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NEUROCYSTICERCOSIS IN PARAIBA, NORTHEAST BRAZIL

AN ENDEMIC AREA?

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ABSTRACT - Neurocysticercosis is the central nervous system infestation by *Cysticercus cellulosae*, the larval form of *Taenia solium*. It is related to poor hygiene habits and sanitation; although Northeast is poorest Region of Brazil, it has been always stated as a non-endemic area. After the installation of computed tomography (CT) service, the incidence of neurocysticercosis began to raise in neurology services in Campina Grande PB, a city where people from the interior Paraíba can find specialized medical facilities. We analyse 5,883 CT record of the TomoHPI Computed Tomography Service from August 1993 to December 1995, observing 1.02% suggestive neurocysticercosis cases and classified them according to sex and age, procedence and socioeconomic condition. Distribution of cases according to age is homogeneous until the age of 50 (mean: 28.36 years old). Men and women are equally affected. Urban areas inhabitants represented 83.33%. Residents of Campina Grande represented 48.33% and 48.34% were residents of cities around Campina Grande (until 50 Km around) and other cities of Paraíba State. Fifty-eight patients were dependent to public health care system. We conclude that neurocysticercosis seems to be endemic in Paraíba State, demanding a more detailed study to determine its incidence/prevalence.

KEY WORDS: cysticercosis, central nervous system infestation, neurocysticercosis, tropical medicine, epidemiology.

Neurocisticercose na Paraíba, Nordeste do Brasil: uma área endêmica?

RESUMO - Neurocisticercose é a infestação do sistema nervoso central pelo *Cysticercus cellulosae*, a forma larval da *Taenia solium*. É relacionada a hábitos higiênicos e sanitários precários; embora o Nordeste seja a Região mais pobre do Brasil, foi sempre considerada área não-endêmica para neurocisticercose. Depois da instalação de um serviço de tomografia computadorizada (TC), a incidência da neurocisticercose começou a crescer nos serviços de neurologia em Campina Grande PB, cidade para onde confluem pessoas de todo o interior paraibano à procura de serviços médicos especializados. Analisamos 5.883 TC realizadas no Serviço TomoHPI de Radioimagem do Hospital Pedro I de agosto de 1993 até dezembro de 1995 e 1,02% foram diagnosticadas como sugestivas de neurocisticercose e classificadas de acordo com idade e sexo, procedência e condições sócio-econômicas. A distribuição dos casos de acordo com a idade é homogênea até os 50 anos de idade (média: 28,36 anos). Homens e mulheres são afetados igualmente. Procedentes de áreas urbanas representam 83.33%. Residentes em Campina Grande representam 48.33% do total; 48,34% residem em cidades ao redor de Campina Grande (até 50 Km de distância) ou em outras cidades da Paraíba. Cincoenta e oito pacientes são dependentes do Sistema Único de Saúde. Concluimos que a neurocisticercose parece ser endêmica em nosso Estado, sendo necessários estudos mais detalhados para que tal assertiva possa ser confirmada.

PALAVRAS-CHAVE: cisticercose, infestação do sistema nervoso central, neurocisticercose, medicina tropical, epidemiologia.

Neurocysticercosis is the infestation of central nervous system (CNS) by the *Cysticercus cellulosae*, the larval form of *Taenia solium*. It represents the most frequent parasitic disease of the

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CNS and is related to poor sanitation conditions[5]. This CNS infestation is rare in USA, Europe and Canada but is endemic in many regions of Asia, Latin America and Africa[10]. It was a medical curiosity until 1970's in USA[13]. The clinical presentation of neurocysticercosis is widely variable and its diagnosis is difficult in regions lacking specialized laboratory facilities[9,13].

According to Coêlho[4], no case of neurocysticercosis was reported in the city of Campina Grande Health Service during 1991. The TomoHPI Radioimaging Service of Hospital Pedro I was the first computed tomography (CT) center installed in Campina Grande, in August 1993. The occurrence of neurocysticercosis in the region has been registered since then, as we showed by serially analysing the records on cranial CT scans of this radioimaging service[8]. This report emphasizes the epidemiology of neurocysticercosis in this same radioimaging service and compares it to other endemic areas reports.

MATERIAL AND METHODS

We analysed 5,883 CT records. They were all obtained from TomoHPI Radioimaging Service of Hospital Pedro I (Campina Grande). Data were examined from August 1993 until December 1995. They were obtained from all patients on admission, following standardized procedures. Patients were clinically evaluated before CT scan procedure. Suspected cases were indicated to this radioimaging service. For the purpose of the present study, only CT records are utized. They are not correlated with clinical data.

It was used a G&E Sytec 2000i CT scanner before and after intravenous contrast injection (iohexol). CT images suggestive for neurocysticercosis were classified according to Machado et al.[11].

They are not reported in this study which deals with epidemiological aspects.

Findings are analysed and classified with relation to sex, age, socioeconomic condition (dependence to Health Care System), rural or urban procedence (from Campina Grande, cities 50 Km around, other cities of Paraíba State, other States).

RESULTS

Sixty cases of neurocysticercosis were diagnosed from a total of 5,883 CT scans analysed in the period of 2 years and 4 months, since the installation of the TomoHPI Center, Hospital Pedro I. Incidence rate is 2.14 cases per month (1.02%).

Sex distribution is: male 30 (50%) and female 30 (50%). Age range is 1 to 75 years old (mean: 28.36 years old). Number of cases diagnosed between 0 and 30 years old is larger (60%) than over 30 years old, with prevalence between 0 and 10 years old (21.67%). Men were uniformly affected until 40 years old, with an incidence rate of 20% per age bracked, representing 80% of cases that affected this gender. The larger number of women is from 0 tho 10 years old bracket (23.33%).

Distribution of cases correlating age and sex is shown in Table 1. Color distribution of cases was not related in the radioimaging service archives.

Fifty-eight patients were supported on the health care public system (SUS, Sistema Único de Saúde), one patient was affiliated to a medical cooperative and another was submitted to private service.

DISCUSSION

Campina Grande is localized nearby the limit of two Paraíba Microregions (Agreste/Brejo). Important highways cross the city (BR-412, to Agreste; BR-230, from João Pessoa, capital of Paraíba State, to Sertão Microregion; BR-104, which crosses the Agreste and Brejo Microregions). People from all over come to this city seeking for medical care. The Zona da Mata Microregion is dependent upon João Pessoa. Campina Grande is the city where people from other microregions (this division is due to climate characteristics that are peculiar to those regions) can find specialized medical facilities . With a population of 326,106 inhabitants, two universities (UFPB, UEPB), sofisticated high schools, museums, 19 health centers, representing a cultural and commercial center, Campina Grande is the biggest city of the interior of Northeast Region of Brazil, and the second biggest city of Paraíba State (Fig 1).

Table 1. Distribution of cases according to age and gender.

Age	Gender					
	M		F		M + F	
	N	%	N	%	N	%
0 - 10	6	20.00	7	23.33	13	21.67
11 - 20	6	20.00	5	16.67	11	18.33
21 - 30	6	20.00	6	20.00	12	20.00
31 - 40	6	20.00	3	10.00	9	15.00
41 - 50	5	16.67	6	20.00	11	18.33
51 - 60	0	-	1	3.33	1	1.67
61 - +	1	3.33	2	6.67	3	5.00
Total	30	50.00	30	50.00	60	100.00

Age in years; M, masculin; F, feminin.

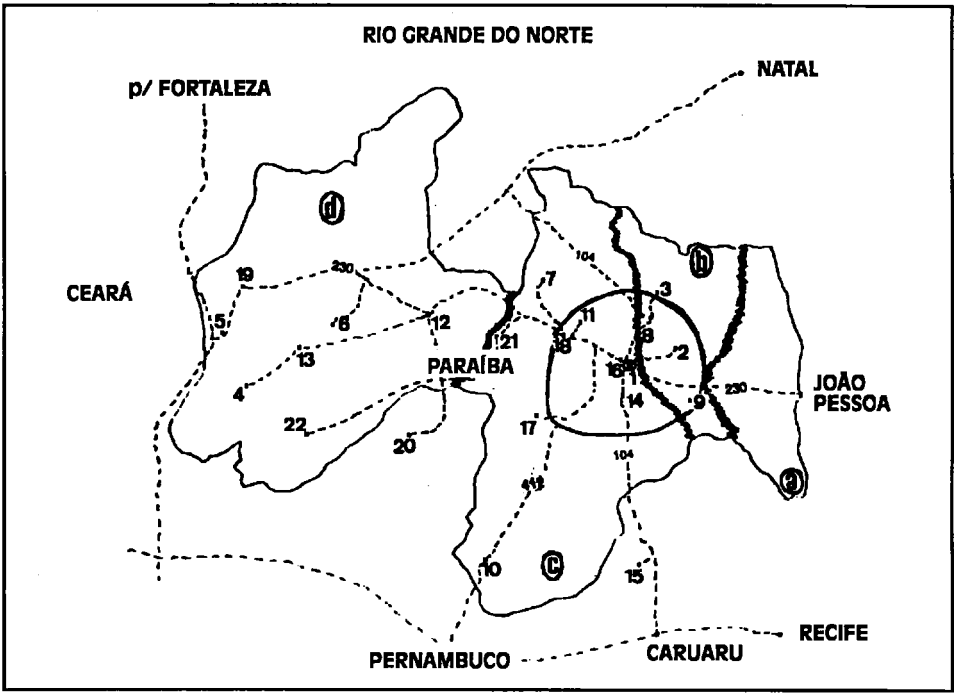

Fig 1. Neurocysticercosis in Paraíba, Northeast Region of Brazil, and Campina Grande geographical situation. Microregions: a, Zona da Mata; b, Brejo; c, Agreste; d, Sertão. O, Campina Grande; O, cities 50 Km around; ##, microregions limits; - - - -, highways.

Procedence (and number) of neurocysticercosis patients: 1, Campina Grande (29); 2, Alagoa Nova (1); 3, Arara (1); 4, Boa Ventura (1); 5, Cajazeiras (1); 6, Coremas (1); 7, Cubati (1); 8, Esperança (1); 9, Ingá (1); 10, Monteiro (3); 11, Olivedos (2); 12, Patos (3); 13, Piancó (1); 14, Queimadas (4); 15, Santa Cruz do Capibaribe (1); 16, São João da Mata (1); 17, São José dos Cordeiros (1); 18, Soledade (1); 19, Souza (2); 20, Tabira (1); 21, Taperoá (2); 22, Tavares (1).

Table 2. Procedence of cases.

	Campina Grande		50 Km around		other cities, PB		other States		Total	
	N	%	N	%	N	%	N	%	N	%
Urban	29	58.00	5	10.00	14	28.00	2	4.00	50	83.33
Rural	0	-	5	50.00	5	50.00	0	-	10	16.67
Total	29	48.33	10	16.67	19	31.67	2	3.33	60	100.00

PB, Paraíba State.

It is known that neurocysticercosis is a public health problem, specially in developing countries, where the incidence persists high. Clinical incidence of neurocysticercosis can reach 18% in the Ekary population of New Guinea[7]. According to Flisser[7], this complex disease can reach 7% of Mexican population and now it is recognized as a priority in Mexico, causing costs for medical care around US$ 14.5 million during 1986 to treat 2,700 new hospitalized cases of neurocysticercosis. Díaz et al.[6] affirmed that in Peru and Mexico neurocysticercosis is responsible by 10% of neurological hospital admissions. Almeida-Pinto et al.[2] found an incidence of 0.7% of neurocysticercosis in Portugal, using a retrospective and prospective study of 23,800 consecutive CT scans performed during a period of 56 months, and considered it frequent even in Western Europe.

Takayanagui and Jardim[17] studied 500 cases of neurocysticercosis and found an incidence of 2.7% of all clinical evaluations at the Neurology Department of the Ribeirão Preto Medical School. Spina-França et al.[16] diagnosed 1,573 cases from the total of 139,000 patients (1.13%) using immunodiagnostic tests for cysticercosis in the cerebrospinal fluid. Shibata et al.[15] established 22 neurocysticercosis diagnosis by CT scan in 20 months (mean: 0.91 cases per month)

In another publication[8] we studied 4,011 CT records from August 1993 until July 1995, and classified possible cases of neurocysticercosis according to CT findings, concluding that Machado et al. CT findings classification of neurocysticercosis[11] would be more adequate because of its simplicity and usefulness.

In the present study, 60 patients with probable neurocysticercosis were diagnosed using CT criteria without correlating clinical data, from the total of 5,883 patients seen from August 1993 to December 1995 (1.02%).

Sex distribution shows no difference for the male/female rate. Women are more affected until 10 years old. Male incidence reaches the same percentage of female rate when it is compared at 30 years old (60%). Both sexes are responsible to 30 patients. Age distribution suggests higher incidence in the 0-10 years old age bracket, with a homogeneous distribution of cases until 50 years of age (Table 1).

Exposure to *Taenia/Cysticercus* cycle occurs early to boys and girls in Northeast of Brazil. Both are exposed to precarious sanitary conditions sooner in Brazil, mostly girls, because, as affirmed by Spina-França et al.[16], their education envisages domestic activities, particularly among people living in poor socioeconomic conditions.

Neurocysticercosis is a disease related to poor socioeconomic conditions[1,2,15,17]. In our series, 96.97% of the patients were dependent to the public health assistance (SUS) that is comparable with Medicaid (USA) or Medicare (Australia). Only two were non-dependent. This may reflect the socioeconomic conditions of people affected by neurocysticercosis. According to Pereira et al.[12],

Taenia sp infestation represented 5.7% of intestinal parasites found in a slum in Campina Grande. As Spina-França et al.[16] affirmed, the only way to reduce the incidence of neurocysticercosis is to cause interruption of the *Taenia/Cysticercus* cycle.

Canelas, in 1963, quoted by Takayanagui and Jardim[17], referred that 2/3 of patients analysed had come from rural areas. Takayanagui and Jardim[17], in 1983, affirmed that 61.6% of patients were from urban areas. In our series, 50 cases (83.33%) were from urban areas. This may reflect the poor socioeconomic conditions found in cities of Northeast Region, and the difficult accessability to medical facilities that country people live through. Also, the culture of rural persons in Northern Brazil, seeking for medical care only when it is extremely necessary, may contribute to this small incidence in country areas (Table 2). Residents of Campina Grande are responsible to 48.33% of people diagnosed as having neurocysticercosis, and 48.34% are from other cities of Paraíba (cities around 50 Km, 16.67%; or far from Campina Grande, 31.67%). It reflects a wide distribution in this Brazilian Northeast State (Fig 1). Also, it shows that neurocisticercosis is a serious health problem in Campina Grande and Paraíba.

Neurocysticercosis has been observed to be more prevalent in South and Southeast States of Brazil, while it is relatively rare in the States of North and Northeast[1,17]. Chequer and Vieira[3] diagnosed 45 cases of neurocysticercosis between January 1987 and January 1989, considering it as an endemic infection in Espírito Santo, a Brazilian Southeast State. Albuquerque and Galhardo[1] reviewed 7,661 CT records in two radioimaging services in Rio Grande do Norte, a Brazilian Northeast State, from January 1990 to May 1993, and found 41 suggestive cases of neurocysticercosis.

Because of its variety of presentations[5,6,14,17], neurocysticercosis is very difficult to diagnose, specially in regions lacking laboratory facilities. The current use of CT scan in the last decade made diagnosis easier, though its use is limited in developing countries because of its high cost and limited availability. The installation of a CT scanner in Campina Grande occurred in August 1993 and, since then, 60 cases of neurocysticercosis were diagnosed until December 1995.

CONCLUSIONS

This study shows the incidence of neurocysticercosis in a specialized facility in Campina Grande, State of Paraíba, in a specific period of time, as others did[1-3,8,14-16,17]. We predict that neurocysticercosis may be endemic in Campina Grande, because this incidence is comparable to studies performed in other services, installed in endemic areas of neurocysticercosis[7,9,15,16].

No sex difference was found.

Young people are more affected by neurocysticercosis probably due to earlier exposure to precarious sanitary conditions.

Precarious socioeconomic conditions are related to the incidence of neurocysticercosis. Northeast is the poorest Region of Brazil. So we might suggest that this Region should have higher incidence than South and Southeast.

It is necessary to have specialized laboratory facilities to case the diagnosis of neurocysticercosis. Its use is limited in Northern Brazil.

In Paraíba, a Northeast Brazilian State, neurocysticercosis is a frequent neuroparasitosis, needing a more detailed and extensive study to determine the endemicity of such a disease in this area.

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