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HISTORICAL SERIES OF ACQUIRED IMMUNODEFICIENCY SYNDROME INCIDENCE IN CHILDREN UNDER AGE FIVE IN NORTHEASTERN BRAZIL

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ABSTRACT

It was sought to analyze the incidence rate of acquired immunodeficiency syndrome - AIDS in children from zero to five years of age, aiming to translate the panorama of AIDS in northeastern Brazil. It was developed a quantitative study of the temporal trend of the annual incidence rate of cases in children under five years of age, residing in Northeastern Brazil, from the records between the years 2005 and 2015. An analysis was conducted (ANOVA one-way), to verify the difference between the average of observations of incidence rates. For this, the assumption of data normality was assumed and, the equality of variances (homoscedasticity hypothesis) was verified through the Levene's test. The ANOVA, performed at a significance level of 0.05%, made it possible to affirm that there is statistical evidence to accept the hypothesis that the annual average of AIDS incidence rates in each state, in children under five years of age, in the study period, are equals. With the analyzes performed, it is possible to identify that, even in the face of the accomplished achievements of the decrease and stabilization of the incidence rates of AIDS among children under five.

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INTRODUCTION

Human immunodeficiency virus (HIV) belongs to the class of retroviruses and it is the etiologic agent of acquired immunodeficiency syndrome (AIDS). Its transmission can occur through the sexual, blood or parenteral routes and vertical transmission when there is contact and / or exchange of blood or organic secretion containing the virus, or by parasitized cells (MELO, 2016). Vertical transmission has been responsible for cases of AIDS in children around the world and, in Brazil, about 84.0% of the cases in children under 13 years of age are resulting from this form of transmission. The probability of vertical transmission can reach 25.5% without any intervention. However, through preventive interventions, the transmission can be reduced to levels between 0.0% and 2.0%. The United Nations Children's Fund's vertical transmission of HIV report pointed to a 50% reduction in the number of new AIDS cases in children, between the years of 2001 and 2012 (MIRANDA *et al.,* 2016). It has been observed a clear change in the scenario of the HIV infection in children, in addition to the increase in survival due to the access to medicines and care. This reality allows children with HIV reach adolescence and eventually

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adulthood. In a new epidemiological context, different from what was seen, for example, in the late 1980s and 1990s, when the processes of feminization, youthization and pauperization of the epidemic intensified (MELO, 2016). Feminization is observed through the reduction of the male / female ratio. Moreover, in some age groups, the inversion of this ratio can be observed. The process of feminization of AIDS is significant since it increases the number of children with AIDS through mother-to-child transmission and consequently causes orphan hood (PINTO, 2012). In 1996, the National Program for sexually transmitted diseases (STDs) and AIDS (PN-STD / AIDS) was created from the published Ordinance No. 236, which provided the highly active antiretroviral therapy (HAART). It also expanded prophylactic actions, particularly to the infected pregnant woman and to the exposed newborn, reducing the morbidity and mortality related to HIV / AIDS infection in children, even during the spread of the epidemic among women (MELO, 2016). Although there is in Brazil availability of testing and prophylactic medication, children are still infected. This is because many women arrive in maternity wards without prenatal care and the coverage of the HIVdiagnosis rapid test during prenatal care is still low in Brazil. Which means that, for most HIV seropositive women, the only opportunity to have access to counseling, to the HIV test, and to the treatment of chemoprophylaxis of vertical transmission is during the hospitalization for childbirth. In the Brazilian Northeast, there has been a tendency to increase the rate of vertical transmission of HIV, which, therefore, increases the incidence rate in the general population. Thus, faced with this problem, there is a concrete need to better investigate the occurrence of AIDS in the Northeast region, in order to the probabilities to contribute to improve the quality of prenatal care and the effective enforcement of the recommendations for seropositive pregnant women and children in the region. It is intended to analyze the incidence rate of AIDS in children from zero to five years, aiming to interpret the panorama of the disease in northeastern Brazil.

MATERIALS AND METHODS

A quantitative study of the temporal trend of the annual incidence rate of AIDS cases in children under five years of age residing in the Northeast region of Brazil was developed from records between 2005 and 2015. The total number of cases informed in the Reportable Diseases Database (SINAN) was collected through the Information Technology Department of the Public Health Care System -SUS (DATASUS). The epidemiological data referring to the variables of interest were obtained considering the inclusion criteria of the study, among them are: age group less than and equal to 5 years of age; the Northeastern region of Brazil as a place of residence and record of the AIDS case from 2005 to 2015. Regarding the total number of live births in the Northeast, from 2005 to 2014, 4.417.992 live births were male, and 4,201,677 were female, with an average of 4.309.835. The total percentage of children with AIDS by 100 thousand/habitant in the period from 2005 to 2015 in the Northeast was 280.8.The data were collected from the DATASUS website, reported by SINAN. It is noteworthy to mention the lack of some data the site does not yet provide, for example, live birth data for the year 2015. The Northeastern region was chosen as the research scenario, especially due to the scarcity of studies on HIV and children in this region, but also because of its importance. In addition, according to the Epidemiological Bulletin of 2013 (Ministério da Saúde, 2013a), the Northeast region is among the states with the worst indicators of AIDS in the country, with a 62.6% increase in the rate of detection of the disease and a rise of 33.3% in the mortality coefficient in the last 10 years. And, the state of Ceará concentrates 16.0% of the diagnosed cases, occupying the 19th position in the national ranking and the 3rd in the Northeast in the year of 2012. Notwithstanding, the city of Fortaleza occupied the 6th position in the cases detection among the capitals of the Northeast Region in the same year.

At the same time, it is known that the Northeast region is less favored economically, is evidenced by the precariousness of many public services, mainly health services. In 2000, more than half of the country's people lived in poverty or extreme poverty in the Northeast, as a determinant of health, adversely affects the quality of the table. In fact, with about 18.2% of the country area and 28.0% of the population, the Northeast region was home in 2000 to about 55.0% of people in extreme poverty in Brazil (ROCHA, 2003; SILVEIRA NETO, 2005). One-way ANOVA analysis of variance was performed to verify the difference between the averages of observations of the incidence rates of AIDS cases in children under five years of age in the states of Northeast Brazil. Thus, the data normality assumption was assumed and the equality of variances (homoscedasticity hypothesis) was verified by the Levene test. Both tests were scored at a significance level of 5.0%. In the performance of the procedures of statistical analysis of the data that based the inferences, the free distribution software Past3 was used.

RESULTS

The sex ratio is expressed the ratio between the number of AIDS cases in men and women. From 1980 to June 2015, 519,183 (65.0%) cases of AIDS in men and 278,960 (35.0%) in women were registered in Brazil. Table 1 shows the sex ratio of each state of the Brazilian Northeast from the years 2005 to 2015, and the annual rates from each state. Considering the presented data, it is clear that the percentage average of the states ofCeará - CE (2.1), Rio Grande do Norte – RN (2.0) and Piauí– PI (1.9) are high relative to other states. In contrast to the average of Bahia - BA (1.6), Pernambuco– PE (1.6) and Maranhão - MA (1.6), which are the lowest averages in the period evaluated. However, there is an annual increase with oscillations of AIDS cases in Pernambuco, Alagoas– AL and Paraíba - PB. For statistical effect, after the Levene's test, concomitant to this, there was the one-way analysis of variance (ANOVA), to verify if there are differences among the averages of the states and the annual averagesof AIDS incidence rate in children less than five years of agein the northeastern Brazil, as shown in the table below.

The ANOVA, performed for the significance level of 0.05%, made it possible to affirm that there is statistical evidence to accept the hypothesis that the average of state and the annual average of AIDS incidence rates in children under five years of age, in the study period, are the same. Hence, the Northeastern states do not have different average incidents rates ($p = 0.4112$). It is opportune to mention that, after the ANOVA test, a residual analysis was performed, presenting the differences between the actual (notified) values and the estimated ones in the test. Estimates that subsidized ANOVA and are have their differences presented in Figure 1. It can be observed, in figure 2, that states like Pernambuco and Alagoas maintain the incidence rate elevated. The incidence of HIV infection is directly proportional to the spread of the disease in pregnant women and women of productive age, and, in fact, in

Table 1. Sex ratio of AIDS cases reported in SINAN, declared in SIM and registered in SISCEL / SICLOM per diagnosis year

State	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	M*
AL	1,5	2,1	1,5	1,6	1,4	1,6	1,3	1,7	1,5	1,9	2,3	1,7
BA	1,4	1,5	1,4	1,5	1,6	1,4	1,6	1,6	1,6	1,6	2,0	1,6
CE	1,8	2,0	1,8	1,8	2,0	2,1	2,3	2,1	2,1	2,4	2,8	2,1
MA	1,8	1,5	1,3	1,5	1,5	1,6	1,5	1,5	1,5	1,7	1,8	1,6
PB	1,9	1,4	1,4	1,4	1,7	1,5	1,8	2,5	2,0	1,9	2,4	1,8
PE	1,5	1,5	1,6	1,5	1,6	1,6	1,5	1,6	1,6	1,7	1,8	1,6
PI	2,0	1,6	1,9	1,5	1,9	2,1	2,0	1,7	2,1	1,9	1,9	1,9
RN	1,5	1,3	2,2	1,8	1,8	2,1	2,3	2,3	2,2	2,3	2,5	2,0
SE	1,7	1,7	1,8	1,8	1,6	1,5	1,7	2,2	2,2	2,3	2,0	1,9

*State mean

Table 2. Result of the one-way analysis of variance (ANOVA)

Contrast	Sum of squares	Df	Mean Square	F	p-value
Between the years	15.9335	10	1.59335	1.048	0.4112
Within states	133.836	88	1.52086		
Total	149.769	98	-		

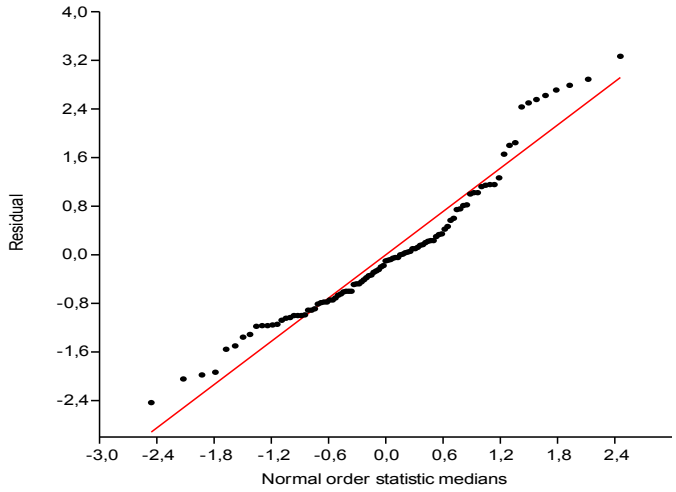

Figure 1. Graphic of estimated residues in ANOVA

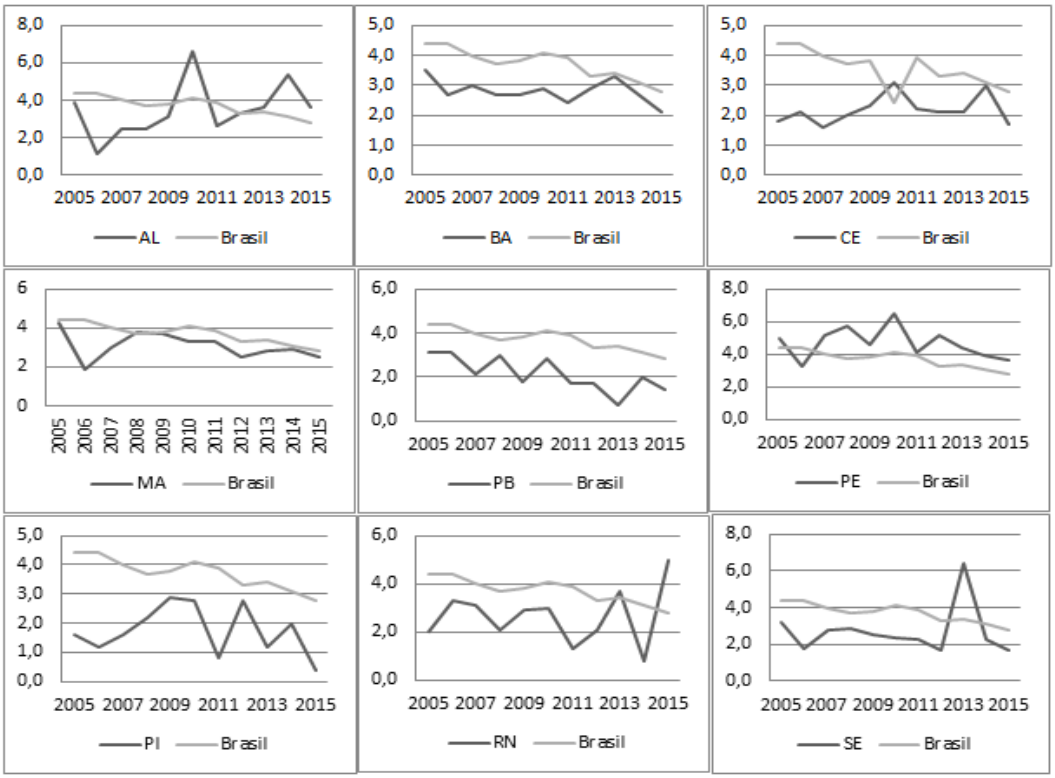

Figure 2. Incidence rate of each Northeast state compared to Brazil

Pernambuco, the incidence of AIDS for this profile is also high. This may be a justification for the incidence rate in children under five years of age in this state be higher than the national average. By analyzing Figure 2, it is perceived that most states at some point on the curve equals or exceeds the national average, except Piauí and Paraíba, and that is good. In these two states, there were some variations, but also a decline, especially in the years 2014 and 2015. Rio Grande do Norte, between the years of 2012 and 2013, had its average equated with the national one. But unlike the other states, in the years 2014 and 2015, instead of a decline, there has been an increase, most notably, in the period from 2005 to 2015.Aracaju, the capital of the state of Sergipe - SE, for example, has the highest HIV / AIDS rate in the state. Pernambuco was the only state that kept the records in almost all the decade analyzed above what is found on the national scenario. This observed fact in the incidence rate of that state may be associated with the scarcity of studies on infection and investigation of care in children, concomitantly with the increase of pregnant women with HIV in that decade, access to health services, conditions regarding vulnerability, such as poverty and low education. Ceará, in 2010 and 2014, reaches the national average, and, in 2015, there was a decrease. The average of Bahia's rate from 2005 to 2012 remained stable. From 2013 equaled to the national average. Alagoas surpassed the national average in 2010 and 2014.

DISCUSSION

A priori, the rate of AIDS detection in children under five years old has been used as a proxy indicator for monitoring vertical HIV transmission. There has been a downward trend in Brazil, which was 33.3% in the last ten years. However, there are important differences between regions regarding this trend (Ministério da Saúde, 2015). In the Southeast, South and Center West regions, there is a downward trend in HIV infections, with a percentage of 58.3%, 40.1%, and 26.1%, respectively, from 2005 to 2014. The Northeast region presented a decrease of 12.1%. Moving from 3.3 in 2005 to 2.9 cases per 100.000 inhabitants in 2014. On the other hand, in the North, there was a 69.2% increase in the rate in the same period (from 2.6 to 4.4 per 100.000 inhabitants) (Ministério da Saúde, 2015). Furthermore, the sex ratio presents important regional differences. In the Southeast and Center West regions, there is a predominance of men compared to the other regions, having the ratio of sexes of 22 cases in men for every 10 cases in women, in the year of 2014. On the other hand, in the North and Northeast regions the sex ratio has an average of 19 cases in men for every 10 cases in women, whereas in the South region there is a greater participation of women in AIDS cases, having the sex ratio of 16 men for every 10 women (Ministério da Saúde, 2015). It is thus understandable that the results are positives; there are statistical evidences to affirm that the average of incident rates are stable and did not differ among the states of the region under analysis. To be precise, the occurrence of AIDS, caused by vertical infection, is invariable in the analyzed period. In Brazil, there was a decrease in cases of AIDS incidence in children under five years of age. When comparing the years of 1980 and 2010, the reduction reached 40.7%. This decline is a reflection of the actions and policy of prevention of vertical transmission of HIV adopted in the country (Ministério da Saúde, 2013a). However, in the Brazilian Northeast there was a trend in the growth of the vertical transmission rate. There is a necessity to improve the quality of prenatal care and the effective fulfillment of the recommendations for seropositive pregnant women and children exposed in the region (Ministério da Saúde, 2013b).
The inferiority in relation to the national average can be explained by having a good structure, such as a committed team, accessible health centers and availability of the materials required, and involve sufficient resources, what mean, methods and actions that attract people in search of prevention and treatment, probably the most important way to protect and promote the quality of care. It is understood that corrective measures, aimed at improving the organizational structure of public health meant to this public, are necessary to obtain the expected results (ARAUJO, 2007).

According to Miranda (2016, p.2) 84.0% of AIDS cases in children are from vertical transmission, in view of this, in 2011 the Brazilian government decided to make an agreement with the objective to reduce vertical transmission of HIV to less than 2% in all countries by 2015. The main actions of this measure are the prevention of HIV infection in women of childbearing age, early knowledge of the serological status at the beginning of pregnancy and adequate treatment. The first adult female case was diagnosed in 1990 and the first case of vertical transmission in 1993. The increasing number of HIV-infected children makes the situation alarming, as evidenced by a study developed in the public maternity hospitals of Sergipe (Public Health Care System - SUS) where HIV seroprevalence of 0.42% was detected among pregnant women (LEMOS, 2012). Between 2012 and 2013, Sergipe was the state highlighted with the highest rate, in 2011 a study was conducted in the capital on a Maternity, using the AIDS protocol Clinical Trial Group 076 (ACTG 076), by Lemos (2012), aiming mainly to determine whether zidovudine administered to HIV-infected women during pregnancy and to their infants during the first six weeks of life could reduce the rate of HIV infection in infants. As a result, it was found that there were significant failures to prevent mother-to-child transmission, including failure to comply with the three phases of the ACTG 076 protocol: prenatal needs, inadequate childbirth and loss of follow-up for the exposed child. In Recife, capital of Pernambuco, in 2010 the average of AIDS incidence rate among children under five years was estimated at 8.18 cases / 100.000 inhabitants. High value when compared to the national rate of 3.5 cases / 100,000 inhabitants, and regional to the Northeast of 3.4 cases / 100.000 inhabitants (Ministério da Saúde, 2013a). In Maranhão, there was a drop in 2006, and a slight decline from 2009 to 2012. Since then, it has remained stable. According to Silva (2010, p.3), the data reveal a failure in maternal and child care, especially that one focused on prevention of HIV transmission. Among them, the late diagnosis of infection in pregnant women, the low application of the ACTG 076 protocol, the practice of breastfeeding by these infected pregnant women, and the non-screening for the type of childbirth should be highlighted. It can be considered that one of the major causes of HIV infection in children is the socioeconomic differential, such as poverty and illiteracy of the mother, which contributes to a pregnancy without prenatal and adequate birth for her. This can help to planning preventive actions and health promotion directed to regions of the identified cities, become more vulnerable to HIV. There are means, such as the covenants for eradication and free availability of the recommended prophylactic interventions to be applied, available to anyone in need. For it has already been proven that by means of preventive interventions, transmission can be reduced to levels between 0.0% and 2.0%. This also reduces the cases of

infected children. As in the other states, the causes of these increases may also be related to vertical transmission, socioeconomic factors, lack of prevention and prenatal follow-up.

Conclusion

With the analyzes performed, it can be possible to identified that, despite the achievements of the reduction and stabilization of incidence rates of AIDS among children less than five years, the Brazilian government continues to strengthen its activities to reduce vertical transmission of HIV, especially in relation to lack of prenatal care, inadequate type of childbirth, and losses for follow-up of the exposed child.

Nevertheless, to ensure that no child is going to born with HIV and to reduce maternal deaths resulting from AIDS still remains a challenge in relation to the commitments proposed to control the epidemic. The method used was relevant, as it enabled the verification of the proximity of the values of the state's averages, as well as the stabilization of the same. What was possible through ANOVA. The main limitation found in this study isthe fact of working with secondary data, which are subject to factors that make them questionable, and they could be seen as poor quality of fill. This compromises the trustworthiness of the results, since the researchers cannot control this fact. However, one contribution left by this study is the importance of maternal and childcare by primary care professionals, especially those focused on prevention of transmission. Among them, the early diagnosis of HIV seropositivity in pregnant women, thesignaling in low use,and the inadequacy in the application of the ACTG 076 protocol, the practice of breastfeeding by HIV-infected pregnant women, and non-screening for the type of childbirth. Following a historical series, it was not possible to compare the evolution of AIDS epidemic with data available since 1980. It was noteworthy that, for the first time in seven years, the detection rate per 100,000 population drop to less than 20 cases, being the lowest detection rate of the last 12 years, it can be verified that the vertical transmission rate of HIV has declined even more, reiterating the growing success of the work strategy with the prenatal service in the identification and correct follow-up of mothers carriers of HIV (Ministério da Saúde, 2015). The improvement of coverage, particularly in areas of great poverty and illiteracy, is of great importance, since this population is the one that most needs monitoring and information. It was possible to visualize a greater concentration of AIDS cases in children in regions with less favored social characteristics.

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