Original article

Redução de infecção respiratória aguda em crianças menores de dois anos em Rondonópolis-MT

Reduction in acute respiratory infection in children under two years in Rondonópolis-MT

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ABSTRACT

Background and objectives: Among the respiratory diseases, acute infections are the main cause of consultation and hospitalization of children under five years. In Mato Grosso (MT), these diseases were the main causes of hospitalization in 2005. This study aimed to analyze the temporal behavior of acute respiratory infection (ARI) in children under two years in Rondonópolis (MT) between 1999 and 2014. **Methods**: Cross-sectional retrospective study whose data source was the Basic Attention Health Information System (SISAB), fed by units of primary health care. Time series analysis techniques were used and their respective models, and the integrated auto regressive and moving averages models were effective. After choosing the model that best represented the data, the choosing criteria for the models were adopted, such as the Akaike's Information Criterion, Bayesian Information Criterion and the Forecast Mean Squared Error, proceeding with the prediction of cases for the next years. **Results:** The occurrences of ARI are suggestive of high prevalence in the studied period, and 83,465 cases were recorded, with an annual average of 5216.56 cases. The years 2001 and 2002 had the highest number of cases: 9,458 and 8,137, respectively. As for 2014, it had the lowest number of cases (1,637). **Conclusion:** The number of cases of ARI reduced over the evaluated years, which can be explained by better quality of health care, running promotion activities of health and prevention of this disease.

DESCRIPTORS: Respiratory tract diseases. Child. Prevalence. Time series studies. Primary health care.

INTRODUCTION

The Brazilian health and social reality shows that 68.6% of deaths of children under one year occur in the neonatal period, representing a significant number since they are preventable by health services. Since 1980, programmes and policies are created to intervene in the change of a techno-model to receive the mother-child dyad.[1] In this

context, public policies have been developing to improve the quality of child care, ensuring rights and promoting the healthy growth and development.

In 1984, the Ministry of Health (MS) establishes the national Programme for Integral Child Health Assistance (PICHA), responsible for reduction of child morbidity and mortality rates. This program consists of the follow-up actions of the growth and development, breastfeeding incentive and guidance for weaning, control of diarrhoeal diseases, control of acute respiratory Infections and immunization. In 1993, the World Health Organization (WHO) and the United Nations Fund for childhood and adolescence (UNICEF) drew up a strategy as part of child health policy, called the integrated management of childhood illness (IMCI) in order to reduce the mortality and morbidity in context of greater risk and contribute to the growth and healthy development of children.[2] The IMCI are suggested the main interventions for evaluation and classification of the situations of children with respiratory diseases.

In 2004, the Ministry of Health (MH) throws the schedule of commitments to the Integral health of children and reducing child mortality, highlighting the need for reorganization of the network of child assistance at various levels. As the challenge of obtaining a single integrated assistance network, presented the line integral care, including attention to management, including the respiratory, regarded as the first reason for consultation in outpatient and emergency services. Pneumonia is highlighted as one of the main diseases and the second most common cause of death in children under one year.[2]

Acute respiratory infections (ARI) meet several conditions that are generally classified according to its location in the respiratory tract, in upper IRE and lower IRE. The wrath of upper airway is more frequent and corresponds to 75% of the cases, including the acute rhinopharyngitis, pharyngotonsillitis, otitis media and sinusitis. In the lower respiratory tract, include pneumonia, bronchiolitis and acute disorders of the larynx. Among the acute upper tract infections include the common cold, acute sinusitis, rhinitis, acute pharyngitis, tonsillitis and adenoidite and laryngitis. As regards the ARI lower tract can be cited the acute tracheobronchitis, pneumonia, pleural disorders and acute respiratory distress syndrome (ARDS).[3]

The ARI is important cause of morbidity and mortality among children in the world. According to the WHO, the three main causes of years of life lost by premature death is coronary heart disease, lower respiratory infections and stroke. In addition, most

deaths among under-fives occurs in children born prematurely (17.3%) and pneumonia is responsible for the second highest number of deaths (15.2%).[4]

The origin of the respiratory diseases affecting mainly children under two years old can be infectious and allergic, and environmental conditions such as the type of home, exposure to cigarette smoke and agglomerations are the main predisposing factors. Infections of viral origin cause often hospitalization of the child in the first two years of life.[4] The Influenza A & B, Parainfluenza 1, 2 and 3, adenovirus, and Respiratory Sincial virus (RSV) are the main etiological agents responsible for outbreaks of ANGER, causing high rates of morbidity and mortality. The main causes of ANGER are numbers of residents and place of residence, malnutrition, maternal schooling, early weaning, weather station and passive smoking, revealing a higher incidence of infections in children whose parents present low family income, in addition to the difficulty of access to health services.[5]

Among the diseases, acute respiratory infections are the main reason of consultation and hospitalization of children under 05 years, pneumonia being one of the leading causes of death. On average, the children present five to eight episodes of ARI per year.[3] Several studies highlight that the ARI is the leading cause of disease in children under five years old, but there are major differences between countries regarding the gravity of mortality. These data are demonstrated by the number of queries due to problems like colds, pharyngitis and bronchitis and amount of hospitalizations for pneumonia and bronchiolitis.[6]

Estimates of the incidence of pneumonia in the world in 2010 have been around 156 million new cases each year, mostly in developing countries. Most occurrences happening in India (43 million), China (21 million) and Pakistan (10 million)[7]. Deaths from pneumonia in children under 05 years happen especially in Africa and Southeast Asia. Still on the lower airways infections, such as pneumonia and bronchiolitis in 2010, hit 12 million hospitalizations of children around the world and between 2000 and 2010 there was a 25% reduction in the incidence of pneumonia in children in low-and middle-income countries.[7-8]

According to the Ministry of Science and Technology, in 2005, in the State of Mato Grosso (MT), respiratory diseases were the main causes of hospitalization in children under five years, with 70% of the cases in the region of Alta Floresta. One of the main categories of hospitalizations for respiratory diseases in this age group, are the pneumonia, account for 73% of the hospitalizations, followed by asthma as a result of

burning in the Amazon, in contrast to 23% of emissions from the energy sector.[9] A projection to 2030, which included a fall in the number of respiratory infection mortality in the world and increase this rate for chronic respiratory diseases. However, respiratory diseases remain among the five main causes of mortality in high and low income countries. In relation to the deaths of children under five years, predicting a drop of 50% in scenario between the 2002 and 2030.[10]

Soon, it is indispensable the study of the prevalence of respiratory infections in this age group. In Rondonópolis (MT), there are no studies that analyze this prevalence. Thus, this study aims to analyze the temporal behavior of ANGER in children under two years old in the town of Gosport, between 1999 to 2014, with the purpose to produce epidemiological information that can support and contribute to the achievement of health promotion and disease prevention, within the framework of primary health care.

METHODS

Transverse retrospective study that has as a source database of the Department of information of the unified health system (DATASUS) which is part of the Department of strategic management and participatory, as Decree nº 7,530, of 21 July 2011, which treats of the structure the regimental Ministry of Health. The information is from the health information system of the basic attention (SISAB) concerning the municipality of Rondonópolis-MT, from January 1999 to December 2014. This system is powered by the only basic health units of Rondonópolis and, according to the national register of Health establishments (CNESNET), this municipality has enabled 32 units of the family health strategy (FHS), six health centres, a polyclinic and four health centers.

Currently, one of the basic health units, the 32 units of FHS, accredited by the Ministry of health (MS), registered in the DATASUS and deployed in Gosport, have a ratio of population coverage estimated at 54.57% of the current population. It is worth noting that the selection of this historical series was due to the availability of the data found on the websites of official searches for this information, being limited this sixteen years period.

According to the Brazilian Institute of geography and statistics (IBGE), Rondonópolis was installed in 01/01/1954 and, in 2013, had a population of 208,019 inhabitants with estimate for 2014 of 211,718. The area of territorial unit is equivalent to 4,159.118 km^2 and population density 47.00 inhab/km^2, which is the cerrado biome and

tropical humid climate presents part of the microregion 538-Rondonópolis that consists of 19 municipalities, totaling 452,564 inhabitants (14.9% of the State's population) which are distributed in an area of 89,471 km^2. The growth rate between 2013 and 2014 was approximately 1.8%, and renumbered as the eighth most populous municipality in the Central-West region of Brazil. In Mato Grosso, however, continues to be the third most populous, after Várzea Grande and Cuiabá.[11]

Rondonópolis and polarized cities by this municipality are located geographically in southern Mato Grosso, with latitude 16°28'15 "South and longitude 54º38´08" West, your resident population from 0 to 4 years is 6,183 male and female 5,956; and the Municipal human development index (IDHM) was of 0.755. In relation to health services establishments, the audiences are: 02 Federal, 01 State and 72 municipal and 41 private, i.e., account with 155 beds of hospitalization in the SUS, 08- Intensive Care Units - ICU - for adults and 10 Neonatal ICU beds According to the IBGE data.[11]

This project was submitted to the Research Ethics Committee of the Hospital Julius Muller and approved with Certificate of Presentation for Ethical Appreciation (CAAE in Portuguese) Protocol: protocolo CAAE: 36618014.8.0000.5541, being respected the ethical aspects of research with human beings (Resolution nº 466/2012).

Regarding the procedures for data analysis, descriptive analysis of the data in terms of percentages of IRA cases in children under two years old, being the data expressed in measures of central tendency (mean and median), dispersion (standard deviation and percentiles) and coefficient of variation (CV). For statistical analysis was used time series analysis techniques, as well as their respective models, in order to check possible anomalous behaviors of the IRA in Rondonópolis-MT. Soon, for the analysis of this time series of cases of ANGER, initially, the description of the behavior of the series, their estimates and finally the evaluation of factors that influenced the behaviour of the series, with a view to establishing cause-and-effect relationship.

Auto regressive integrated models and moving averages were efficient, because the strategy for construction of these models is based on interactive cycle, in which the choice of the structure of the models is based on own data. Finally, after choosing the model that best represented the data in study, some adopted criteria for the choice of models, such as the Akaike information criterion (AIC), Bayesian information criterion (BIC) and the mean square Error of prediction (NDE), proceeding with the prediction of -WRATH for years to come.

These were the models that best fit the data from this study, allowing verification of the quality of the models to perform prediction of records of new IRA cases in children under two years old.

RESULTS

IRA cases in children under two years old in Rondonópolis-MT, relating to data from primary health care, were distributed according to each month for the past sixteen years (1999 to 2014). Has registered a total of 83,465 cases, with an annual average of 5,216.56. Note that 2001 and 2002 showed the largest number of cases; 9,458 and 8,137, respectively. These 2001 data, are related to issues of super setting dispersion to the statistical model more suited to this analysis, negative binomial distribution, being considered the averages for June, July and August 2001, 853, 838 and 837, respectively. 2014, already showed lower number of cases (1,637).

June (8,631), July (8,983) and August (8,825) represent the periods with significant amount of IRA cases in these years of analysis. A monthly estimate of IRA cases in July each year, reveals the average 561.44 cases/month and 18.71 cases/day. By contrast, December and January presented 5,262 and 5,305 cases of the disease, with monthly averages of 328.87 cases/month and 10.61 cases/day and 331.56 cases/month and 10.69 cases/ day, respectively. Practically, there is no variation in the occurrence of cases of rage in the summer months (December and January).

In Rondonópolis-MT there are the cases of IRA have a reduction over the sixteen years of analysis (figures 1a and 1b). This reduction was of 4073 cases in 1999 to 1637 in 2014.
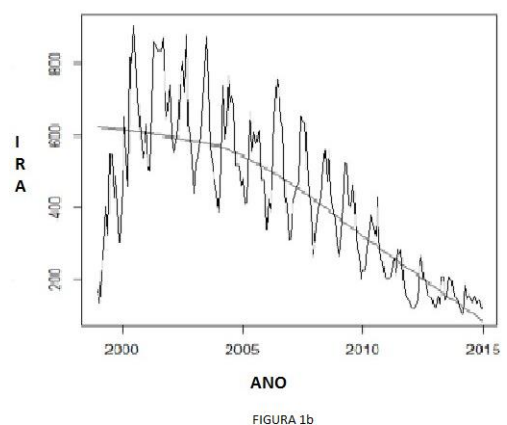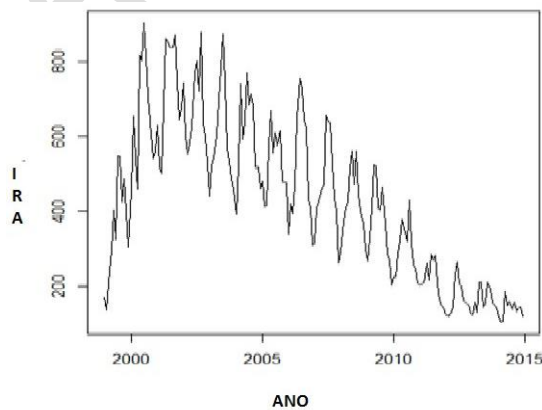

FIGURA 1a

FIGURA 1b

Figure 1- 1a- Distribution of the number of IRAS cases. 1b - Temporal behavior of acute respiratory infection (ARI) in children under two years from 1999 to 2014, Rondonópolis-MT.

In this research, the temporal trend monthly series of amount of IRA cases in children under two years old was evaluated by nonparametric Mann-Kendall (MK), which is to compare each value of a time series with the other remaining values in ord in sequence, at the 5% significance level (p-value<0.05), i.e. the level of confidence that rejects or does not reject a statistical hypothesis, and note that the hypothesis of nullity was rejected. Thus, the observations of the series have dull trend over time, i.e. There is the preservation of the total order of the dependent variable IRA. As a result, using the estacionariedade test (unified root) of Dick-Fuller, one can observe that the hypothesis of nullity was rejected. In this way, it is assumed that the prevalence of WRATH is stationary.

Following the analysis, one can see the fit of some models for the cases of IRA in Rondonópolis-MT (table 1). In this table, it should be noted that the potential of SARIMA model identified are the AR (1), D (1) and (2), that is, with parameters p = 1, d = 1 and q = 2. Thus, the model that best represents the number of IRA is a SARIMA (1, 1, 2), equivalent to an ARIMA model (1, 1, 2) with seasonality (2, 1, 2), because it presents the smallest value of AIC and BIC between competing models to IRA as highlighted in Table 1.

Table 1 - Results of the ARIMA model with seasonality for the cases of acute respiratory infection (ARI) in the municipality of Rondonópolis-MT.

Models	p	d	q	$\widehat{\sigma}^2$	EQM	AIC	BIC
M₁: SARIMA (1,1,1) (1,1,1)	1	1	1	5477	71,46	2068,15	2084,08
M₂: SARIMA (1,1,2) (2,1,2)	1	1	2	**4776**	**66,73**	**2052,26**	**2077,76**
M₃: SARIMA (1,1,1) (2,0,1)	1	1	1	5301	72,62	2199,26	2218,77
M₄: SARIMA (1,1,2) (2,0,1)	1	1	2	4998	70,51	2192,08	2214,84
M₅: SARIMA (2,1,3) (2,0,1)	2	1	3	4992	70,47	2194,78	2224,05
M₆: SARIMA (1,0,1) (1,0,1)	1	0	1	5497	74,14	2219,66	2239,20

EQM = Mean Square Error; AIC = Akaike Information Criteria BIC = Bayesian Information Criterion; p represents the number of autoregressive terms, d is the number of differences and q is the number of terms of the moving average.

Once adjusted the model data was accomplished SARIMA the forecasting model, noting that there was a reduction in the conduct of cases over the years. In this regard, it

is relevant to point out that in the model of prediction for 2015 and 2016, elucidated in Figure 2, except that there is a tendency to decrease the cases of IRA in children under two years old in Rondonópolis-MT diagnosed in primary health care, corroborating with what has been happening in recent years.
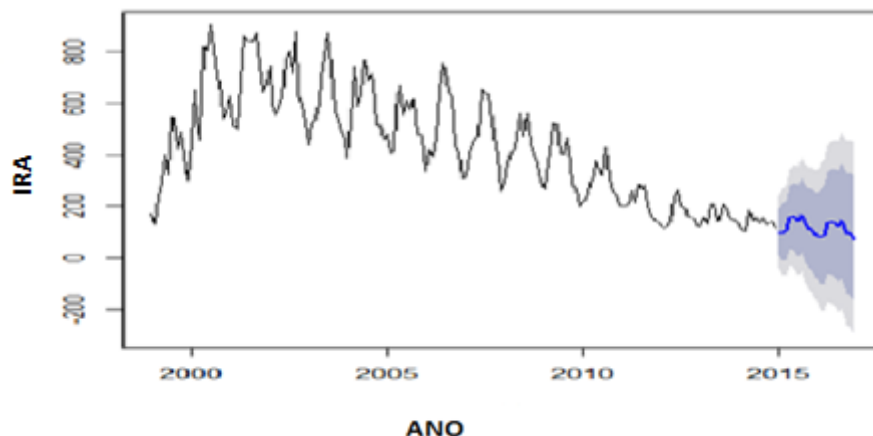

Figure 2 - Time variation and Prediction of cases of acute respiratory infection (ARI) for the period from 2010 to 2016 in Rondonópolis-MT.

DISCUSSION

Currently, many studies examine hospitalizations and mortality data for ANGER in children, especially in children under five years, though few elements are analysed in relation to primary health care, considered as the gateway of the SUS. In this study, the findings of WRATH are suggestive of a high number of cases of this pathology in the last sixteen years, despite the amount of ANGER have decreased in the period of study. In this context, some factors should be considered as a reduction in the number of children aged 0 to 4 years, the improvement of the quality of life of the population of municipality, as well as the social and economic aspects that present an evolution over the years of analysis.

Corroborating with the data of this research in relation to reducing the cases of IRA in Rondonópolis-MT, studies highlight the reduction in hospitalizations and deaths from respiratory infections. In this sense, the health care of the child should be the responsibility of professionals of the family health team, acting multi-and interdisciplinary in order to guarantee the child full and individual attention. In the context of care the child, epidemiology has among its contributions to reducing social inequalities in health, health promotion and the regulation exerted by the State on goods and services with consequences on health.[12]

The resolution of the primary health care should reflect the decrease in hospital admissions for a group of specific causes, since they are an indirect indicator of the effectiveness of the health system. The average hospitalization (SUS) in Brazil, according to the group of diseases that most affect children from one to four years, from 1998 to 2007, are respiratory diseases (40.3%) as leading causes of hospitalizations. For these diseases the hospitalizations predominated in the South and Midwest, suffering both climate influence as showing regional disparities with regard to access to services and health professionals, as living conditions. 13 Worldwide 38% of children with lower severe ANGER never are hospitalized and 81% of deaths occur outside the hospital, suggesting that the community management of disease can be important complementary strategy to reduce pneumonia mortality.[7]

With regard to the results of this research, the IRA cases in children under two years decreased, to be associated with the resolution in these children, avoiding relapses, hospitalizations and deaths for this cause. On the other hand, a greater concentration of posts and health centres was accompanied by greater spatial variation in rates of hospitalization for asthma and pneumonia in Salvador (BA), probably because of the inability of these units in solving the health needs of population, as well as the first alternative routing to hospitals. Another possibility is the existence of difficulties in access to health services or low perception of the disease in poorer communities, making the search for the system occurs only when there is aggravation of the disease, requiring hospitalization.[14]

In Cuba, the morbidity by IRA is 25 to 30% of consultations and influenza and pneumonia mortality is among five leading causes of death in children under five years.[15] One of the IRA in under five years in the United States between 1997 and 2006, those caused by respiratory syncytial virus (RSV) caused hospitalization in greater numbers. In addition, estimated that the impact of the disease by RSV decreases with increasing age.[16] In India, the IRA are considered as an important public health problem and pneumonia mortality is considered as a quarter of the total of deaths in children under five years.[17] In Bangladesh between 2008 and 2010, the ambulatory and hospital care for the flu influenza in children under five years had incidence estimated around 6.7, 4.4 and 6.5 cases for 1000 persons/year respectively. The influenza was often associated with ambulatory healthcare.[18]

The evaluation of the prevalence of respiratory symptoms as the reason for the emergency care for children, between November 2008 and November 2009, in Porto

Alegre (RS) was 38.9% (5,011/12,870), 11.9% (458/3,860) the rate of hospitalization and 0.3% (12/3,860) mortality, with an increase in the number of consultations during April to June and the most common symptoms were cough (73.4%), fever (56.1%), shortness of breath (40.9%), chest pain (24.5%), runny nose (20.9%).[19]

It becomes possible to observe the effectiveness of health promotion actions, as integral to child assistance, health education and assistance to institutionalized children, developed by the interdisciplinary team on primary health care in Rondonópolis-MT through the reduction of IRA cases over the years. It should be noted that, in the case of secondary data which may present problems relating to its registration, overage and quality, one should have some caution when interpreting the findings of the present study. It is possible that limitations, such as the subenrollment and incomplete filling of data by health units, have affected the results.

Finally, it becomes indispensable the study and knowledge of the cases of different age groups, with the aim of organizing health services and other sectors to new needs or expectations of the population, including children under two years old. The significant change in the epidemiological profile over the years in the country generates reflection on the effectiveness of interdisciplinary actions in the context of primary health care in the municipalities.

In this context, the Rondonópolis-MT cases of acute respiratory infection in children under two years old diagnosed in primary health care come showing a reduction over the last sixteen years. These occurrences can be associated with a better quality of health care through health promotion and disease prevention that are being developed in primary health care in the municipality.

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