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PREVALENCE OF SEIZURES AND ASSOCIATED FACTORS IN CHILDREN UNDER FIVE LIVING IN A DEPRIVED MUNICIPALITY OF SOUTHERN BRAZIL

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ABSTRACT - *Objective:* To determine the frequency and distribution of seizure in children under five, living in a deprived community. *Method:* This was a cross-sectional study, conducted in a probabilistic sample of 487 children aged 5 or less, resident in the rural and urban areas of São José do Norte, a poor municipality in southern Brazil, during the period 1998-99. Children were identified as having this disorder after the application of the three subsequent instruments, the screening questionnaire for epileptic seizures (SQES), the neurological diagnostic interview for epilepsy (NDIE) and the EEG. Statistical analysis included a multivariate analysis using Poisson regression. Prevalence ratios (PR) and 95% confidence intervals (CI) were calculated. *Results:* Diagnosis of epileptic seizures was confirmed in 22 children. Prevalence of seizure was 45.2/1000 (CI 2.9-6.8). Absence of tap water (PR 2.86; IC 1.15-7.10), and precarious housing (PR 2.50; CI 1.01-6.18) were significantly associated with the outcome. *Conclusion:* Prevalence of seizure in this deprived population is extremely high and related to socio-economic conditions.

KEY WORDS: epilepsy, socioeconomic factors, children, epidemiology.

Prevalência de convulsões e fatores associados em crianças menores de cinco anos em município pobre do sul do Brasil

RESUMO - *Objetivo:* Determinar a freqüência e distribuição de convulsões em crianças menores de cinco anos que vivem em uma comunidade pobre no sul do Brasil. *Método:* Foi realizado estudo de corte transversal, em amostra de 487 crianças menores de cinco anos de idade, residentes na área urbana e rural do município de São José do Norte, RS, Brasil, em 1988 e 1999. As crianças foram identificadas como positivo para a doença depois da aplicação de três instrumentos subseqüentes, rastreamento neurológico para epilepsia (QRN-E), entrevista diagnóstica neurológica para epilepsia (EDN-E) e eletrencefalograma. A análise estatística incluiu a análise multivariada por meio da regressão de Poisson. As razões de prevalência (RP) e intervalo de confiança (IC) de 95% foram calculados. *Resultados:* O diagnóstico para crise epiléptica foi confirmado em 22 crianças. A prevalência de convulsões foi 45,2/1000 (IC 2,9-6,8). A ausência de água encanada (RP 2,86; IC 1,15-7,10) e moradias precárias (RP 2,50; IC 1,01-6,15) foram, significativamente, associadas com a convulsão. *Conclusão:* A prevalência de convulsão em uma população pobre é extremamente alta e relacionada a condições sócio-econômicas.

PALAVRAS-CHAVE: epilepsia, fatores sócio-econômicos, crianças, epidemiologia.

Epilepsy has been considered as a worldwide problem of public health. Its frequency and characteristics cause adversities not only to the patient and his/her family, but also to society and does not have social, ethnic, geographical, age or sex barriers, which makes it the most common chronic neurological disorder[1]. The studies of prevalence can give important information for strategies promotion and protection of health. Studies on the prevalence of this disorder differ concerning its rates, and a wide variability among the values found is observed, fundamentally due to differences in the studied groups, in the places where the research was conducted and in the instruments used. However, in order for this information to be representative of the reality of a population, it is better to get it from within the com-

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munity itself and from a large enough number of its individuals[2].

There is little information regarding either the prevalence of epilepsy in children under five years old or concerning the influence of socio-economical and environmental factors, although they are taken into account. Among the studies conducted worldwide, in Nigeria[3], people of both sexes and all ages were examined and a prevalence of 37/1000 was found for active epilepsy. In South America, the study conducted in Chile[4] investigated 2085 children between 8 and 9 years. A prevalence rate of 31.9/1000 for accumulated epilepsy was found. In Ecuador[5], a questionnaire was used for screening in the first phase and a confirmatory second stage, and obtained an accumulated prevalence of 19.5/1000. In the Brazilian literature, specific studies for the age group studied in this research were not found. In Brazil, the first population study on the prevalence of epilepsy was published in 1980, in Salvador, Bahia[6]. The global prevalence rate was 1/1000 for adults and 8/1000 for children. Another study of population basis was conducted in São Paulo city[7]. The prevalence rate found was 11.9/1000, with a corrected prevalence of 13.3/1000. In the city of Porto Alegre in the State of Rio Grande do Sul, a cross-sectional study indicated an accumulated prevalence rate of 36.8/1000 for epilepsy[8]. In Rio de Janeiro city, another study found an accumulated prevalence of 16.3/1000 cases[9]. In São José do Rio Preto, São Paulo State[10], a study of prevalence in the urban population was conducted and an accumulated prevalence of 18.6/1000 inhabitants, and 8.2/1000 for active epilepsy was found over the past two years.

The purpose of this study was to identify the prevalence of seisure in children under five years old in the town of São José do Norte (Rio Grande do Sul State, Brazil), as well as to establish possible associations among socio-economic and children health variables with this neurological disorder.

METHOD

Population, sample and type of study – A cross sectional population-based study was conducted in São José do Norte, where 40% of the population belong to the rural area, in the period from August 1998 to December 1999. The target population for the study was the children from 0 to 4 years, living in the urban and rural zone of the town. For calculation of the sample, an estimated prevalence of convulsions in 0-5 year children of 5% ±2% and a confidence interval of 95% were used. The child population for this age group in that town was 2096. The sample size calculated, with 10% added for eventual losses, was 415. Considering that the average population per home was 3.26 people and the rate of 0-4 year children was of 9.13%, it was necessary to visit 1296 homes.

The sampling was of multi-phase type, and in the first phase, 20 census tracts of a randomly chosen lot were selected, being 13 in the urban zone and 7 in the rural zone. In the second phase in each section, a block and a corner were randomly chosen (in the urban zone), or a starting point in the perimeter of the section (rural zone). In the urban zone, one out of each two houses was visited, starting from the corner chosen by lot, until reaching 65 homes. In the rural zone, starting from the chosen point and following the direction north/south or east/west, all homes found in the itinerary were visited, until reaching 65 homes. All mothers of children under 5 years old were interviewed in the visited home.

Variables and instruments – For collection of data, a questionnaire with demographic, socio-economic questions was applied, as well as questions on child morbidity. The demographic variables included child's age and sex. The socio-economic variables included the type of house investigated (masonry, wood, mixed, mud-wall and slum), water supply (piped, well or water-hole), type of sanitary facilities (outside toilet, with or without discharge). Among the child's variables studied were: occurrence of diarrhea in the past fifteen days and low acute respiratory disease – ALRD (taken as cough and breathing difficulty in the past 7 days).

Seizure is the outcome variable, which concerns the occurrence of epileptic seizures in the past five years. As children under five years old are the target population, the study followed ILAE (International League Against Epilepsy) criteria[11-13]. For evaluating the occurrence of seizure, first the screening questionnaire for epileptic seizures (SQES) was used, validated in Brazil[14] with a 68,7% sensitivity and 83,7% specificity. Positive cases were studied by the neurological examination (NE). Finally, the electroencephalogram (EEG) was used in all the cases considered positive by the last exam[15]. In the SQES at least one positive question out of 14 was used as cut off point, except for question two, (if the child fell and went pale), that should be accompanied by question one, (if the child had uncontrollable trembling). The neurological examination applied by neurologist, was used as an instrument of diagnostic confirmation of epileptic seizures, and was based on the clinic report. In this stage, only patients under treatment with ant-epileptic drugs were taken into account, without considering the recurrence interval of the seizure, or febrile seizure and isolated seizure[11]. For the electroencephalogram, a 16-channel Mikromeditron® EEG was used, with technical specifications recommended by ILAE. Using EEG, both nonspecific abnormalities and epileptiform abnormalities were considered[13].

Statistical analysis – Data were typed twice, using the software EpiInfo 6.04, by two independent typists. Later the amplitude and consistence errors were corrected. The bank was translated for the software Stata 6.0, for statistical analysis.

The statistical analysis included a descriptive stage, where the proportions, averages and standard deviations were calculated. In a second stage a bivariate analysis was done, and the prevalence ratios (PR) and their 95% respective confidence intervals (CI) between the outcome and the different variables were calculated. To calculate the statistical significance of the associations in this stage, the chi-square test was used. In the case of ordinal type variables, a test of linear tendency was carried out. In the third stage, for studying the association between the outcome and the other variables adjusted among them, a backward stepwise Poisson regression with robust CI estimation was used, following a hierarchical model of analysis that was constructed with five levels: the first one with sociodemographic variables; the second level with home facilities; the third level included child morbidity (diarrhea, respiratory infection and malnutrition); the fourth level was constructed with neurological morbidities; finally, the fifth level with heritage analysis.

The variables having $p \leq 0.2$ or PR higher than 1.5, stayed in the model in order to avoid the possibility of negative confusion. The local ethics committee approved the study, and confidentiality and informed consent was assured to all participants.

RESULTS

A total of 531 children were interviewed; 487 questionnaires (91.7%) were completed. As can be observed in Table 1, children were equally distributed concerning gender, with a small prevalence of the female gender (249=51.13%), A rate of 57% of the children lived in houses not made of masonry. Concerning drinking water, 45.77% of the families did not have drinking water inside their homes and 47% of the families did not have sanitary facilities. The prevalence of diarrhea over the 15 day period was of 11.6%. The prevalence of ALRD for the last week was of 11.3%. Among the 487 children initially investigated, 61 (12.53%) had a positive SQES, 8.21% (40/487) had a positive NE, and 4.52% (22/487) had an EEG with pathological alterations, confirming the diagnosis of seizure.

The prevalence of seizure was 4.52%. It consisted of isolated crisis–2.1% (10/487); recurrent crisis–2.4% (12/487); unprovoked crisis–3.7% (18/487); and, fever-provoked crisis–0.82% (4/487).

Table 2 shows the prevalence ratios of seizure according to the characteristics of interest. There was a larger prevalence in boys, although the association was not statistically significant. With regard to age, even though categories over 12 months presented increased risks for seizure, none of the associations were significant. The linear tendency test was not significant (p=0.2). Analyzing the variable age classified in only two groups (under and over one year old), PR was of 2.65, but it was not significant (IC95% 0.62-11.33; p=0.2).

Table 1. Characteristics of the children in this study (n=487).

Variable	N	%
Sex		
Male	238	48.87
Female	249	51.13
Age (months)		
0-11	102	20.94
12-23	98	20.12
24-35	99	20.33
36-47	93	19.10
48-59	95	19.51
Type of house		
Masonry	210	43.12
Wood	225	46.20
Mixed	49	10.06
Mud-wall/slum	3	0.62
Water supply		
Piped	263	54.23
Well, water-hole	222	45.77
Sanitary facilities		
Toilet with discharge	258	53.42
Outside toilet	146	30.23
Toilet without discharge	62	12.84
None	17	3.52
Diarrhea		
No	427	88.41
Yes	56	11.59
Alrd		
No	425	88.73
Yes	54	11.27

Concerning seizure and type of house, it may be observed that children living in non-masonry houses had 3.5 times more chance of having seizure. Likewise, children living in houses without sanitary discharge had a risk 2 times higher of seizure than children living in houses with sanitary discharge. However, this result was not significant (p=0.1).

The children living in houses without piped water had a prevalence ratio 2.5 times higher for seizure than the reference group, showing a significant association (p=0.03). The risk of diarrhea was larger in the group with seizure, and this characteristic determined a PR 2.38 as compared with the group without diarrhea, but the significance was over the predetermined limit (p=0.07). Concerning ALRD, a significant association was not found.

Table 3 shows the multivariate analysis according to the hierarchical level. In the first level of analysis and adjusted to each other, age and sex did not show

Table 2. Occurrence of seizure and raw ratios of prevalence for the characteristics under study.

	Epilepsy (N)	PR	(CI 95%)	p
Sex				
Female	2.8% (7)	1	–	–
Male	6.0% (15)	2.24	0.93-5.40	0.06
Age (months)				
0-11	2.0% (2)	1		
12-23	4.0% (4)	2.08	0.39-11.1	0.4
24-35	6.1% (6)	3.09	0.64-14.9	0.1
36-47	5.4% (5)	2.74	0.55-13.80	0.2
48-59	5.3% (5)	2.68	0.53-13.5	0.2
Type of house				
Masonry	3.7% (16)	1		
Non masonry	11.5% (6)	3.4	1.28-7.66	0.001
Sanitary facilities				
Toilet with discharge	3.1% (8)	1		
Toilet without discharge	6.2% (14)	2.01	0.86-4.70	0.1
Water supply				
Piped water	2.7% (7)	1		
Other	6.8% (15)	2.54	1.05-6.11	0.03
Diarrhea				
No	3.7% (16)	1		
Yes	8.9% (5)	2.38	0.91-6.25	0.07
ALRD				
No	4.45% (19)	1		
Yes	5.56% (3)	01.24	0.38-4.06	0.7

Table 3. Adjusted ratios of prevalence of seizure and associated factors in children under five years old.

Variable	PR	CI	p
Age[a]	1.02	0.99-1.03	0.1
Sex[a]			
Female	1		
Male	2.20	0.91-5.30	0.08
House masonry[b]			
Masonry	1		
Non masonry	3.00	1.26-7.12	0.01
Piped water[b]			
Yes	1		
No	2.45	1.03-5.79	0.04
Diarrhea[c]			
No	1		
Yes	2.49	0.93-6.59	0.07

[a]Model of first level: age and sex; [b]Model of second level: first level + type of house and piped water; [c]Model of third level: second level + diarrhea.

significant association with the outcome, but they were maintained in the model because they present a p<0.2, as previously explained in the methodology. The male sex had a PR 2.2 as compared to the female, but the value of p was over the significance value (p=0.08).

In the second level of analysis, and adjusted for the variables of the first level, type of house and presence of piped water showed to be a risk factor for the outcome. Children living in houses made of non-masonry materials had three times more chance of having seizure (PR 3; IC95% 1.26-7.12). Children without piped water available at home had a probability 2.5 times higher of having seizure than children living in houses with piped water (PR 2.45; IC95% 1.03-5.79). In this level of analysis, the variable sanitation was removed, since it presents strong co-linearity with piped water.

In the third level and adjusted for the previous variables, children that had diarrhea showed a chance 2.5 higher of suffering the outcome than those without diarrhea, but the association was not significant. The variable ALRD was removed from the model since it did not present any of the criteria agreed to stay in the analysis.

DISCUSSION

Population-based studies with regard to the prevalence of seizure are relevant to better planning of health care activities. In the present study, seizure was investigated among children under five years old

in a poor community. Among the possible limitations of the study, there was a loss of eight percent from the data, although this missing data is quite low to affect the results. Another possible limitation could be recall bias, since mothers of children with seizure would be more likely to answer the questionnaire, as they know the symptoms. But, if this was possible, it had little importance since only 1.64% of the mothers said they knew that the child was epileptic, while the SQES found 12.53% of positive cases.

The prevalence rates found for active seizure in the urban and rural area of São José do Norte for children under five years old was 45.2/1000. This high estimate is consistent with the findings of other studies conducted in other underdeveloped countries[3,4]. Concerning studies conducted in Brazil[7], approaching a group of the same age rate, a prevalence of 4.9/1000 was found in Rio Preto, a prosperous city of São Paulo State[10]. This number is close to the values found in developed countries, but it is ten times lower than the number found in this study. This fact is related to the health conditions as well as the risks to which the poor population is exposed. This can be seen in the result of a test carried out in the rural area of Nigeria[8], which showed prevalence above 40/1000 for the general population.

There was difference in the rates between genders, as seizure was more frequent in males. Analyzing other population based studies, the prevalence of one or another gender varied. A several studies have described the frequency of epilepsy prevailing in male[16-19]; others showed prevalence of the female gender[20,21] and other ones report no differences among genders[22-30]. Concerning the different age groups, in this study there was no significant difference among them, although the rate of one-year olds or over had higher PR than the group of one year or less. In the other studies, a variation of prevalence has been described according to the age group[8]. A study conducted in Porto Alegre, in an age group that included the age rate studied here (1-9 years), no differences were found among the genders[8].

Although the socio-economical factors, such as type of house and variables related to child health showed a significant association with the outcome, and that these are mentioned in the literature as risk factors for epilepsy[4,8,13,25], there is little information about them. It is supposed that the unfavorable socio-economic conditions cause the arising of other risk factors such as infectious-contagious and parasitic diseases or bad care in pregnancy and childbirth that in their turn may produce brain lesions[23,26,27,29,30]. For these reasons a higher prevalence of this disorder is observed in the youngest age groups, and in the poorest countries. The present study found that the socio-economic factor is related to the higher prevalence of seizure and that amongst this group, those with lower living conditions present an even higher risk factor.

In conclusion, it can be said that this study found a high prevalence of seizure in the 0-4 year group. The values are higher than those observed in developed countries or in Brazilian areas with better socio-economic conditions. It also shows that with illness linked to poverty, those children who are in the lowest segment within the poor community present a higher risk factor. This data indicates the need of better planning of health activities provided for the population; the establishment of appropriate programs for seizure and for the associated factors, and the improvement of the services aimed at reducing the social differences.

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