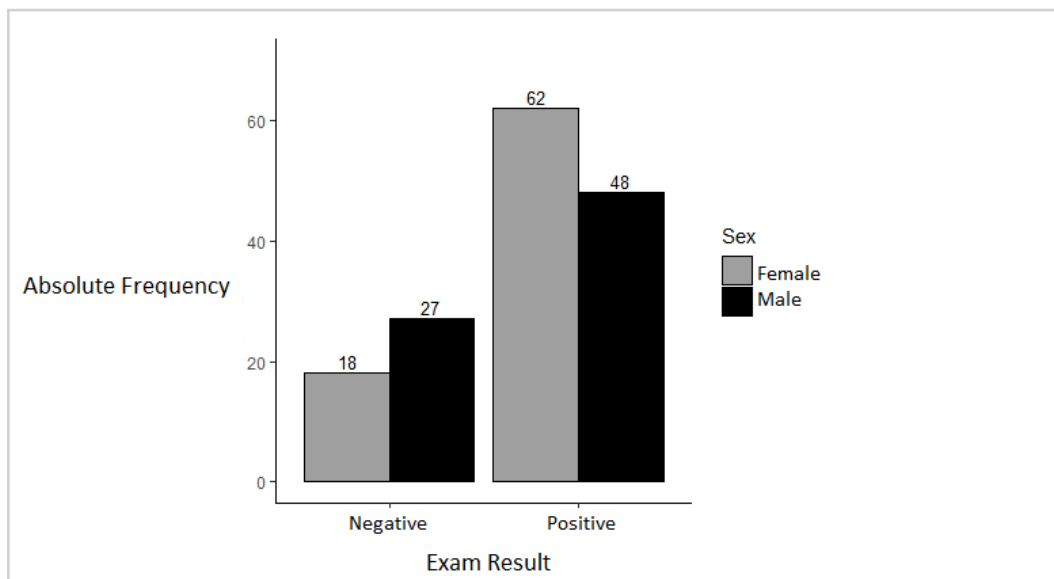**Figure 3 –** Distribution of children with positive tests by age and sex

Figure 4 – Distribution of test results by sex of the child.
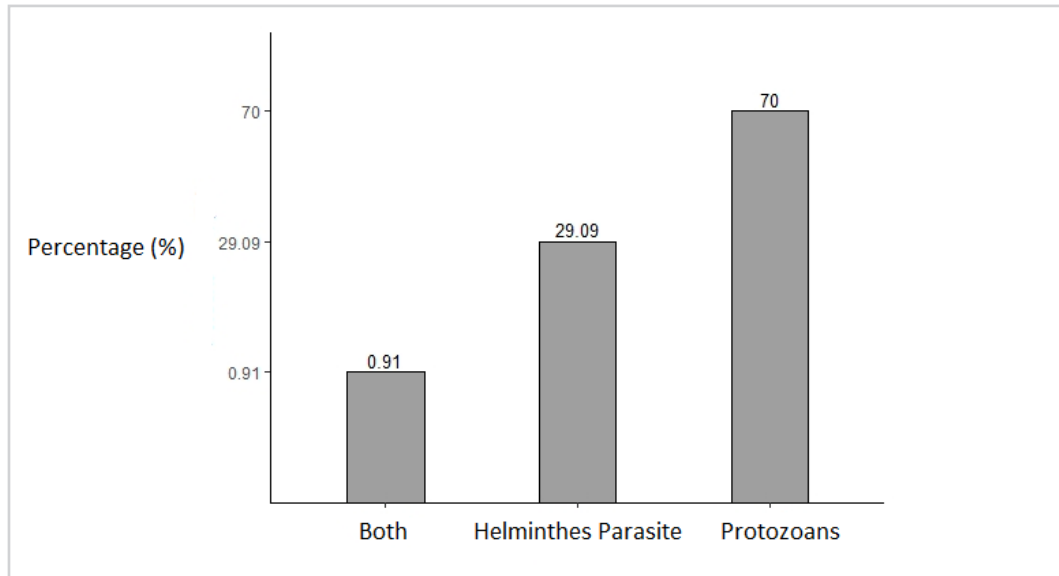

Figure 5 – Parasites diagnosed in fecal examinations for parasites.

DISCUSSION

Infectious and parasitic diseases stand out among the main causes of death worldwide[10]. Health studies indicate that prevention, control, and reduction of incidence are the main alternatives for mitigating their often serious effects[11]. These diseases are from helminths and protozoa that can be transmitted by soil, water, and food without proper hygiene[10]. They are neglected and affect populations living in a state of poverty, causing suffering and possibly leading to death, especially in children. It is estimated that 46 million children live in areas at risk of infection by these parasites. Thus, child health in Brazil is a topic that covers several aspects in social, educational, and public health policies[8-11].

It is important to discuss the profile of those responsible for the children, as they are the family structure. It was observed that the maternal presence was more constant; 132 mothers (85.16%). This result is in line with the literature, since a paternal figure is often the one who spends the day away from home to work, and the woman is considered the figure responsible for all monitoring of the children[12]. All those responsible for the children were farmers (n=155; 100%), thus recognizing that there is a continuity of agricultural work from father to son. This culture remains alive for families as it is their main source of income. The Brazilian Agricultural Research Corporation (EMBRAPA) estimates that about 70% of the food that reaches the tables of our homes comes from family farming[13]. This type of agriculture is directly related to the food and nutritional security of the Brazilian population[12].

In this study, a high rate of adults with low education was found, even with the offer of Youth and Adult Education (YAE) programs. Illiteracy is present in every age group and the Northeast is the region with the highest rate reaching 50%.[13] Education is important for the population to have knowledge of the main social determinants[12-14]. Many families justified that family income is from agriculture and social programs made available by the government. The high prevalence of infectious diseases, as well as worms, are associated not only with precarious environmental conditions, but also with economic conditions that lead to poverty[7].

In this social context, it was observed that the water supply in the community is still backward. The high prevalence of protozoa and helminths in waters considered to be contaminated is present in the reality of these families. In addition to the water used for intake, other forms of consumption can lead to contamination, whether through bathing, personal hygiene and food. It is known that the lack of water treatment is one of the main sources of parasitic infestation[14]. In the present study, most of participants ate food without performing proper hygiene (n=64; 41.29%). This data is worrisome since it is known that food is one of the main carriers of parasites[15]. Also associated with this, the handling of food in poorly hygienic conditions is an important factor in parasitic dissemination, which worsens more with people who handle food without prior hygiene[15-16]. It was also found that many families had their waste disposed of in the open, thus providing adequate conditions for the continuity of the parasites' life cycle[17].

77 (70%) children were parasitized by protozoa. The majority (n=33; 42.85%) were diagnosed with Entamoeba coli and Entamoeba histolytica. The presence of Entamoebas is closely related to socio-environmental conditions, contamination of water and food consumed, in addition to

the precarious living conditions that were verified in this community. The smaller number of cases due to Giardia intestinalis found in the survey (n=28; 36.36%) may be associated with little consumption of contaminated vegetables[18].

It was observed that the Height/Age presented expected values. 110 (70.97%) of the children obtained adequate standards. It is important to highlight that 19 (12.26%) of the children demonstrated thinness, which is an aggravation for malnutrition associated with more than half of infant deaths around the world[19]. The prevalence of underweight and parasitized children was identified in 17 (10.97%) individuals. This result demonstrates how much this condition can reflect on nutritional deficiencies, which can negatively contribute to the child's growth, development, and health[15]. Low height deficit was found in 24 (15.48%) children, and 7 (4.52%) children had very low height[20].

CONCLUSION

Intestinal parasitosis is a major public health problem, with children living in poorer communities, especially quilombos, being the most vulnerable group for these diseases. Above all, it depends not only on changes in eating habits and daily life, but on new actions aimed at public policies. New practices are needed, for which families depend on changes in the health conditions in which they live. It was noticed in the study that socioeconomic and demographic factors are variables that contribute to the emergence of health problems in this community. Corroborating with other studies that also showed the existence of precariousness in public policies that are aimed at these populations, which are, therefore, a crucial factor in the health-disease process of children.

It was evident that there are major problems in sanitary and cultural conditions that directly contribute to the emergence of parasitic diseases. It was noticed that there are great gaps in the axis of the DSS of this community, demonstrating a significant scenario of social inequality. The high prevalence of intestinal parasitosis may be associated with the lack of better living conditions, whether at a structural or assistance level.

There was a high prevalence of parasitized children, as well as nutritional deficits (thinness, short stature, and low weight). Through the analyses performed, no statistically significant association was verified. Thus, the presence of helminths and/or protozoa in the children in the study was not directly associated with nutritional indicators. However, there was a statistically significant relationship between the variables of water intake and water treatment at home, for those children who were parasitized. This association between parasitosis and nutritional status is still a major health problem in several social contexts and directly impacts the child's growth and development. Therefore, this study positively contributed to improve the social and political visibility of the quilombola community, thus, highlighting the importance of action initiatives that favor the structural improvement of the community and the lives of children.

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