Socioeconomic and parasitological aspects in Quilombola communities in two of the oldest municipalities in Brazil

Aspectos socioeconómicos y parasitológicos en comunidades quilombolas en dos de los municipios más antiguos de Brasil

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ABSTRACT

Objective To carry out a socioeconomic, demographic and parasitological evaluation of quilombola communities in two of the oldest municipalities in Brazil.

Material and Methods Between December 2015 and June 2016, of the total of 231 residents of the communities, socioeconomic questionnaires were applied and fecal samples collected from 150 individuals were analyzed by spontaneous sedimentation method and the Kato-Katz method.

Results It was observed that 95.3% (n=143) of the interviewees had piped water at their residence, and 76% (n=114) came from wells or springs; 85.3% (n=128) reported that the toilet drain was made in a rudimentary septic tank and 59.3% (n=89) reported having litter buried or burned, showing precarious conditions in basic sanitation. Still on socioeconomic aspects, 80.7% (n=121) of the individuals reported having access to the public health service. Parasitological tests were positive for 48% (n=72) of the analyzed samples, and 25% (n=18) had two or more parasites. The most frequent organism in the study population was the commensal Entamoeba coli (55.6%, n=40), followed by Ascaris lumbricoides (19.4%, n=14) and the commensal Endolimax nana (16.7%, n=12). The Poisson regression showed an increase of 1.59 in the prevalence of parasites for individuals who do not have access to the public health service, when compared to those who have access to these services.

Conclusions The results indicate the need to implement public health measures in order to reduce, prevent and treat the parasitological condition of the population to obtain better conditions and quality of life.

Key Words: African Americans; population health; parasitology; epidemiology; South America (*source: MeSH, NLM*).

RESUMEN

Objetivo Realizar una evaluación socioeconómica, demográfica y parasitológica de las comunidades quilombolas en dos de los municipios más antiguos de Brasil.

Materiales y Métodos Entre diciembre de 2015 y junio de 2016, del total de 231 residentes de las comunidades, se aplicaron cuestionarios socioeconómicos y se analizaron muestras fecales de 150 individuos mediante el método de sedimentación espontánea y el método Kato-Katz.

Resultados Se observó que el 95,3% (n=143) de los entrevistados tenían agua entubada en su residencia y el 76% (n=114) provenía de pozos o manantiales; El 85,3% (n=128) informó que el desagüe del inodoro se realizó en un tanque séptico rudimentario y el 59,3% (n=89) informó que tenía basura enterrada o quemada, que mostraba condiciones precarias en el saneamiento básico. Aún en aspectos socioeconómicos, el 80,7% (n=121) de las personas reportaron tener acceso al servicio de salud pública.

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Las pruebas parasitológicas fueron positivas para el 48% (n=72) de las muestras analizadas, y el 25% (n=18) tenía dos o más parásitos. El organismo más frecuente en la población de estudio fue el comensal Entamoeba coli (55.6%, n=40), seguido de Ascaris lumbricoides (19.4%, n=14) y el comensal Endolimax nana (16.7%, n=12). La regresión de Poisson mostró un aumento de 1,59 en la prevalencia de parásitos para las personas que no tienen acceso al servicio de salud pública, en comparación con aquellos que tienen acceso a estos servicios.
Conclusión Los resultados indican la necesidad de implementar medidas de salud pública para reducir, prevenir y tratar la condición parasitológica de la población para obtener mejores condiciones y calidad de vida.

Palabras Clave: Afroamericanos; salud poblacional; parasitología; epidemiología; América del Sur (*fuente: DeCS, BIREME*).

From the sixteenth century, black populations arrived in Brazil on expeditions brought from the African continent in the holds of slave ships, in the condition of slaves. Blacks were treated as inferior beings and subjected to poor living conditions, various forms of violence and overwork, factors that triggered episodes of resistance and struggle against the slave rule (1,2).

The history of slaves is characterized by innumerable social movements and actions that were based on the intense search for freedom, regardless of the means used to achieve it: escape, negotiation with lords, donation and, in some extreme cases, suicide and abortion as well were practiced. The escape was seen by the slaves as the main form of survival, and it culminated in the formation of quilombos which, according to their Bantu etymology, are defined as fortified camps in the forest (1,3-6).

With the abolition of slavery, they came to be known as quilombola communities or quilombo remnant communities, which present "a historical trajectory of their own, endowed with specific territorial relations and with black ancestry related to the resistance to the historical oppression suffered" (6,7).

After Africa, Brazil is considered the country with the largest contingent of black population, and this prominent presence has led to a change in the State's attitude towards the racial issue. Many researchers consider the Federal Constitution of 1988 as an important landmark for the social changes that occurred in the country, since it instituted the criminalization of racism and all forms of discrimination, besides recognizing the lands of quilombola communities as definitive property (1,8,9).

Since then, many laws, programs, operational strategies, actions and public policies have been instituted to protect the black population and reduce racial inequality in the country, guaranteeing the black population and residents of quilombola communities access to health, improvements in environmental protection, basic sanitation, comprehensive health care, food and nutritional security (10).

However, it is still possible to observe in these communities a scenario marked by socioeconomic marginalization and precarious living and health conditions; quilombola dwellers deal with high poverty rates that are reflected in several ways, among them, difficulty in accessing health services, lower life expectancy and higher infant mortality (1,11,12). It is observed that the legal rights of quilombola communities do not correspond to their effectiveness, and this is often due to the scarcity of studies that are not only demographic, but also epidemiological, which help in a suitable formulation, institution and execution. On the other hand, some researchers have identified this need and have carried out research in quilombola communities, in order to collect socioeconomic data and health indicators of these populations (1,13).

Socioeconomic assessment can illustrate the conditions and quality of life of a population. Quilombola communities are usually referred to as vulnerable in relation to the disease/health process, since they have precarious health and infrastructure conditions, where the vast majority do not have adequate homes, treated water and sanitary sewage (14,15).

In fact, this socioeconomic reality is directly related to the transmission of intestinal parasites, since low sanitary conditions, associated with inadequate domestic and personal hygiene practices, are determining factors in the development and propagation of parasitic diseases (16-18).

Parasitic diseases are infections caused by the presence of protozoa or helminths in the intestinal tract, whose transmission mainly occurs via the fecal-oral route, through the ingestion of contaminated food or water and inadequate hygiene practices. Brazil has several endemic areas with a high prevalence of parasitic diseases, constituting a serious public health problem (19-21).

Besides the association with socioeconomic conditions, researchers relate the high frequency of parasitosis with the ease of transmission, the resistance of the infecting forms, and the possibility of triggering reinfection cycles. The clinical manifestations of parasitic diseases can increase morbidity rates and, in more severe situations, lead to the death of infected individuals, which makes the knowledge of this reality relevant in different population groups (16,18,22,23).

In this context and considering that quilombola communities are constantly associated with poor basic sanitation conditions (1,11,14,15), this study aimed to evaluate

socioeconomic and parasitological aspects in quilombola communities located in the Northern region of Espírito Santo.

MATERIAL AND METHODS

This is a cross-sectional, descriptive study with a quantitative approach and non-probabilistic convenience sample conducted in five quilombola communities (Angelim DISA, Córrego do Alexandre, Córrego do Macuco, Nova Vista and São Jorge), located in the municipalities of São Mateus and Conceição da Barra, Northern region of Espírito Santo, Brazil. The population of the municipality of São Mateus is estimated at 109,028 inhabitants, distributed in an area of 2,338.727 Km2, with a population density of 46.62 inhabitants/Km2, and a Human Develop Index (HDI) of 0,735. The municipality of Conceição da Barra has a population of 28,449 inhabitants, distributed in 1,184.908 Km2, with a population density of 24.01 inhabitants/Km2 and HDI of 0.681 (24).

Socioeconomic data and fecal samples were collected between December 2015 and June 2016. A total of 500 residents of quilombola communities were contacted to participate in the study. Of these, only 150 (30%) accepted to participate, and gave stool samples and answered the questionnaire. Parasitological analyses were performed using qualitative spontaneous sedimentation methods proposed by Hoffman, Pons and Janer (HPJ), and the Kato-Katz semi-quantitative method, in triplicate and duplicate, respectively (25-27). A single faecal sample was collected from an individual subject. The results of the parasitological examinations were given to each participant or legal guardian. The data obtained, systematized in a Microsoft Excel 2007 spreadsheet and typed twice, were analyzed using the software STATA, version 12.0. Univariate and multivariate analyses were performed using the Pearson chi-square test, Fisher's exact test and Poisson regression analysis, respectively. The dependent variable chosen for this study was "Parasitosis". The independent variables were chosen among other socioeconomic and demographic variables included in the National household sample survey questionnaire (28), and those that presented statistical significance ($p<0.20$) in the Pearson chi-square test and Fisher's exact test were included in the Poisson regression model. The Prevalence Ratio was obtained and a confidence interval of 95% ($p<0.05$) was adopted in the final model. The questionnaire presents questions related to socioeconomic, demographic and health variables such as gender, skin color, age, what kind of material predominates on the roof of the houses, how many rooms are in the house, whether the residence has piped water, how the garbage family is income, and whether residents have access to health care.

Ethics statement

The study was initially evaluated and approved by the Research Ethics Committee of Federal University of Espírito Santo, under Nº CAAE: 47999915.1.0000.5063. The participants of the research were oriented on the objectives of the study and, through the agreement, they signed an Informed Consent Term (TCLE). The participants were adults and minors and for the minors the parents or guardians provided consent on behalf of all child participants.

RESULTS

From a total of 150 stool specimens analyzed, considering the methods of Spontaneous Sedimentation and Kato-Katz, 48.0% (n=72) were positive for intestinal parasites, out of them 75.0% (n=54) monoparasite and 25.0% (n=18) biparasite/polyparasite, presenting two or more species of parasites. Among the positive samples, protozoa were found in 72.2% (n=52) and helminths in 41.6% (n=30). On the other hand 13.8% (n=10) of the samples had parasites of both groups.

The commensal Entamoeba coli was the most frequent among the samples (55.6%, n=40), followed by *Ascaris lumbricoides* and by the commensal ENDOLIMAX nana, present in 19.4% (n=14) and 16.7% (n=12), respectively. The complete prevalence of parasitic species is described in (Table 1).

Table 1. Prevalence of intestinal and commensal parasites in quilombola communities in the Northern region of Espírito Santo, Brazil, in 2016

Parasites	N	%*
Ascaris lumbricoides	14	19.4
Hookworm	7	9.7
Entamoeba coli	40	55.6
Entamoeba histolytica/dispar	8	11.1
Endolimax nana	12	16.7
Enterobius vermicularis	2	2.8
Hymenolepis nana	3	4.2
Trichuris trichiura	3	4.2
Taenia sp.	2	2.8
n=72		

* The total % of the table is more than 100%. Some of the samples had co-infection and involved in more than one parasite infection percentage.

The Kato-Katz method allowed the identification of six kinds of intestinal parasites in 19 positive samples, some of which biparasite. When comparing the methods of spontaneous sedimentation and Kato-Katz it was observed that the Kato-Katz method was more specific for most of the helminths identified in the study (Table 2).

Table 2. Prevalence of intestinal and commensal parasites in quilombola communities in the Northern region of Espírito Santo, Brazil, in 2016.Comparison between Spontaneous Sedimentation and Kato-Katz methods

Parasites	Spontaneous sedimentation method		Kato - Katz method	
	N	%	N	%
A. lumbricoides	1	1.4	13	18.1
Hookworm	3	4.2	4	5.6
Entamoeba coli	40	55.6	0	0
Entamoeba histolytica/dispar	8	11.1	0	0
Endolimax nana	12	16.7	0	0
Enterobius vermicularis	2	2.8	0	0
Hymenolepis nana	2	2.8	1	1.4
Trichuris trichiura	1	1.4	2	2.8
Taenia sp.	0	0	2	2.8
n=72				

Once the number of infected individuals was established, the number of parasites eggs per gram of feces (epg) per individual sample was determined, with values ranging from 24 to 14,808 epg. Of all infected individuals, 14 (73.68%) had low parasite load (up to 100 epg), none had intermediate parasite load (>100 and <400 epg) and 5 (26.32%) had high parasite load (above 400 epg) (29) (Table 3).

Table 3. Number of parasites eggs per gram (epg) per individuals sample in the Northern region of Espírito Santo, Brazil, in 2016

a	Parasites	epg (feces)
1	Hookworm	24
	Ascaris lumbricoides	24
2	*Ascaris lumbricoides*	24
3	*Hymenolepis nana*	24
4	*Trichuris trichiura*	72
5	*Ascaris lumbricoides*	48
	Taenia sp.	48
6	*Ascaris lumbricoides*	24
7	*Ascaris lumbricoides*	8.7
8	Hookworm	24
9	Hookworm	24
10	*Taenia* sp.	24
11	*Ascaris lumbricoides*	24
12	*Ascaris lumbricoides*	1.5
13	Hookworm	24
14	*Ascaris lumbricoides*	11.1
	Trichuris trichiura	72
15	*Ascaris lumbricoides*	14.8
16	*Ascaris lumbricoides*	2.1
17	*Ascaris lumbricoides*	9.2
18	*Enterobius vermicularis*	24
19	*Ascaris lumbricoides*	48

It was observed that intestinal parasites were more frequent in males (52.8%), black-skinned (76.4%) aged between 21 and 60 years old (50%). Regarding the socioeconomic conditions of the studied population, 95.3% have piped water, of which 76% come from a well or spring, 97.3% have a bathroom at home, 85.4% have a toilet drain made in a rudimentary septic tank and 59.3% reported having litter buried or burned. In addition, 40.7% report having a family income between two and three minimum

wages and 80.7% report having access to the public health service (Table 4).

When comparing socioeconomic and demographic variables between positive and negative samples for parasitosis, using the Pearson chi-square test or Fisher's exact test when necessary, a value of p<0.20 can be observed for the variables skin color, age group, toilet drain, waste management, family income and access to health services. Subsequently, these variables were applied to the Poisson regression model, and a significant association with the parasitological results was obtained only for the variable access to the health services, with gross prevalence ratio (PR) of 2.9 (95% CI: 0.37-1.02) and prevalence ratio (PR) adjusted by the model of 1.59 (95% CI: 1.09-2.66, p<0.05), showing that individuals who do not have access to health services have an increase of 1.59 in the prevalence of parasitosis, when compared to those who have access to these services.

DISCUSSION

The study showed a high prevalence of intestinal parasites, as observed in other epidemiological studies conducted by Damazio et al. (30) and Mendes et al. (31), who identified, respectively, frequencies of 42.7% and 40.6% of intestinal parasites; both studies were also conducted in quilombola communities of Espírito Santo.

It is worth noting that intestinal parasites are a public health problem common to quilombola communities in several states and regions of Brazil, as can be observed in parasitological surveys conducted by Andrade et al. (14) and Amorim et al. (32), who identified, respectively, a prevalence of 63.8% parasitosis in quilombola communities in the state of Minas Gerais and 35.4% in communities in the state of Bahia.

The use of two parasitological techniques (Spontaneous Sedimentation and Kato-Katz) allows obtaining more accurate results, as described by Mendes et al. (33) and Carvalho et al. (34) who reported that the laboratory routine should use more than one parasitological method for detecting parasitic forms of protozoa and helminths, especially in samples with low parasite load (35,36), as observed in the present study.

Although not posing a health risk, the prevalence of commensal, non-pathogenic parasites, such as *E. coli* and *E. nana*, suggests poor hygiene and basic sanitation, since they indicate fecal-oral contamination, thus facilitating the transmission of other pathogenic parasites with a similar contamination pathway (9,37).

Unlike protozoa *E. coli* and *E. nana*, *E. histolytica/dispar*, present in 11.1% (n=8) of the positive samples, may pose a public health risk. *E. histolytica* and *E. dispar* are

Table 4. Characterization, using Pearson chi-square test and Fisher's exact test of the general population and positive samples for intestinal parasites in quilombola communities in the Northern region of Espírito Santo, Brazil, in 2016

	General Sample (n[1])		Negative Sample (n[2])		Positive Sample (n[3])		p
Gender	n	%	n	%	N	%	
Female	79	52.7	45	57.7	34	47.2	0.76
Male	71	47.3	33	42.3	38	52.8	
Skin color							
Yellow	1	0.7	0	0	1	1.4	
White	7	4.7	5	6.4	2	2.8	0.008*
Black	103	68.6	48	61.6	55	76.4	
Pardo	39	26.0	25	32.0	14	19.4	
Age group							
0-10 years old	27	18.0	10	12.8	17	23.6	
11-20 years old	15	10.0	10	12.8	5	6.9	0.01*
21-60 years old	75	50.0	39	50.0	36	50.0	
Above 60 years old	33	22.0	19	24.4	14	19.5	
Wall Material							
Masonry	148	98.7	78	100	70	97.2	0.25
Plywood	2	1.3	0	0	2	2.8	
Roof material							
Asbestos	123	82.0	64	82.1	59	81.9	
Concrete	3	2.0	2	2.6	1	1.4	0.22
Roof tile	20	13.3	9	11.5	11	15.3	
Wood	4	2.7	3	3.8	1	1.4	
Number of rooms							
Up to three	2	1.3	2	2.6	0	0	0.39
Four or more	148	98.7	76	97.4	72	100	
Number of bedrooms							
Up to two	56	37.3	32	41	24	33.3	0.55
Three or more	94	62.7	46	59	48	66.7	
Piped water							
Yes	143	95.3	76	97.4	67	93.1	0.35
No	7	4.7	2	2.6	5	6.9	
Origin of water							
Well or spring	114	76.0	58	74.4	56	77.8	
General distribution network	35	23.3	20	25.6	15	20.8	0.33
Rain or transported	1	0.7	0	0	1	1.4	
Bathrooms							
Yes	146	97.3	77	98.7	69	95.8	0.53
No	4	2.7	1	1.3	3	4.2	
Toilet drain							
Rudimentary septic tank	128	85.4	68	87.2	60	83.3	
Septic tank	20	13.3	10	12.8	10	13.9	0.04*
Sewerage system	2	1.3	0	0	2	2.8	
Use of bathroom							
Exclusive to the household	147	98.0	77	98.7	70	97.2	0.82
Common to other households	3	2.0	1	1.3	2	2.8	
Waste management							
Burned or buried	89	59.3	45	57.7	44	61.1	0.16*
Collected	61	40.7	33	42.3	28	38.9	
Family income							
Less than 1 minimum wage	29	19.3	23	29.5	6	8.3	
1 minimum wage	57	38.0	24	30.8	33	45.8	
2 to 3 minimum wages	61	40.7	29	37.2	32	44.5	0.04*
Between 3 and 5 minimum wages	1	0.7	1	1.3	0	0	
Above 10 minimum wages	2	1.3	1	1.3	1	1.4	
Access to health services							
Yes	121	80.7	69	88.5	52	72.2	0.001*
No	29	19.3	9	11.5	20	27.8	

n[1]=150; n[2]=78; n[3]=72 *p<0.20: significant result.

morphologically identical, but biochemically, physiologically and genetically distinct, which makes *E. dispar* non pathogenic and *E. histolytica*, the etiological agent of intra-intestinal amoebiasis and, in the most severe cases, extra-intestinal invasion, with clinical manifestations ranging from asymptomatic infections to death. Species

differentiation can be done through ELISA, indirect immunofluorescence, radioimmunoassay, among others, and the parasitological methods used in this study are insufficient to distinguish them (30,37,38).

In addition to protozoa, helminth species with a high degree of pathogenicity were identified in quilombola communities, such as *Taenia sp.*, hookworms and *A. lumbricoides*, besides other species that manifest themselves with milder symptoms, such as *E. vermicularis*, *H. nana* and *T. trichiura*. However, not only does the severity of parasitic infections depend on virulence, but also on parasite load and host characteristics, such as age, nutritional status and immunological status (38,39).

The children, aged 0-10 years, were the most affected by intestinal parasites, which is in agreement with studies that relate the age of the children with being more prone to parasitic infections, once the immune response to parasites is still under development, personal hygiene care is being learned, many are dependent on parents and/or caregivers, in addition to a change in dietary patterns, with the introduction of raw foods in the diet, besides a greater contact with the soil, domestic animals and other children (40-42).

The high prevalence of intestinal parasites is often related to the precarious conditions of infrastructure and basic sanitation, favoring the transmission and maintenance of parasitosis in the populations. The high prevalence of *A. lumbricoides*, Ancylostomidae, *E. histolytica/dispar*, *H. nana*, *T. trichiura*, *E. vermicularis*, *Taenia sp.* parasites and the commensals *E. coli* and *E. nana*, indicating the need for effective interventions through educational actions, improved access to health services, implementation of parasite control programs, expansion and improvement of basic sanitation services offered to the community, in order to reduce the prevalence of intestinal parasites and to ensure better conditions and quality of life to the residents.

Considering that basic sanitation involves services of water supply, sewage and solid waste management, and that the population must be assisted in these three aspects to have a quality service, the results of this study indicate precarious conditions of basic sanitation, which makes the population vulnerable to diseases, posing a risk to public health (18,43).

The water supply comes mainly from wells or springs, without prior treatment or quality control, and may be unfit for human consumption, acting as a vehicle in the transmission of parasitic, bacterial and/or viral diseases. In addition, the burning and burial of the solid waste generated contributes negatively to population health, favoring air pollution, increasing the probability of respiratory problems, among others, besides the contamination of soil and groundwater, compromising the agricultural production of these populations. Some studies associate the poor conditions of basic sanitation and home infrastructure in quilombola communities to geographic isolation, making it difficult to increase services and improve the living conditions of this population (18,44).

However, in spite of the precarious socioeconomic condition, a statistically significant association between socioeconomic and demographic variables with the prevalence of parasitosis was not observed in this study, except for the variable access to the public health service, which presented an inversely proportional relation, acting as a protection factor, which may have occurred due to the number of participants in this study. Other studies with the same theme are suggested, covering a quilombola population that is representative of the state of Espírito Santo ♣

Conflict of interest: None.

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