

TAENIASIS AND CYSTICERCOSIS PREVALENCE IN A SMALL VILLAGE FROM NORTHEASTERN BRAZIL

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ABSTRACT – Although not considered as an endemic region, the Northeast of Brazil has the necessary conditions for the development of taeniasis-cysticercosis complex. In a previous paper, we demonstrated that Mulungu do Morro municipality, in the State of Bahia, has a high seroprevalence to cysticercosis in epileptic patients. *Objective:* to determine the prevalence of taeniasis and positive cysticercosis serology in the population of Mulungu do Morro. *Method:* blood and stool samples were collected from a random sampling of the population, by family. The identification of antibodies against *T. solium* cysticerci was made by EITB and *T. solium* antigens were identified using a polyclonal antibody-capture ELISA. *Results:* the cysticercosis seroprevalence was 1.6% (C.I. = 0.8 to 2.8%) and the taeniasis prevalence 4.5% (C.I. = 3.0 to 6.5%). Seropositivity to cysticercosis was higher among those who lived in a house of a person testing positive for coproantigen, $p=0.017$. *Conclusion:* our results demonstrate that the taeniasis-cysticercosis complex is endemic in Mulungu do Morro. We believe that all areas in the world with the same socio-economic and sanitary characteristics are likely to have high prevalence of this parasite.

KEY WORDS: cysticercosis, taeniasis, epidemiology, prevalence, risk factors.

Prevalência de teníase e sorologia positiva para cisticercose em Mulungu do Morro, Bahia

RESUMO – Embora alguns autores não a considerem uma região endêmica, existem no Nordeste do Brasil as condições necessárias para o desenvolvimento do complexo teníase/ cisticercose. Em uma publicação prévia demosntramos no município de Mulungu do Morro, Bahia, alta soroprevalência para cisticercose em pacientes epiléticos. *Objetivo:* determinar a prevalência de teníase e sorologia positiva para cisticercose na população de Mulungu do Morro. *Método:* foram coletadas amostras de sangue e fezes em 175 famílias definidas aleatoriamente. A identificação de anticorpos séricos anti-cisticercose foi feita através do método de EITB e a presença de teníase foi verificada através de ELISA de captura para identificação de antígenos do parasita nas fezes. *Resultados:* encontramos soroprevalência para cisticercose de 1,6% (IC a 95% de 0,8 a 2,8%) e prevalência de teníase de 4,5% (IC a 95% de 3,0 a 6,5%). Foi observado maior número de soropositivos nas famílias em que havia uma pessoa com teníase ($p=0,007$). *Conclusões:* nossos resultados demonstram que Mulungu do Morro é endêmico para teníase e cisticercose. Acreditamos que os demais municípios do Nordeste, cujas características socio-econômicas e condições sanitárias são semelhantes ao estudado, apresentam também alta prevalência dessa parasitose e que estudos epidemiológicos são necessários para esta definição e para que medidas de controle sejam tomadas.

PALAVRAS-CHAVE: cisticercose, teníase, epidemiologia, prevalência, fatores de risco.

Taenia solium taeniasis and cysticercosis, are endemic in several developing countries of Asia,¹⁻³ Africa,⁴ and Latin America.⁵⁻⁷ In industrialized countries it has been described with increasing frequency, mainly due to the arrival of immigrants from endemic areas.^{8,9} Cysticercosis often attacks the human nervous system and is frequently responsible for neurological hospitalizations due to epilepsy, intracranial hypertension or meningitis, in endemic areas.¹⁰

In Brazil, very few seroepidemiological studies of

cysticercosis have been published; even though, its high prevalence is demonstrated in some areas – notably in the Southeastern region of the country.¹¹ The Northeastern region is considered endemic for various infectious diseases, due to poor socio-economic conditions, which could also facilitate the transmission of taeniasis/cycticercosis. In a previous study, we have found a seroprevalence of antibodies of 15% among epileptic patients of Mulungu do Morro, a small village of Northeastern Brazil.¹²

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The aim of this paper is to define the prevalence of taeniasis and cysticercosis markers in the population of this municipality.

METHOD

Population

The Mulungu do Morro municipality is a semi-arid region, 455km from the capital of the State of Bahia, in Northeastern Brazil. According to the census carried out by the Prefecture in 1998, it has a population of about 15,000 inhabitants. In general, this population lives in rural areas, and has low level of sanitation and schooling. According to the State's Secretary of Health, it has a high-level consumption of anti-epileptic drugs¹².

Starting with the existing census, we carried out random sampling of the population, by family. One hundred and eighty homes were selected, with an average number of inhabitants of five per house, involving approximately 900 persons (6% of the population). However, five families were not found in the city.

Data Collection

First, we obtained data about socio-demographic aspects and of taeniasis/cysticercosis risk factors. Previously trained health agents administered a questionnaire to all chosen houses. It contained questions about sanitary conditions, hygiene habits, and level of knowledge about the taeniasis/cysticercosis complex. Family representatives, after having been informed about this study and having agreed to participate, provided this information.

After this initial survey, blood and stool samples were collected from every consenting member of each family. The consent for minors was obtained from those responsible for them. The blood samples were centrifuged, the serum extracted and preserved, along with stool samples, at -20° C until use.

Laboratorial Analysis

The identification of antibodies against *Taenia solium* cysticerci was made by EITB (electroimmuno-transfer blot assay) as described by Tsang et al.¹³ This glycoprotein-based western blot gives up to 7 specific bands (gp 50, gp 39 – 42, gp 24, gp 18, gp 14 and gp 13), which distinguish between cysticercosis and other cestode infections. The reaction was considered positive when at least one of the above mentioned bands was present.

The stool samples were submitted for identification of *T. solium* antigens using a polyclonal antibody-capture ELISA (enzyme-linked immunosorbent assay) as previously reported.¹⁴

Statistical analysis

A data bank was created by using Access '97 and analyzed with the aid of the SPSS statistical software (version 6). Chi-square test was applied to compare distribution by sex and by zone of residence between the sample and the whole population, and the average age was compared using the t-Student test for similar variances.

The prevalences were calculated with the respective 95% confidence intervals, taking a populational size of 15,000 inhabitants. The comparisons between the tests for taeniasis and cysticercosis and the potential risk factors were made using Chi-square and Fisher bicaudal exact tests.

RESULTS

Population

One hundred and seventy five families, a sum total of 854 individuals, were evaluated, of these 51.1% were male and 70.5% lived in rural areas. The ages varied between zero and 95 years, with an average age of 19.6 (SD=19,6). No differences between the sample and the total population, in relation to zone of residence, sex or age were observed.

The studied population presented very poor sanitary conditions, as well as inadequate hygiene habits (Table 1). Only 18% of the homes had indoor plumbing and 46% had bathroom facilities. It was reported that in 77% of the residences, hogs were being raised and they were often in contact with human faeces.

Regarding the level of education, it was observed that 74% of the individuals, 12 years or older, had not completed primary education and 38% had never attended school. When the heads of households were questioned about their knowledge of the parasite, it was found that 94% of them knew about the

Table 1. Frequency of basic sanitation conditions and hygiene habits among 167 families, randomly selected in Mulungu do Morro, Northeastern Brazil.

Characteristics	n	%
Indoor water plumbing	166	18.1
Bathroom facilities	162	45.7
Familiarity with cysticercosis	165	93.9
Familiarity with tapeworm	131	26.7
Has raised hogs	155	77.4
Raises hogs presently	155	30.3
Boils drinking water	159	8.8
Throws out faeces outside the home	165	47.3
Washes hands prior to eating or when going to bathroom	165	63.6
Washes food products	164	84.1
The hogs consume excrement	119	72.3
Has eaten or eats pork contaminated by cysticercosis	153	45.8

existence of cysticercosis in hogs, and 27% were familiar with the tapeworm.

Prevalence of taeniasis and cysticercosis

There were 694 blood and 577 faeces samples collected. The analysis of these samples presented a distribution by age, sex, and place of origin similar to that of the general population.

The serology was positive for cysticercosis in 11 cases, with a prevalence of 1.6% and a 95% confidence interval of 0.8 to 2.8%. Twenty six of the faeces samples contained *Taenia* spp antigen, demonstrating a 4.5% prevalence, with a 95% confidence interval of 3.0 to 6.5%.

Risk factors

In Table 2, one can observe the association between seroprevalence and different risk factors.

Higher prevalences were noted in males (2.1%), in individuals living in urban areas (2.5%), and in the 50 – 69 year old age group (5.1%). However, these differences, as well as other studied factors, were not statistically significant.

A higher prevalence of taeniasis was found among males (5.8%) and those living in an urban area (6.2%). It was more prevalent among people younger than 49 years of age, peaking between 10 and 29 years of age (5.7%). Except for a higher prevalence of taeniasis markers found among people having indoor plumbing, no other statistically significant association was found (Table 3).

In the general population, 2.2% of people had a history of seizures. The frequency of taeniasis and cysticercosis markers in this group was 8.3% and 10%, respectively. There were no statistical differences when we compared these frequencies with those

Table 2. Prevalence of positive serology for cysticercosis according to possible risk factors among a randomly chosen sample (by family) of the population from Mulungu do Morro, Northeastern Brazil.

Characteristic	n	Prevalence	χ^2	P
Gender				
Male	341	2.1	0.796	0.372
Female	337	1.2		
Zone				
Rural	497	1.2	1.602	0.206
Urban	197	2.5		
Age range (years)				
0 – 9	153	1.3		
10 – 29	278	1.4	7.031	0.134
30 – 49	142	0.7		
50 – 69	75	5.1		
≥ 70	20	0.0		
Schooling				
Not completed primary school	476	1.9	*	1.000
Primary school or higher	126	1.6		
Indoor water plumbing				
Yes	111	1.8	*	0.680
No	546	1.5		
Bathroom facilities				
Yes	271	1.8	0.032	0.857
No	371	1.3		
Raises hogs at present				
Yes	507	1.8	*	1.000
No	107	0.9		
Has raised hogs in the past				
Yes	198	1.0	0.244	0.621
No	416	1.9		

Table 3. Prevalence of taeniasis according to possible risk factors among a randomly chosen sample (by family) of the population from Mulungu do Morro, Northeastern Brazil.

Characteristic	n	Prevalence	χ^2	P
Gender				
Male	295	5.8	2.215	0.137
Female	282	3.2		
Area				
Rural	415	3.9	1.454	0.228
Urban	162	6.2		
Age range (years)				
0 – 9	142	4.2	2.871	0.580
10 – 29	227	5.7		
30 – 49	127	4.7		
50 – 69	63	1.6		
≥ 70	17	0.0		
Schooling				
Not completed primary school	413	4.1	<0.001	1.000
Primary school or higher	92	4.3		
Indoor water plumbing				
Yes	74	12.2	9.749	0.002
No	483	3.3		
Bathroom facilities				
Yes	206	5.3	0.409	0.522
No	337	4.2		
Raises hogs at present				
Yes	161	3.7	0.645	0.422
No	354	5.4		
Has raised hogs in the past				
Yes	427	4.4	0.448	0.503
No	88	6.8		

found in the non-epileptic population, $p=0.182$ and 0.366 respectively.

The seroprevalence for antibodies among persons who lived in a house of a person testing positive for coproantigen test was 4.2% as compared to 1.0% among the people living in a coproantigen negative household, $p = 0.017$.

DISCUSSION

Agapejev¹¹, in a review paper about the epidemiological situation of neurocysticercosis in Brazil, described that the disease is endemic in the Southeastern region and in the states of Parana and Distrito Federal. The Northeastern region is described as having a casual incidence. However, we have found, in Mulungu do Morro municipality social, sanitary and hygienic characteristics, comparable to those in places described as having high prevalence of tae-

niasis and cysticercosis.^{4,6,15} Nevertheless, in Brazil there are not other studies regarding population seroprevalence of cysticercosis with EITB, which could permit comparisons with the 1,6% prevalence found in Mulungu do Morro. Even though this Municipality shares many similarities with regions of Latin America and Africa, where the seroprevalence of cysticercosis customarily reaches 4.9 to 17.0%,^{5,6,15-17} our indicators were less expressive.

On the other hand, we found a substantial prevalence of *Taenia spp* copro-antigens in Mulungu do Morro (4.5%) as compared to other countries.^{6,16,18-20} We believe that in this case there is a divergence of standard, because the majority of researches used a parasitological faeces examination to identify taenia infection, while in our study we used faeces antigens – a more sensitive method.^{6,17}

Even though the coproantigen is not specific for

the taenia species, we believe that, because of the characteristics of this Municipality, a majority of parasite contaminated persons have *T. solium*, which occurs in other countries in which cysticercosis is endemic^{18,21}. In addition, a higher prevalence of antibodies was found among people living with copro-positive persons, as compared to the rest of the sampled population. In other words humans testing positive for the cysticercosis marker are clustered with adult tapeworm carriers. This household transmission has been reported in other parts of the continent.^{17,22}

In Brazil two population surveys were carried out, which used coproparasitology. These surveys found the prevalence of taeniasis to be 4.3 and 4.6% in two small towns in the Southern region²³ and 1.3% in another small town in the southeastern region²⁴. Our data suggest, however, an equal or higher prevalence of taeniasis described in these other regions. In this study, excluding the greater incidence of taeniasis among the people with indoor plumbing, which probably occurs due to a confusing variable, we did not find any significant risk associated with taeniasis or with positive serology for cysticercosis. Garcia-Navel et al.⁶ studied two Guatemalan municipalities, finding a higher prevalence of taeniasis and cysticercosis in one of them, which had poorer economy, a larger number of hogs raised without sanitary control, and a population without hygiene and sanitary conditions. However, just as in our findings, no risk factors were found when analyzing each Municipality individually. Thus, we suppose that the whole population, of the Municipality, where the necessary conditions exist for maintaining the parasite's life cycle, is exposed to infection. The risk difference is small, as the risk of being contaminated by taeniasis and cysticercosis is related to individual risk factors, as related by others authors.^{25,26}

In conclusion, our results demonstrate that the taeniasis-cysticercosis complex is endemic in Mulungu do Morro. We believe that the Northeast of Brazil has a high prevalence of these parasites, which is probably correlated to areas of existent poor sanitary conditions. Wider epidemiologic studies should be made, so that effective measures can be implemented to better control this endemy.

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