J. Health Biol Sci. 2023;11(1):1-11 doi: 10.12662/2317-3206jhbs.v11i1.4637.p1-11.2023

ORIGINAL ARTICLE

Social and health indicators in an academic community: enteroparasites, nutritional, allergic and clinical aspects

Indicadores sociais e de saúde em uma comunidade acadêmica: enteroparasitos, aspectos nutricionais, alérgicos e clínicos

Edemilton Ribeiro Santos Junior[1], Raoni dos Santos Andrade[1], Aldery Souza Passos[1], Raíssa da Silva Santos[1], Glauber Andrade dos Santos[1], Mariana Soares de Almeida[1], Érica Santos Bomfim[1], Paulo José dos Santos de Matos[1], Luana Brunelly Araújo de Lima[1], Karine Sampaio de Carvalho[2], Rebeca Correia Rossi[1], Wesley Araújo de Albuquerque[1] Manuella Silva Correia[1], Lívia Sousa Ribeiro[1], Ana Lúcia Moreno Amor[1]

1. Centro de Ciências da Saúde - Universidade Federal do Recôncavo da Bahia - Brasil. 2. Instituto de Ciências da Saúde - Universidade Federal da Bahia - Brasil.

Abstract

Objective: this study aimed to associate enteroparasitic infection with nutritional, allergic, and clinical repercussions and the sociodemographic aspects in an academic community in Santo Antônio de Jesus, Bahia, Brazil. **Methods**: the cross-sectional research was carried out between February 2018 and March 2020, with 121 participants. Spontaneous sedimentation and Rugai techniques were used for the parasitological diagnosis of fecal samples. Allergies and clinical issues and the sociodemographic aspects were studied via a questionnaire, and the nutritional status was obtained from the assessment of body mass index and arm and abdominal circumferences. **Results**: there was 38.2% positivity for intestinal parasites; 65.9% for female participants; with the majority of eutrophic, between 18-27 years old; heteronormative, and single. Besides, the Endolimax nana (78.7%) and Giardia duodenalis (21.3%) were the predominant species. Statistical significance was found between obesity rates and the presence of intestinal parasites and those with allergic aspects. Nervousness, headache, and back and abdominal pains were the most common symptoms. **Conclusions**: this study contributes to obtaining data on epidemiological and public health surveys in the Bahian territory, providing a reference for other researchers. The statistical association of these with nutritional and allergic aspects can support future research on this population.

Keywords: Parasitic diseases; nutrition. signs and symptoms; diagnosis. universities

Resumo

Objetivo: este estudo teve como objetivo associar a infecção enteroparasitária com aspectos nutricionais, alérgicos, clínicos e sociodemográficos em uma comunidade acadêmica do município de Santo Antônio de Jesus, Bahia, Brasil. **Método:** a pesquisa transversal foi realizada entre fevereiro de 2018 e março de 2020, com 121 participantes. As técnicas de sedimentação espontânea e Rugai foram utilizadas para o diagnóstico parasitológico de amostras fecais. Alergias, questões clínicas e aspectos sociodemográficos foram estudados por meio de um questionário, e o estado nutricional foi obtido por meio da avaliação do índice de massa corporal e das circunferências braquial e abdominal. **Resultados:** houve 38,2% de positividade para parasitos intestinais; 65,9% para participantes do sexo feminino; com a maioria eutrófica, entre 18-27 anos; heteronormativa e sigle. Além disso, Endolimax nana (78,7%) e Giardia duodenalis (21,3%) foram as espécies predominantes. Foi encontrada significância estatística entre as taxas de obesidade e presença de parasitos intestinais e com aspectos alérgicos. Nervosismo, dor de cabeça, dores nas costas e abdominais foram os sintomas mais comuns. **Conclusões**: este estudo contribui para a obtenção de dados sobre inquéritos epidemiológicos e de saúde pública no território baiano, servindo de referência para outras pesquisas. A associação estatística destes com aspectos nutricionais e alérgicos pode subsidiar futuras pesquisas nesta população.

Palavras-Chave: Doenças parasitárias; nutrição; sinais e sintomas; diagnóstico. universidades.

INTRODUCTION

Parasitic diseases represent a Public Health problem since they are associated with social determinants, such as basic sanitation and precarious economic conditions, which provide the perpetuation of parasitic cycles in social interactions[1] and require continuous work by the whole society for its prevention and control[2,3].

Health education represents a great collaborator in the prophylaxis of infectious or parasitic diseases. It aims to share information with the community or public of action to which it is intended, aiming at their autonomy to improve the communication and grow the discussion forms[4].

The socioeconomic, sanitary, and educational condition analyses show a more enlightening panorama of the determining scenario for the infection evolution and dialogue with Public Health. In contrast, the high dissemination rate of agents of these infections through water, soil, and food demonstrates that the triggering of these diseases can reach anyone in the epidemiological triad of infection. It means anyone who is in the environment where there is the interaction of the parasite with the host, collaborating in the triad maintenance[5].

Correspondence: Ana Lúcia Moreno Amor - Centro de Ciências da Saúde, Universidade Federal do Recôncavo da Bahia - Avenida Carlos Amaral, 1015 - Cajueiro, Santo Antônio de Jesus - Bahia - Brasil. CEP: 44.430-622. Email: ana_amor@ufrb.edu.br
Conflict of interesse: There is no conflict of interest on the part of any of the authors.
Received: 2022 Dec 17; Revised: 2023 Jun 9; Accepted: 2023 Jun 16

Personal and food hygienes are essential variables in the health-disease process and allies in prevention measures. The lack of information on attitudes like washing hands, wearing sandals, sanitizing food, and consuming potable water is still a difficulty in the primary prevention of these infections3.

Housing and social living conditions can develop vulnerabilities and benefit the emergence of parasitic diseases caused by helminths and protozoa. Furthermore, they are variables that influence other health conditions like allergic and respiratory conditions, which may also have an immunomodulatory relationship with helminthic diseases2.

The systemic repercussions of parasitic diseases promote a series of complications in each individual's health-disease process, labor issues, cognitive growth, and organic development3. Moreover, such infections carry a greater risk of nutritional imbalance, which stimulates disorder in intestinal metabolism and allows deterioration of the health condition5.

The significant morbidity of parasitic diseases happens due to their range of symptoms and immunological "attacks" that can occur to combat these aggressors. Consequently, the clinical condition can be aggravated by: diarrhea; dysentery; abdominal pain or cramps; malnutrition; anorexia; anemia; mood changes; anxiety; agitation; among other symptoms6.

It allows transformations in the in the newborn life and changes in their feeding pattern that can worsen the individual's health status and allow them to be more vulnerable. Besides, it provides greater contact with diseases transmitted by water and food, such as intestinal parasites7.

Sironi et al.8 identified the lack of hand washing and the finding of dirty university toilets as predisposing factors for infection by enteric parasites in students from a federal university in southern Brazil.

Considering the topics above, the health conditions of an academic community in Santo Antônio de Jesus (Bahia/Brazil) were investigated based on the study of the association of the finding of enteric parasites with nutritional, allergic, clinical and sociodemographic aspects, based on the few studies on the status of these infections and their associations in academic communities of higher education institutions.

METHODS

Study design: This is a cross-sectional research carried out from February 2018 to March 2020. The sample was chosen for convenience due to the easy contact with the participants (students, professors, technicians, and servers outsourced from a federal university located in the municipality of Santo Antônio de Jesus, Bahia, Brazil) so that the results could be extended to the epidemiological reality of the public evaluated. Descriptive research was carried out, focusing on an interpretive approach. The obtained results reflect the studied universe for the period in question.

After signing the Free and Informed Consent Term, human fecal samples were collected from each participant who responded to the questionnaire applied. All results were delivered personally to the participants and guidelines about the positivity of the samples were passed on, and extension actions were organized in the halls of the Teaching Center9 for guidance on the findings.

Laboratory procedures: For enteric parasites investigation, the parasitological techniques of spontaneous sedimentation and Rugai's[10] were used, which helped in helminths identification (eggs and larvae) and/or protozoa (cysts). The laboratory analyses were carried out in the Laboratory of Parasitology at the Health Sciences Center of the Federal University of Recôncavo of Bahia / CCS-UFRB, Brazil.

Assessment of allergic diseases, nutritional status and sociodemographic aspects

A standard questionnaire used by the International Study on Asthma and Allergies in Childhood (ISAAC) was applied11 for questions related to allergic diseases (asthma, rhinitis, and eczema) with the insertion of questions about the sociodemographic profile of the studied population. For the nutritional status analysis, the Body Mass Index (BMI) was used: BMI=weight/height² (kg/m²), with adequacy by percentiles by sex, with reference values to identify obesity, overweight, eutrophic, thinness, and accentuated thinness[12]. Arm Circumference (AC) measurement was also evaluated, which is used as an anthropometric nutritional parameter recommended by the World Health Organization (WHO) to estimate total skeletal muscle protein[13].

The classification of nutritional status was appropriate according to the following equation: (assessed AC/AC 50th percentile) x 100. Thus, based on the result, it was classified as severe malnutrition if <70%; moderate malnutrition if 70-79.9%; mild malnutrition if 80-89.9%; eutrophic if 90-109.9%; overweight if 110-119.9%; obesity if >120%[14].

The AC was measured using a tape measure with arms extended along the body, at the midpoint between the scapula's acromion and the left ulna's olecranon. The midpoint is obtained with the arm flexed at 90º, and the AC value was obtained with the arm relaxed, taking care not to compress soft parts[12].

Finally, the Waist Circumference (WC) was measured at the midpoint between the lower costal margin and the anterosuperior iliac crest. Its measurement is highly connected with cardiovascular risk, with values lower than 94 cm for men and 80 cm for women considered normal12. These measurements were guided by the Laboratory of Nutritional Assessment of the CCS/UFRB.

Statistical Analysis: Data were processed and analyzed using the IBM SPSS Statistics 20 program through the distribution

of frequencies, means, standard deviation, and median of the continuous and categorical variables analyzed. Association tests, measures of comparison of means, confidence intervals, statistical significance, ratio, chance, and grouping of results, with the variables mentioned above, will be carried out later for the final version of this study. Statistical significance will be declared when p≤0.05.

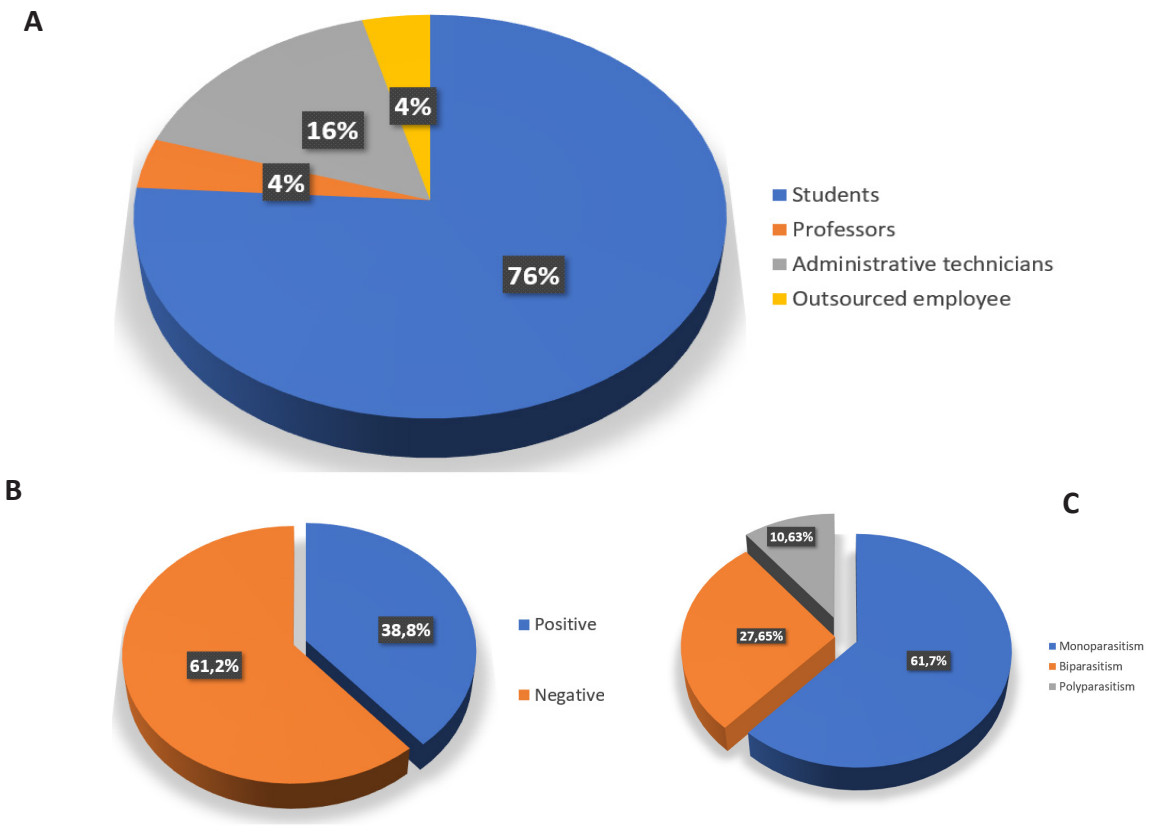
This research is an excerpt of a study authorized by the Ethics Committee in Research with Human Beings of the Federal University of Recôncavo da Bahia, protocol nº 40542314.5.0000.0056.

RESULTS

Data from 121 individuals (92 undergraduate students, 05 professors, 05 administrative technicians, and 19 employees of outsourced companies/service providers) were analyzed, as presented in the initial data by Souza Passos et al.[15] (Figure 1A).

The result of the parasitological test showed positivity for parasitic infection in 38.20% of the samples evaluated (Figure 1B), observing, of this quantity, 61.70% corresponding to cases of monoparasitism; 27.65% for biparasitism; and 10,63% for polyparasitism by helminth and/or protozoan species (Figure 1C).

Figure 1 A. Participant data by category evaluated. (B e C) Parasites prevalence by species in the analyzed samples - Santo Antônio de Jesus, Bahia, Brazil - Period 2018-2020: **B**. Percentage of positive and negative samples; **C**. Parasitism level (mono, bi, and polyparasitic)



Source: Prepared by the researchers.

For the species, the following absolut frequencies were found: Endolimax nana (n=37); Giardia duodenalis (n=10); Entamoeba coli (n=9); Entamoeba histolytica (n=7); Iodamoeba butschlii (n=4); Trichostrongylus sp (n=1); and hookworms (Ancylostoma duodenale/Necator americanus) (n=1). These data highlight the predominance of infections by protozoa and the finding of the Trichostrongylus sp helminth, a not very frequent finding in the region[15].

Tables 1 and 2 describe the distribution of the study group by stool parasitological result according to the variables of sociodemographic data and nutritional status (BMI, AC, and AC/WC) and symptomatology (signs and symptoms).

Regarding the results highlighted in Table 1, statistically significant data were found (p≤0.05) in the parasitic associations with sexual orientation or employment relationships.

Among the parasitized individuals, 23.1% were eutrophic, with 10.2% of the analyzed data showing parasitic infection in overweight people, according to BMI (Table 2).

Table 1. Relationship between sociodemographic data and parasitological analysis - 2018-2020 period

Variables	Fecal Parasitological - Positive		Fecal Parasitological - Negative		Total		p-value
	n	%	n	%	n	%	
Gender							**0.24**
Male	16	47.1	18	52.9	34	28.1	
Female	31	35.6	56	64.4	87	71.9	
Age range (años)							0.26
18-27	31	39.7	47	60.3	78	64.4	
28-37	7	30.4	16	69.6	23	19.0	
38-47	5	50.0	5	50.0	10	8.3	
48-60	4	40.0	6	60.0	10	8.3	
Sexual orientation							**0.003***
Heterosexual	37	33.9	72	66.1	109	90.1	
Male homosexual	5	100.0	----	----	5	4.1	
Bisexual	2	50.0	2	50.0	4	3.3	
Did not inform	3	100.0	----	----	3	2.5	
Oral-anal intercourse practice							**0.013***
No	40	35.7	72	64.3	112	90.1	
Yes	7	77.8	2	22.2	9	4.1	
Marital status							**0.84**
Single	39	39.4	60	60.6	99	81.8	
Married	7	38.9	11	61.1	18	14.9	
Stable union	1	25.0	3	75.0	4	3.3	
Labor relationship							**0.001***
Signed card	8	32.0	17	68.0	25	20.7	
Without Signed Card	4	80.0	1	20.0	5	4.1	
Scholarship	21	65.6	11	34.4	32	26.4	
Other	2	20.0	8	80.0	10	8.2	
Does not work	12	24.5	37	75.5	49	40.6	
There are children under 5 years old in the residence							**0.56**
Yes	1	25.0	3	75.0	4	3.3	
No	46	39.3	71	60.7	117	96.7	
Room numbers in the house							0.65
1-4	7	33.3	14	66.7	21	17.4	
5-6	19	35.8	34	64.2	53	43.8	
>7	21	44.7	26	55.3	47	38.8	
Resident numbers							0.15
1-2	26	34.2	50	65.8	76	62.8	
3-4	15	40.5	22	59.5	37	30.6	
5-6	6	75.0	2	25.0	8	6.6	

*p≤0.05 = significantly statistical result. Source: Prepared by the researchers.

Table 2. Distribution of the study population by fecal parasitological result according to the variables evaluated - Santo Antônio de Jesus, Bahia, Brazil, 2018 – 2020

Variables	Fecal Parasitological Examination						p-value
	Positive		Negative		Total		
	n	%	n	%	n	%	
Nutritional status / BMI **							0.09
Pronounced thinness	0	0.0	0	0.0	0	0.0	
Thinness	0	0.0	5	4.6	5	4.6	
Eutrophy	28	23.1	42	38.9	70	64.8	
Risk of overweight	1	0.9	2	1.9	3	2.8	
Overweight	11	10.2	10	9.3	21	19.4	
Obesity/severe obesity	3	2.8	6	5.6	9	8.3	
Nutritional status / AC***							0.06
Below adequate	1	0.9	4	3.4	5	4.3	
Adequate	43	37.0	64	55.1	107	92.2	
Above adequate	2	1.7	2	1.7	4	3.4	
Nutritional status / WC****							0.2*
Adequate	30	25.0	48	40.0	78	65.0	
Above adequate	17	14.2	25	20.8	42	35.0	
Symptomatology	0.9						
Yes	45	37.2	61	50.4	106	87.6	
No	2	1.7	13	10.7	15	12.4	

*p≤0.05 = significantly statistical result (Chi-square statistical test – uncorrected, calculated by SPSS Statistics version 20). **BMI = Body Mass Index. The variable was composed of 108 individuals. ***AC = Arm circumference. The variable was composed of 116 individuals. ****WC = Waist Circumference. The variable was composed of 120 individuals.

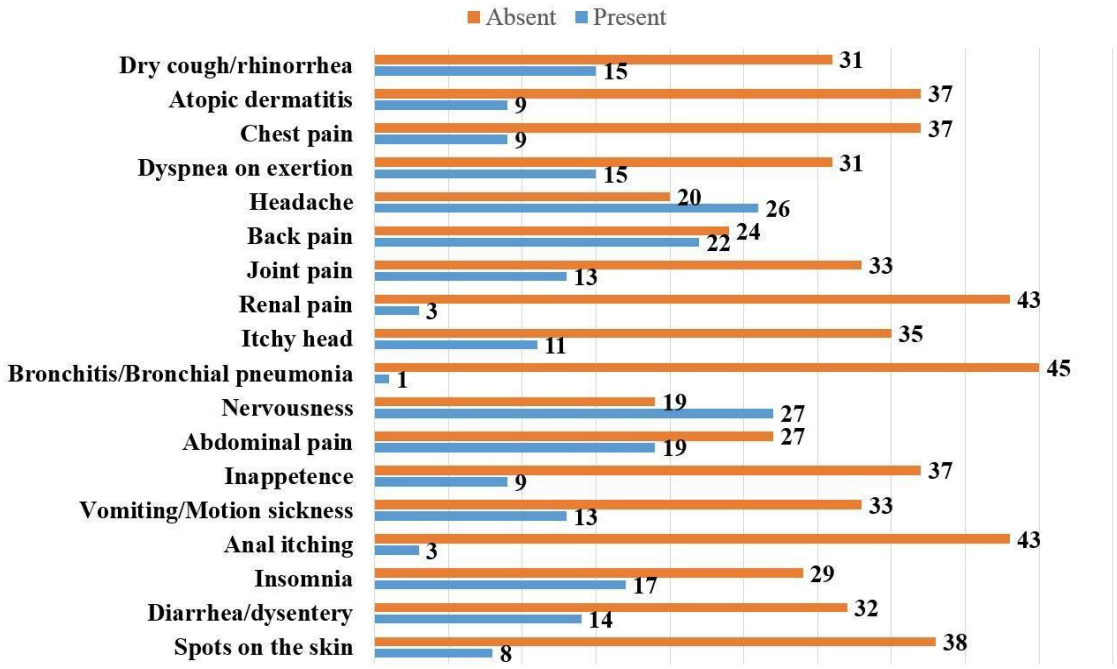
Source: Prepared by the researchers.

The same pattern was observed when the nutritional status was analyzed from the AC, observing that 37% of the samples were within the adequate standards of nutritional status. However, 1.7% showed an increasing change in nutritional status, equivalent to that analyzed before the BMI. When investigating the nutritional status under the assessment by the WC, statistical significance stands out (p≤0.05).

About 37.2% of the study subjects with positive samples in the parasitological test had some symptoms. On the other hand, 50.4% of participants who were not diagnosed with parasitic infection also had some symptoms.

Figure 2 shows the signs and symptoms reported by the interviewees in the last 15 days before this research, associated with the parasitic infection state, with the presence of the following clinical findings: dry cough/rhinorrhea (n=15); urticaria/eczema (n=9); chest pain (n=9); dyspnea on exertion (n=15); headache (n=26); back pain (n=22); joint pain (n=13); renal pain (n=03); head itching (n=11); bronchitis/pneumonia (n=01); nervousness (n=27); abdominal pain (n=19); inappetence (n=09); vomiting/nausea (n=13); anal itching (n=03); insomnia (n=17); diarrhea/dysentery (n=17); skin spots (n=08). Nervousness, headache, back pain, abdominal pain, diarrhea/dysentery, and insomnia stand out as the most reported clinical findings by the sample.

Figure 2. Signs and symptoms distribution in individuals with positive fecal parasitology in Santo Antônio de Jesus, Bahia, 2018-2020.



Source: Prepared by the researchers.

Table 3 relates the effect of parasitic infection with or without a clinical diagnosis for asthma, rhinitis, and eczema in the individuals in the sample. All the variables of this analysis showed statistical significance (p≤0.05) in the analyzed samples. For participants who did not have a clinical diagnosis, the variable "no diagnosis" was established.

Considering having ("yes") and not having a ("no") clinical diagnosis for the investigated allergic manifestations, higher frequencies of these manifestations are highlighted in participants with a negative result of the parasitological analysis of their feces.

The association of positive samples for enteric parasites with a diagnosis of asthma was reported by 4.1% of the public. In comparison, 6.6% reported having a history of allergic rhinitis and, with the same percentage, eczema with symptoms present for the last 12 months.

Table 3. Effect of parasitic infection with asthma, allergic rhinitis, and eczema in 121 individuals surveyed - Santo Antônio de Jesus, Bahia, in 2018-2020

Variables**	Fecal Parasitological Examination										
	Mono parasitized		Bi- parasitized		Poly-parasitized		Negative		Total		p-value
	n	%	n	%	n	%	n	%	n	%	
Asthma											0.04*
Yes	3	10.3	0	0.0	2	40.0	13	17.6	18	14.9	
No	5	17.2	2	15.4	2	40.0	9	12.2	18	14.9	
Without diagnosis	21	72.4	11	84.6	1	20.0	52	70.3	85	70.2	
Rhinitis										0.05*	
Yes	3	10.3	3	23.1	2	40.0	13	17.6	21	17.4	
No	2	6.9	0	0.0	1	20.0	4	5.4	7	5.8	
Without diagnosis	24	82.8	10	76.9	2	40.0	57	77.0	93	76.9	
Eczema											0.05*
Yes	3	10.3	3	23.1	2	40.0	13	17.6	21	17.4	
No	2	6.9	0	0.0	1	20.0	4	5.4	7	5.8	
Without diagnosis	24	82.8	10	76.9	2	40.0	57	77.0	93	76.9	
Total	**29**		**13**		**5**		**74**		**121**		

DISCUSSION

The findings of this research for commensal and/or pathogenic enteric parasites reflect the existence of the epidemiological triad of infection since there is an encounter between the parasite and the host in the environment16. Also detected in other studies for related publics in Brazil, as by Odwyer and Amor[17] and Almeida et al.[18] with undergraduates and employees of a higher education center, respectively, in the city of Santo Antônio de Jesus (Bahia).

The biparasitism and polyparasitism presented raise an alert about the spread of parasites in the environment, which may indicate the need for more investment in the health education area and prevention mechanisms[19,20]. The highest occurrence of monoparasitism was also observed by Cabral-Miranda, Dattoli, and Dias-Lima[21] in Senhor do Bonfim (Bahia), where they found a prevalence of 79.3% of monoparasitism in the analyzed samples. High frequencies of biparasitism and polyparasitism were also observed in other studies, as in an Amapá community[22], in university students of Ethiopia19,20, and in the municipality of Malhada (Bahia)[23].

The frequency of pathogenic protozoa (G. duodenalis and E. histolytica) and commensals (E. nana, E. coli, and I. Butschlii) infection was higher than helminths infection, being these findings in agreement with Brito et al.[24] (in three laboratories in Aracaju, Sergipe), Cabral-Miranda, Dattoli and Dias-Lima[21] (in a quilombola community of Bahia) and with Fonsêca et al.[25] (with children and adolescents in the rural area of the municipality of Santo Antônio de Jesus, Bahia). Furthermore, similar results have been verified in previous studies in this academic community[26,27].

Although this high rate of commensal protozoa is undervalued in the clinical aspect, this reference is hugely relevant for the discussion of hygiene measures since its existence is conditioned to water and food transmission, and there may be happening fecal-oral transmission[28,29,30].

G. duodenalis, the most common pathogenic protozoan in coproparasitological analysis, is a frequent finding in studies that correlate diseases transmitted by water and food[16,22]. Its presence corroborates the need to adopt health education measures that promote the interruption of unhygienic practices among individuals[19].

This protozoan is one of the main etiological agents of acute diarrhea, together with E. histolytica, with a high incidence in cases of dysentery. While the first promotes the malabsorption syndrome in the small intestine, the second can carry out a luminal cycle, invasive or extra-intestinal, constituting a severe factor of seriousness for Public Health, mainly due to its gastrointestinal disorders[30,31]. Abdominal pain and diarrhea/dysentery symptoms were reported by research participants and corroborate the clinical condition of giardiasis and amoebiasis, which may have a direct correlation.

In general, access to information presents itself as a protective factor for parasitic infection16. Although the sample population of this study is primarily individuals who have or have had access to higher education, exposure to contaminated elements, like water and food, can remain high if there is an environment conducive to parasitic spread. Thus, the frequency of intestinal parasitosis can remain high[21], in addition to the lack of personal and/or food hygiene, which in many situations is also an individual behavior.

The low frequency of helminths may be associated with increased prophylactic adherence to the use of albendazole, which is an effective anthelmintic distributed by the Brazilian Unified Health System (SUS) and/or has cheaper prices, which promotes easier access and, therefore, a decrease in the rates of these parasites, different from antiprotozoa[32].

The occurrence of Trichostrongylus sp is a peculiar finding, given its low incidence and research in human coproparasitology[33]. In a study conducted with Japanese food handlers in João Pessoa (Paraíba, Brazil), the occurrence of 16.6% of Trichostrongylus sp[29] was identified, concomitantly with this, in Imperatriz (Maranhão, Brazil), parasitic forms of this helminth were identified in coriander sold at open markets[34]. Moreover, using animal feces as fertilizers, mainly from ruminants, may be another risk factor for this helminthiasis[35], a fact attributed to this study with individuals from a higher education center in the interior of Bahia[15].

This finding highlights the need for further studies to assess the risk factors associated with infection by Trichostrongylus sp, including other animal species as possible hosts of this parasite. It also highlighted the need to carry out projects that involve the empowerment /training of health professionals who work in the diagnosis and care of patients for better quality control of the analyzed material, working together in the epidemiological data and treatment of those involved, when necessary.

The symptoms of parasitic infections are diverse and demand an individualized study for the differential diagnosis of each parasitosis16. Regarding the health aspect of individuals related to allergic manifestations, the study by Fonsêca et al.[25] demonstrated a frequency of 34% for eczema and 6.3% for asthma in children from a rural community in Santo Antônio de Jesus (Bahia). In the study proposed here in the same municipality but with the academic community in question, these manifestations had similar frequencies, considering the total number of participants clinically diagnosed for these alterations and positive fecal samples for enteric parasites.

Some variables showed statistical significance with the occurrence of enteroparasites. However, due to the sample size, it is not comfortable to say about a possible association of protection between infection by enteric parasites and allergic

conditions in this population. This factor is seen in studies with helminths, where they may have a substantial effect in protecting against allergic manifestations[16,36,37]. Strachan explained the hygiene hypothesis in 1989, which proposes precisely the relationship between exposure to helminths and other pathogens and the reduction of allergic disorders[38].

In participants with a negative result in the fecal parasitological test, the frequencies of these clinical manifestations were higher. Although there is a strong association between the suppression of allergic symptoms after parasitic infections, mainly mediated by helminths, but not exclusively, there may be an eosinophilic hypersensitivity resulting from infection by protozoa[28].

The assessment of the nutritional profile acquires great importance in observing the symptomatic conditions caused by intestinal parasites[16]. Most parasitized participants were eutrophic when examined based on BMI and AC. However, when the nutritional status is evaluated using the WC, the statistical significance of this variable can be seen, configuring a probable association with parasitosis. Such interpretation can be supported by Freitas et al.[39]. They indicated that individuals with abdominal obesity tend to increase the risk of comorbidities, which can be considered as making them more vulnerable and susceptible to more morbid clinical conditions caused by possible infections.

The nutritional status of the Brazilian population is in transition, where the malnutrition profile has decreased in the face of the obesity epidemic[40].

Palheta et al[41] report that entering the University and the job market promotes several social changes that directly impact the lifestyle of this individual in a way that modifies psychological, emotional, social and physiological relationships, resulting in an imbalance in their habits of life. This can increase adherence to unhealthy habits and inadequate diets, consequently exposing their vulnerability to pathogens transmitted by water and food. The high percentage of negative fecal parasitological samples is an expressive finding and may represent a satisfactory element when evaluating the health aspect of individuals. Nevertheless, the biological character of the parasite's reproductive cycle is revealed, which can vary and lead to a false negative diagnosis since the collection was performed only at a specific moment[26]. A more significant number of fecal samples surveyed increases the probability of finding the parasite if present in these[42].

Considering the prophylaxis of parasitic diseases, public health policies in Brazil have focused on the prophylactic treatment of helminth infections rather than investing in basic sanitation4[3,44,45,46].

As research data, some studies show an association of sexually transmitted intestinal infections with people who practice anal-oral sex[47,48,49]. Therefore, it is relevant to understand/identify their possible infection/transmission mechanisms.

All non-heteronormative and/or non-recorded participants about sexual orientation were positive for some enteric parasites also being high in those who reported having anal-oral intercourse regardless of sexual orientation. Five of these show positivity for G. duodenalis. With this result, giardiasis is not associated here with people's sexual orientation, but the need to establish more effective prophylaxis is highlighted because bacterial, viral, and/or parasitic pathogens can be transmitted through sexual practices that facilitate oral-fecal contamination[50,51,52,53].

Finally, it is revealed that educational interventions, such as the interactive health fair held by this team and arranged by Passos et al.[9], collaborate in the improvement of the knowledge about parasitic diseases in a way that contributes to the adequate prevention, treatment, and control measures of these, in addition to collaborating in the understanding of the symptoms and associations that can occur with other parasitic diseases and comorbidities[54]. According to an action carried out by Rodrigues, Scherer, and Moreira55 in a group of Community Health Agents, they observed improvement in these professionals after a guidance activity regarding the importance of drinking filtered or boiled water, adequate food hygiene, hand washing and fighting to parasite-carrying insects, which strengthened the role of knowledge multipliers in the enrolled population.

Health education is an excellent protection factor, as it can by allowing the sharing of information and instruct and train individuals to act in the prevention and fight against parasitic diseases. In this manner, educational interventions stimulate the prevention of parasitic diseases and the non-perpetuation of the epidemiological triad of infection, generally associated with the reflection and discussion of hygienic and sanitary conditions, which makes it possible to raise awareness about intestinal parasites[4].

Considering that there is little epidemiological information, especially on individuals who are part of academic communities in federal universities, the determination of the profile of enteric parasitic infections and the association of this with the variables nutritional, allergic, and clinical aspects collaborate to provide greater visibility on the health conditions of the public involved, contributing to the development of future investigations and actions with this group and the prevention of health problems in these communities, since it is a teach-and-learning environment. The finding of infection by commensal protozoa suggests fecal-oral contamination, being a route of infection also for pathogenic protozoa and other etiological agents transmitted by water, food, and poor hygiene (personal, food, and/or sexual practices), which confirms the need to promote activities with an educational aim.

By registering in this study the encounter of commensal and pathogenic protozoa and their association with nutritional and allergic aspects and the practice of oral-anal sex, this finding denotes the consistency of the data concerning the literature specific on intestinal parasitic diseases, which may express the

quality of the information signaled here.

The findings epidemiological influenced the health profile of this university community, with the need to persist in health education and implement active measures such as evaluation of water from drinking fountains, hygiene of university food, among others, to reduce the infection rates found and that this study can be replicated periodically after the implementation of measures to verify the effect on future prevalence.

ACKNOWLEDGMENTS

The National Council for Scientific and Technological Development and the Foundation for the Support of Research in the State of Bahia.

REFERENCES

1. Grimes C, Ronchi DL, Hirano ZMB. Prática pedagógica diferenciada nos processos de ensinar e de aprender em Parasitologia. Ens Saúde Amb. 2013; 6(1): 89-100. doi: https://doi.org/10.22409/resa2013.v6i1.a21007.

2. Brauer AMNW, Gradella DBT, Souza AA, Souza MAA. Socioeconomic and parasitological aspects in Quilombola communities in two of the oldest municipalities in Brazil. Rev. Salud Pública. 2019; 21(6): 588–594. doi: https://doi.org/10.15446/rsap.v21n6.76110.

3. Silva RSB, Malheiros AF, Santos DP, Shaw JJ, Araújo MSM, Moraes MFA, Campos WNL. Estudo de parasitoses intestinais em moradores de Corumbá, Mato Grosso do Sul, Brasil. RICA. 2019;10(2): 110-125. doi: https://doi.org/10.6008/cbpc2179-6858.2019.002.0010.-

4. Falkenberg MB, Mendes TPL, Moraes EP, Souza EM. Educação em saúde e educação na saúde: conceitos e implicações para a saúde coletiva. Cien Saude Colet. 2014;19(3): 847-852. doi: https://doi.org/10.1590/1413-81232014193.01572013.

5. Padilha AS, Sperotto RL, Portella AF, Henn A. Análise da ocorrência de parasitos com potencial zoonótico no solo de escolas municipais infantis em dois municípios do Rio Grande do Sul. Clin Biomed Res [Internet]. 2019; 39(1): 9-14. doi: https://doi.org/10.4322/2357-9730.85692.

6. Antunes RS, Morais AF. Correlação de alterações hematológicas em doenças parasitárias. RBAC. 2019; 51(3): 191-195. doi: https://doi.org/10.21877/2448-3877.201900808.

7. Pivetta H, Martins JS, Souza MAA. Intestinal parasitoses in students in a public school in the municipality of São Mateus, Espírito Santo, Brazil. BJPE 2021; 6(9): 1–13. doi: https://doi.org/10.47456/bjpe.v6i9.33863.

8. Sironi BB, Schneider DF, Barbosa de Oliveira J, Niero Santos L, Rodrigues de Moraes RQ, Toledo MJO. Awareness and understanding of risk factors for intestinal parasitic infections at a public university in southern Brazil. J Trop Pathol. 2021; 50(1): 49–60. doi: https://doi.org/10.5216/rpt.v50i1.66111.

9. Passos AS, Santos Junior ER, Bomfim ES, Matos PJS, Almeida MS, Carvalho KS, et al. Interactive fair: Use of innovative methodologies in health education. Res. Soc. Dev. 2021; 10(6): e54910616168. doi: https://doi.org/10.33448/rsd-v10i6.16168.

10. De Carli GA. Parasitologia Clínica: seleção de métodos e técnicas de laboratório para o diagnóstico das parasitoses humanas. 2. ed. São Paulo: Atheneu. 942p.

11. Asher MI, Keil U, Anderson HRR, Beasley R, Crane J, Martinez F, et al. International Study of Asthma and Allergies in Childhood (ISAAC): rationale and methods. Eur Respir J. 1995; 8(3): 483-491. doi: https://doi.org/10.1016/j.aller.2012.03.001.

12. Ministério da Saúde (BR). Orientações para a coleta e análise de dados antropométricos em serviços de saúde: Norma Técnica do Sistema de Vigilância Alimentar e Nutricional – SISVAN. Brasília : Ministério da Saúde; 2011. 76 p.

13. Najas MS, Nebuloni CC. Avaliação nutricional. In: Ramos LR, Toniolo J Neto. Geriatria e Gerontologia. Barueri: Manole; 2005. p 299.

14. Frisancho AR. New norms of upper limb fat and muscle áreas for assessment of nutritional status. Am J Clin Nutr. 1981; 34(11): 2540-2545. doi: https://doi.org/10.1093/ajcn/34.11.2540.

15. Passos AS, Santos RS, Andrade RS, Santos ER Junior, Bomfim ES, Ribeiro LS, et al. Enteric parasites and socio-epidemiological variables in an academic community. J Trop Pathol. 2021; 50(2):163–178. doi: https://doi.org/10.5216/rpt.v50i2.67673.

16. Carvalho FL, Souza VB, Jesus JM, Santos IP, Almeida JS, Pereira JS, et al. Enteroparasitos, indicadores socioculturais e de saúde em uma população de 0 a 18 anos do município de Santo Antônio de Jesus (Bahia) - período de 2010 a 2011. J. Health Biol Sci. 2016; 4(1): 8-17. doi: http://dx.doi.org/10.12662/2317-3076jhbs.v4i1.192.p8-17.2016.

17. Odwyer SS, Amor ALM. Ocorrência de enteroparasitos em estudantes por curso de graduação no Centro de Ciências da Saúde - Santo Antônio de Jesus / Bahia. In: Anais da Reunião Anual de Ciência, Tecnologia, Inovação e Cultura no Recôncavo da Bahia; 2011; Cruz das Almas: Universidade Federal do Recôncavo da Bahia; 2011. p. 1087-1088.

18. Almeida JS, Silva IM, Santos GA, Mota LHS, Paz VS, Amor ALM. Enteroparasitos e sintomatologia em funcionários de um estabelecimento de ensino superior. In: Dias-Lima AG. Anais do XXIV Congresso da Sociedade Brasileira de Parasitologia e do XXIII Congresso Latinoamericano de Parasitologia, Salvador, Bahia; 2015. p. 308-308.

19. Abebe A, Amenu D. Prevalence of intestinal protozoan among students visiting Wollega University Students' Clinic. WJSRR [Internet]. 2013 Dec 5 [Accessed on: 2022 Aug 5]; 1(1): 1-7. Disponível em: https://www.researchgate.net/publication/315822698_Prevalence_of_Intestinal_Protozoan_among_Students_Visiting_Wollega_University_Students%27_Clinic.

20. Ayele BH, Geleto A, Ayana DA, Redi M. Prevalence of feco-oral transmitted protozoan infections and associated factors among university students in Ethiopia: a cross-sectional study. BMC Infect Dis. 2019 Jun; 19(1): 499. doi: https://doi.org/10.1186/s12879-019-4095-z.

21. Cabral-Miranda G, Dattoli VCC, Dias-Lima A. Enteroparasitos e condições socioeconômicas e sanitárias em uma comunidade quilombola do semiárido baiano. J Trop Pathol. 2010; 39(1): 48-55. doi: https://doi.org/10.5216/rpt.v39i1.9498.

22. Menezes Júnior RC, Lima Junior CAA, Marinho IG, Braga KHM, Nascimento RO, Calandrini TSS, et al. Enteroparasitoses, anemia e estado nutricional de uma população ribeirinha no estado do Amapá. Rev Eletr Acervo Saúde. 2020; 12(5): e2841. doi: https://doi.org/10.25248/reas.e2841.2020.

23. Rosine GD, Rosine IO, Ribeiro F, Schröder NT. Prevalência de parasitose intestinal em uma comunidade quilombola do semiárido baiano. Aletheia. 2018 Jan-Dez; 51(1-2): 97-107. doi: https://doi.org/10.29327/226091.

24. Brito AMG, Melo CM, Reis AA, Brito RG, Madi RR. Protozoário comensal em amostra fecal: parâmetro para prevenção de infecção parasitária via fecal-oral. Scire Salutis. 2013 Abr-Set; 3(2): 17-22. doi: http://dx.doi.org/10.6008/ESS2236-9600.2013.002.0002.

25. Fonsêca CHA, Marques BC, Reis LB, Lima DAC, Mota LHS, Andrade RS, et al. Enteroparasites, respiratory allergy and other signs and symptoms in childs and

youth population of Recôncavo of Bahia – Brazil. JAAID. 2018; 2. https://doi.org/10.25177/JAAID.2.1.5.

26. Andrade RS, Santos CJ, Santos GA, Amor ALM. Análise de exames coproparasitológicos em estudantes universitários In: Anais do 51º Congresso da Sociedade Brasileira de Medicina Tropical - Medtrop2015; 2015; Fortaleza. Ceará, 2015. p.297. Disponível em: http://sbmt.org.br/portal/wp-content/uploads/2016/03/TRABALHOS_APRESENTADOS.pdf.

27. Jesus JSA, Silva IM, Santos GA, Mota LHS, Paz VS, Amor ALM. Pesquisa de enteroparasitos em funcionários de um estabelecimento de ensino superior correlacionados com dados socioeconômicos In: Anais da IV Reunião Anual da Ciência, Tecnologia, Inovação e Cultura no Recôncavo da Bahia - IV RECONCITEC. Cruz das Almas: UFRB, 2017, p.551. Disponível em: https://www.ufrb.edu.br/ppgci/images/documentos/Anais/20170801_anais_IV_RECONCITEC_2017.pdf. Acesso em: 14/08/2022.

28. Mariot A Netto, Brito MGS, Pavanelli MF. Relação entre enteroparasitoses e alterações hematológicas em crianças da região centro-oeste do Paraná. RBAC [Internet]. 2016 [acesso 2022 Ago 08]; 48(1): 78-84. Disponível em: http://www.rbac.org.br/wp-content/uploads/2016/05/ARTIGO-14_VOL-48_1_2016-ref-90-1.pdf.

29. Silva DF, Lima CMBL, Silva AB, Cavalcante UMB, Figueiredo FS Júnior, Freitas FIS. Análise coproparasitológica de manipuladores de alimentos em restaurantes especializados em gastronomia japonesa. Arch. Health Sci.. 2018 Abr; 25(1): 29-34. doi: https://doi.org/10.17696/2318-3691.25.1.2018.918.

30. Santana LA, Vitorino RR, Antonio VE, Moreira TR, Gomes AP. Atualidades sobre giardíase. J. bras. Med [Internet]. 2014 Jan-Fev [acesso 2022 Out 24]; 102(1): 7-10. Disponível em: https://www.researchgate.net/publication/274074799_Atualidades_sobre_giardiase.

31. Lacerda JS, Dias ME. Detecção de Giardia lamblia em exames parasitológicos de fezes: Avaliação comparativa de resultados em laboratório de análises clínicas de rede privada e pública. Rev Saúde UniToledo [Internet]. 2017 [acesso 2022 Ago 05]; 01(01): 147-156. Disponível em: http://www.ojs.toledo.br/index.php/saude/article/view/2444.

32. World Health Organization. The selection and use of essential medicines [Internet]. Geneve: WHO; 2017 [acesso 2022 Out 24]. 604p. Disponível em: https://apps.who.int/iris/bitstream/handle/10665/259481/9789241210157-eng.pdf.

33. Soares B, Cantos GA. Detecção de estruturas parasitárias em hortaliças comercializadas na cidade de Florianópolis, SC, Brasil. Rev. Bras. Cienc. Farm. 2006 Set; 42(3): 455-460. doi: https://doi.org/10.1590/S1516-93322006000300015.

34. Oliveira DM, Novaes BCB, Lucena VB, Souza TS, Barros NCL, Dias SS, et al. Perfil parasitológico do cheiro verde comercializado em feiras livres de Imperatriz-MA. Rev Biota Amazônia. 2016; 6(2): 123-126. doi: https://doi.org/10.18561/2179-5746/biotaamazonia.v6n2p123-126.

35. Ashrafi K, Sharifdini M, Heidari Z, Rahmati B, Kia Eb. Zoonotic transmission of Teladorsagia circumcincta and Trichostrongylus species in Guilan province, northern Iran: molecular and morphological characterizations. BMC Infectious Diseases. 2020; 20(28). doi: https://doi.org/10.1186/s12879-020-4762-0.

36. Araújo MI, Lopes A, Medeiros M, Cruz AA, Sousa-Atta I, Sole D, Carvalho EM. Inverse association between skin response to aeroallergens and Schistosoma mansoni infection. Int Arch Allergy Immunol. 2000 Oct; 123(2): 145-8. doi: https://doi.org/10.1159/000024433.

37. Scrivener S, Yemaneberhan H, Zebenigus M, Tilahun D, Girma S, Ali S, et al. Independent effects of intestinal parasite infection and domestic allergen exposure on risk of wheeze in Ethiopia: a nested case-control study. Lancet. 2001 Nov; 358(9292): 1493-9. doi: https://doi.org/10.1016/S0140-6736(01)06579-5.
38. Strachan DP. Family size, infection and atopy: the first decade of the "hygiene hypothesis". Thorax. 2010; 55(1): S2-10. doi: https://doi.org/10.1136/thorax.55.suppl_1.S2.

39. Freitas RWJF, Araújo MFM, Lima ACS, Pereira DCR, Alencar AMPG, Damasceno MMC. Análise do perfil lipídico de uma população de estudantes universitários. Rev. Latino-Am. Enfermagem. 2013 Set-Out; 21(5): 1151-1158. doi: https://doi.org/10.1590/S0104-11692013000500019.

40. Coutinho JG, Gentil PC, Toral N. A desnutrição e obesidade no Brasil: o enfrentamento com base na agenda única da nutrição. Cad Saúde Pública. 2008; 24(2): s332-s340. doi: https://doi.org/10.1590/S0102-311X2008001400018.

41. Palheta JCP, Lopes PD, Borges AC, Martins DS, Melo JV, Rosa TA, et al. Hábitos de vida e perfil lipídico de estudantes de uma universidade pública. Rev Horizonte Cient [Internet]. 2016 [acesso ano mÊs dia]; 10(1). doi: https://www.researchgate.net/publication/317958238.

42. Souza RF, Amor ALM. Quality control of the parasitological techniques used in the laboratories of clinical analyses of the Department of Health of the Salvador City, Bahia. RBAC. 2010;42(2):101-106. Disponível em: doc slide.com.br artigo-controle-qualidade-parasitologia-with-cover-page-v2.pdf. Acesso em: 03/08/2022.

43. Veras RP. Envelhecimento populacional contemporâneo: demandas, desafios e inovações. Rev Saúde Pública 2009 Jun; 43(3): 548-54. doi: https://doi.org/10.1590/S0034-89102009005000025.

44. Luz EP, Dallepiane LB, Kirchner RM, Silva LAA, Silva FP, Kohler J, et al. Perfil sociodemográfico e de hábitos de vida da população idosa de um município da região norte do Rio Grande do Sul, Brasil. Rev. Bras. Geriatr. Gerontol. 2014; 17(2): 303-314. doi: https://doi.org/10.1590/S1809-98232014000200008.

45. Ministério de Integração e Desenvolvimento Regional. Plano nacional de saneamento básico – PLANSAB [Internet]. Brasília: Ministério de Integração e do Desenvolvimento Regional, 2013 [acesso 2020 Maio 14]. Disponível em: https://www.cidades.gov.br/images/stories/ArquivosSNSA/Arquivos_PDF/plansab/Versaoatualizada07mar2019_consultapublica.pdf.

46. Ferreira ERS, Santomé JG, Duarte RNSS, Carvalho LCBM, Garcia SAS, Gonçalves AF Júnior, Mendonça BOM, Alves FAVB. Prevalência de Giardia sp. em crianças de 3 a 7 anos em uma escola municipal de Cachoeira de Goiás. Reva Fac Mont Belos [Internet]. 2015 [acesso 2020 Maio 10] 8(1): 1-16. Disponível em: em: http://revista.fmb.edu.br/index.php/fmb/article/view/23/19.

47. Cimerman S, Castañeda CG, Iuliano WA, Palacios R. Perfil das enteroparasitoses diagnosticadas em pacientes com infecção pelo vírus HIV na era da terapia antirretroviral potente em um centro de referência em São Paulo, Brasil. Parasitol. latinoam. 2003 Jul-Dez; 57(3-4): 111-119. doi: http://dx.doi.org/10.4067/S0717-77122002000300005.

48. Campos R, Rocha N, Baptista A. Infecções sexualmente transmissíveis em homens que têm sexo com homens. Rev SPDV [Internet]. 2014 [acesso 2020 Maio 28]; 72(2): 201-2010. Disponível em: https://revista.spdv.com.pt/index.php/spdv/article/view/256/231.

49. Mayer K. Sexually transmitted diseases in men who have sex with men. Clin Infect Dis. 2011 Dec; 53(S3): S79-83. doi: 10.1093/cid/cir696.

50. Nahn Junior EP, Oliveira EC, Barbosa MJ, Mareco TCS, Brígido HA. Protocolo Brasileiro para Infecções Sexualmente Transmissíveis 2020: infecções entéricas sexualmente transmissíveis. Epidemiologia e Serviços de Saúde, 2021; 30(esp1): e2020598. doi: https://dx.doi.org/10.1590/s1679-4974202100012.esp1.

51. Quinn TC, Stamm WE, Goodell SE, Mkrtichian E, Benedetti J, Corey L, et al. The polymicrobial origin of intestinal infections in homosexual men. N Engl J Med 1983 Sep; 309(10): 576–82. doi: 10.1056/NEJM198309083091002.

52. Meyers JD, Kuharic HA, Holmes KK. Giardia lamblia infection in homosexual men. Br J Vener Dis [Internet]. 1977 Feb [acesso 2022 Aug 15]; 53(1): 54-55. doi: 10.1136/sti.53.1.54. Disponível em: https://www.nescon.medicina.ufmg.br/biblioteca/imagem/0233.pdf.

53. Ludwig KM, Ribeiro ALT, Conte AOC, Decleva DV, Ribeiro JTD. Ocorrência de enteroparasitoses na população de um bairro da cidade de Cândido Mota-SP.

J Health Sci Inst [Internet]. 2012 Jul-Set [acesso 2022 Ago 15]; 30(3): 271-6. Disponível em: https://repositorio.unip.br/wp-content/uploads/2020/12/V30_n3_2012_p271a276.pdf.

54. Cirne FSL, Cabrera JGP. Ações em Saúde Única para redução de parasitoses infantis: revisão integrativa de literatura. Rev Saber Dig [Internet]. 2020 [acesso ano mÊs dia?]; 12(2): 136-149. Disponível em: https://revistas.faa.edu.br/SaberDigital/article/view/802.

55. Rodrigues LS, Scherer AA, Moreira NM. Intervenção educativa com agentes comunitários de saúde sobre giardíase na região de Fronteira - Foz do Iguaçu. Arq. Ciênc. Saúde UNIPAR. 2019 Maio-Ago; 23(2): 89-95. doi: https://doi.org/10.25110/arqsaude.v23i2.2019.6383.

How to cite this article/ Como citar este artigo:
Santos ER Júnior, Andrade RS, Passos AS, Santos RS, Santos GA, Almeida MS, et al. Social and health indicators in an academic community: enteroparasites, nutritional, allergic and clinical aspects. J Health Biol Sci. 2023; 11(1):1-11.