

Characterization of tuberculosis in children and adolescents in underdeveloped country

Abstract

Introduction: Globally, it is estimated that two hundred thousand children died from tuberculosis from 2010 to 2012, due to certain clinical and laboratory peculiarities that difficult the diagnose and delay treatment in childhood. Objective: To characterize epidemiologically the tuberculosis in children and adolescents.

Materials and methods: This is a retrospective cohort study, carried out georeferencing in the laboratory and evaluation of the density of the cases by neighborhood.

Results: In the 67 patients analyzed, 36 were female and 31 were male. As for the age group, 39 patients had 11 to 14years, 12 had less than to 2years, 9 had 3 to 6years, 7 had 7 to 10years old. There were 32 positive bacilloscopies in the first examination and 30 in the second, 52 cases of pulmonary form of the disease and 52 patients were discharged for cure, but 5 deaths were also recorded in the study. There was a high prevalence of cases in the neighborhoods of Jaderlândia, Heliolândia and Coqueiro.

Conclusion: The characterization of tuberculosis in the studied age group in underdeveloped country was done successfully. It was observed a greater prevalence mostly on poor neighborhood.

Keywords: tuberculosis, child health, bacilloscopy, pediatrics

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Introduction

Despite the fact that most people who develop tuberculosis (TB) can be cured when timely diagnosis and correct treatment¹, worldwide, this disease has caused deaths of 3.7millions of people between 2010 to 2012, where, among these, 200,000 were children.^{2,3} TB in childhood is usually abaciphiliferous - unlike adults, who are usually bacilliferous. In addition, children may exhibit nonspecific signs and symptoms and are generally unable to expectorate. Such factors make diagnosis difficult and prolongs treatment.⁴ According to Zombini et al.,⁵ infant TB is also not a well investigated aspect in the evaluation of an adult communicants with the bacilliferous pulmonary form, they only receive the necessary assistance after presenting symptoms of the disease already installed. Thus, it is necessary to highlight the importance of screening in close cohabitants or patient's contacts diagnosed with TB. Specially in children, several cases have been identified that could be treated even before they develop the disease.⁶ Tuberculosis is a public health problem due to its high prevalence and mortality, which still presents alarming numbers. In 2014, in the world, one million deaths were attributed to the disease, and in Brazil, that number was around 4.400.⁷ Thus, knowledge of epidemiological and operational indicators is essential for the construction and planning of activities of tuberculosis control programs. Therefore, the objective of this research was to epidemiologically characterize TB cases in children and adolescents in the municipality of Ananindeua-Pará - Brazil, from 2005 to 2014.

Materials and methods

All data of this research were studied according to Declaration of Helsinki precepts and the Nuremberg Code, respecting Research involving Human beings norms (brazilian Resolution n.466 of 2012) of the National Health Council and after obtaining the necessary

authorizations. The study project was submitted and approved by Research Ethics Committee of the University of State of Pará (UEPA) (Protocol number 773,881). This is a retrospective cohort study, based on Health's department database of Ananindeua, a Brazilian city in the state of Pará, located in the Northern Region of Brazil. Were included in this research children, aged 0 to 14years diagnosed tuberculosis and that were residing and/or diagnosed in Ananindeua city, between January 2005 to May 2014, children with incomplete or conflicting data were excluded from casuistry. To characterize the epidemiologic profile of TB, the following variables were analyzed: sex, age, race, cases confirmed in the 1st sputum smear microscopy, cases confirmed in the 2nd sputum smear microscopy, smear microscopy with other material, entry and exit of the health service, form of the disease, sputum culture, presence of HIV/AIDS coinfection, indication for supervised treatment, year of diagnosis and place of residence.

The statistical study of the results obtained was performed according to the nature of the variables. Statistical analysis was applied using the Qui Quadrado test, using the software Biostat 5.3, being considered statistically significant $p < 0.05$. For the creation of a database and elaboration of graphs and tables the programs Excel and Microsoft Word 2010 were used. The georeferencing of the residences of registered patients was done in a laboratory, using the National Center of Address for Statistical Purposes (CNEFE) of the Brazilian Institute of Geography and Statistics (IBGE). The collected points were inserted in a spreadsheet of the program Microsoft Excel 2010 and later converted to a Geographic Database (BDGeo) by the Geographic Information System (GIS) ArcGIS 10.2. The satellite image acquired from the National Institute of Space Research (INPE) SPOT 5_702/352; July 5, 2010, was pre-processed by ArcGIS 10.2 Software. The geostatistics technique was used to analyze the behavior of dot patterns (Kernel density interpolator).

Results

In the analyzed period there were 67 confirmed cases of tuberculosis in children and adolescents in the city of Ananindeua, where 36 were female (p=0.3). Regarding the race variable, 47 were reported as brown, 13 were white, 3 were black, and 4 had this data ignored. There were 48 indications for supervised treatment, 28 were children of 11 to 14years, 11 for patients between 3 and 10years and 9 were children under 2years (p=0.9812). About age range (p<0.2) of the patients analyzed, 12 were 2years old or younger, 9 were between 3 to 6years old, 7 were between 7 to 10years old and the majority (39) were between 11 and 14years. As far as sputum smear microscopy is concerned, it was possible to notice that most of the positive results were observed in the first exam Table 1 and in group of 11 to 14years old Table 2. Regarding the form of the complaint Table 3, it was observed a predominance of the pulmonary form, with 52 cases. In the others, 14 were extrapulmonary forms and there was a case where both presentations coexisted. About forms of entry into health service the most common was new cases (p=0.0716), with only one relapse notification and one relapse notification after abandonment, in addition to 10 transfers. On the other hand, in relation to the forms of exit Table 4, it is highlighted that the absolute majority of the patients were discharged for cure and in that period 5 died (7.5% of the cases). There was also one case of abandonment of treatment and three transfers. In addition, no changes in diagnosis and progression to multidrug-resistant TB were reported. Most of the patients did not undergo HIV/AIDS test (68.6% of the cases), more than 97% of the cases the sputum culture was not performed. In Figure 1, it is possible to observe a high concentration of cases in the neighborhood of Jaderlândia, in red on the map, followed by the neighborhoods Heliolândia and Coqueiro with 8cases each.

Table 1 Smear microscopy cases results of childhood tuberculosis in Ananindeua-PA

	1st smear microscopy	2nd smear microscopy	smear microscopy with other material
Positive	32	30	5
Negative	16	17	3
Unrealized	19	20	59
Total	67	67	67

X²=62.3, P<0.05

Table 4 Age group by exit's forms of hospital in children and adolescents in Ananindeua-PA

Age	Cure	Abandonment of treatment	Death	Transfer to another hospital	Unknow	Total
≤2years	8	0	3	1	0	12
3-6years	7	0	1	1	0	9
7-10years	5	0	0	0	2	7
11-14years	32	1	1	1	4	39
Total	52	1	5	3	6	67

X²=14.8, P=0.25

Table 2 Age range according to results of the first sputum smear microscopy in patients 0 to 14years old

xc	Positive	Negative	Unrealized	Total
≤2years	2	4	6	12
3-6years	0	3	6	9
7-10years	2	2	3	7
11-14years	28	7	4	39
Total	32	16	19	67



X²=27.03, P<0.05

Figure 1 Kernel density map for pediatric tuberculosis cases in the municipality of Ananindeua-PA, from 2005 to 2014. Source, Lab Geo/CCBS/UEPA. Asterisk next to the number in the three most affected regions.

Table 3 Age range according to the form of the disease in cases of tuberculosis in Ananindeua-PA

Age	Pulmonary	Extrapulmonary	both	Total
≤2anos	10	1	1	12
3-6anos	6	3	0	9
7-10anos	4	3	0	7
11-14anos	32	7	0	39
Total	52	14	1	67

X²=8.6, P=0.19

Discussion

Tuberculosis is an age-old infectious disease that, even though the etiologic agent *Mycobacterium tuberculosis* isolated and identified since 1882 and the use of specific chemotherapy since the beginning of the 20th century, remains a major public health problem in underdevelopment country, especially in countries such as Brazil.⁵ Thus, epidemiological studies are important because its provides general data about the conditions of the analyzed population and identify those whose care during diagnosis and treatment should be redoubled. In this context, special emphasis should be given to children, since the diagnosis of TB in these patients can be a real challenge. The literature demonstrates that although mycobacteria research and culture are the most commonly used diagnostic methods when TB is suspected, less than 20% of the children with the diagnosis have a positive bacilloscopy and the culture detects *M. tuberculosis* in less than 50% of the cases.⁸ This is most often due to the characteristics of pulmonary lesions in this age group, non-cavitary, with a small number of bacilli and/or because of the technical difficulty in obtaining sputum, since children up to school age can not expectorate.⁵ However, in the present study, it was possible to show that TB cases presented a high number of positive results in the first (66.6%) and second (63.8%) smear microscopies, but the higher rates of smear positivity suggest a selection bias for older children (58.2% are 11 to 14years old) who are more likely to provide a sputum sample with higher bacillary load, 9 it is also worth noting that adolescents express a disease with a pattern more similar to that of an adult.⁹

It is also important to note that the highest number of reported cases in adolescents may be a reflection of underreporting of TB in the younger age group, as it is estimated that about 50% of cases of childhood tuberculosis should be among children younger than fiveyears, as they are more likely to progress to active TB when exposed,¹⁰ but the difficulties cited earlier to identify the disease at this age may be responsible for concealing such numbers. These data are in line with those reported by the Pan American Health Organization¹¹ in its regional report for 2014, which states that the reduced numbers of children among tuberculosis cases reported may be mainly due to insufficient detection among infants and preschool children, and that the highest rates of underreporting occur in children under 5years of age. The most common form of TB in children and adolescents was the pulmonary form (about 80%) and the remainder presented in the extrapulmonary form, which is in agreement with other reports in the literature.^{12,13} Regarding the closure situation, approximately 80% obtained cure, similar to another study carried out in the State of Espírito Santo,¹⁴ and 5 patients died, 3 of whom were younger than 2years. It is important to emphasize that this age group includes cases of perinatal TB that admittedly increase the chances of preterm birth, low birth weight, fetal distress and perinatal death.¹⁵ HIV testing is a recommendation of the Ministry of Health for all patients with tuberculosis, 16 because the human immunodeficiency syndrome (AIDS), by compromising the immune system, makes the individual more susceptible to opportunistic diseases, among which TB is considered as one of the most important, for raising the mortality rate¹⁷. Thus, several studies point to HIV as one of the main aggravations associated with TB,^{10,16,17} but the present study can not perform such a correlation since most of the patients were not submitted to the HIV rapid test. Another factor to be evaluated is the existing inequalities in the conditions of housing, income distribution and access to education that influence the sickness in the geographical spaces, characterized by pockets of poverty within the

municipalities,¹⁸ which can be evidenced in figure 1 (in red on the map). Thus, the worse the social and economic conditions are the worse are the individual's living conditions generating an increase in vulnerability and, consequently, the chances of becoming ill from diseases such as TB.¹⁹

Conclusion

Tuberculosis in the studied age group was characterized as predominantly in the pulmonary form, confirmed by sputum smear microscopy and had a greater number of cases reported in adolescents between 11 and 14years of age, but it is worth mentioning the possibility of underreporting of cases in children under 5years. It was observed a higher prevalence of cases in the neighborhood of Jaderlândia, which can be attributed to socioeconomic conditions of the region that favor the transmission of mycobacteria. One of the main limitations of the study is related to the quality and effectiveness of TB notification service, since beyond notorious underreporting, some erroneous and/or incomplete information was found in the database. In addition, information on early contact prevention and screening strategies were not evaluated and should be the subject of further research, as TB is a preventable disease.

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Conflict of interest

Author declares that there is no conflict of interest.

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