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Measles: epidemiological profile and vaccine indicators in Brazil

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Abstract: Measles is a viral and transmissible disease that is related to the circulation of the virus, immunity and vulnerability of the population, also linked to socioeconomic conditions. The safe, low-cost triple viral vaccine is used to prevent it. Many cases are being reported worldwide, including Brazil. Therefore, control strategies through vaccination should be applied. To analyze the incidence of measles cases and deaths in Brazil. Cohort study that analyzed the years 2018 to 2019. Through the database of the Notifiable Diseases Information System (SINAN), the epidemiological profile and vaccination indicators in Brazil, provided by DATASUS/Ministry of Health, were analyzed. The results showed that the states of the northern region of

Brazil, Amazonas, Roraima and Pará, during the period from 2018 to 2019, were the most affected by measles, and had as a consequence the evolution of some cases to death. Due to the reappearance of measles cases in Brazil, it is important to analyze its incidence and consequent death rate. As well as, strategies to reduce these numbers, associated with vigorous epidemiological surveillance and vaccination coverage, allowing the acquisition of measures to cease their transmission.

Keywords: Measles. Epidemiology. Vaccination

1. Introduction

Measles is a viral and severe, highly contagious pathology that can be transmitted through speech, coughing and sneezing. Because it is contagious, it has a higher risk of presenting distribution at the universal level, with variations in seasons or seasons. Its conduct depends on the circulation of the virus, and also on the interaction between the immune system and the vulnerability of the population. In children under 5 years of age, it is considered one of the major factors of morbidity and mortality, with a relationship between the incidence and low socioeconomic conditions, including low-income countries, malnutrition and immunosuppressed patients¹.

The main symptoms involve high fever, generalized rashes on the skin, congested nose and redness in the eyes. When left untreated, it can progress to complications such as severe diarrhea, ear infections, blindness and pneumonia, mainly linked to children with nutritional difficulties and immunosuppressed patients².

Due to mass vaccination, the number of measles infections has decreased dramatically worldwide and, in the Americas, the elimination of endemic measles transmission was declared in 2016 [1 , 2]. Given these encouraging results, measles has been the target of global eradication. Under the Global Vaccine Action Plan, all six regions of the World Health Organization (WHO) have committed to eliminating measles and five have aimed to achieve this goal by 2020 [1]. However, with the year 2020 approaching, the eradication of measles has proved to be a challenge. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6375639/>

Auto-co-transmission of measles virus in the Americas, that is, within its own territory, and not brought by someone who has become infected elsewhere, was discontinued in 2002 and declared eliminated by the Pan American Health Organization (PAHO)/World Health Organization (WHO) in 2016. However, in 2015 around the world, about 250,000 cases of measles were confirmed, resulting in the deaths of approximately 184,000 people. Among the continents with the highest number of cases, European and African stood out³.

In Brazil, currently, measles epidemics were reported in the states of Amazonas (n=9,808), Roraima (n=361) and Pará (n=102), in addition, eight Federated Units also ratified measles cases: in Rio Grande do Sul (n=46), Rio de Janeiro (n=20), Pernambuco (n=4), Sergipe (n=4), in São Paulo (n=3), Bahia (n=3), Rondônia (n=2) and the Federal District (n=1), concluding 10,343 confirmed cases of measles in Brazil⁴.

The triple viral vaccine used for measles, mumps and rubella is considered safe, and low-cost. It is divided into two

doses applied subcutaneously. The first at 12 months, and the other, reinforcement at 15 months. For its release it is essential that there is a monitoring related to quality, and after the distribution is performed an analysis of the vaccination situation of the population in question. Therefore, there are control strategies associated with vaccination that should be used depending on the current situation, among the most cited is routine vaccine, blocking, campaigning, intensification and scanning operations^{5,6}.

However, when vaccination coverage of a disease is low, the risk to public health is great and significant. Examples include Venezuela, which through migration, mainly across borders with the northern states, increased transmission rates causing sharp seasonal increases in population density, thus also related to human aggregation patterns. Thus, these small changes can lead to major changes in the complexity of measles dynamism, often causing epidemic conditions⁷.

The present study brings relevance to public health, since it contributes to awareness and control, in view of the considerable increase in the number of cases. Therefore, the aim of the research is to evaluate the epidemiology of measles in Brazil and vaccination indicators.

2. Methodology

This is an epidemiological study of the descriptive type of cut with comparative characteristics in the period from 2018 to 2019, whose data were collected through the secondary database of the Notifiable Diseases Information System (SINAN), provided by DATASUS/Ministry of Health, with the help of the descriptors: measles, epidemiology and vaccination. The Informatics Department of the Unified Health System (DATASUS) provides information that can assist objective analysis of the health situation, evidence-based decision-making and development of health action programs.

Data tabulation in the Informatics Department of the Unified Health System (DATASUS) was performed through SINAN, which is nourished by the notification and investigation of cases of diseases and injuries that are included in the national list of diseases of compulsory notification, including measles, which is the focus of the study.

Inclusion criteria involve data from the last five years that evaluated cases of measles and vaccines in Brazil in both sexes. In the exclusion criteria, studies that evaluated children, adolescents and adults with other types of pathology, and that exceed the period of 6 years, were discarded.

A Database was constructed in the SPSS Statistical Program version 22 with the variables included in the study.

For the analysis of these data, percentage calculations were used to observe the dispersion among the collected variables, analyzed by simple percentage. The information was analyzed through the SPSS version 22 program for data formatting.

3. Results and Discussion

A total of 10,343 confirmed cases of measles were observed in the period of 2018 and 2019, with the states with the highest Amazonas index, showing 94.73%, Roraima with 3.49% and Pará with 0.99%. In addition to the outbreaks in these three federated units, eight others confirmed isolated cases, characterizing 0.80%. (Table 1). To date, 12 deaths from measles have been recorded in the three states where there are active outbreaks. (Table 2). Thus, the large number of cases in these regions should raise awareness of the importance of vaccination coverage as a way to stop the transmission of measles for consequent eradication. Still, there is a heterogeneity in this coverage in certain regions (Table 3).

Table 1. Distribution of states with active outbreaks and isolated cases of measles in 2018 and 2019 in Brazil.

| State | Confirmed Cases | | N | % |
|--------------------------------|-----------------|-----------|---------------|-------------|
| | 2018 | 2019 | | |
| Amazon ¹ | 9.803 | 5 | 9.808 | 94,73% |
| Roraima ¹ | 361 | | 361 | 3,49% |
| Para ¹ | 79 | 23 | 102 | 0,99% |
| Rio Grande do Sul ² | 46 | | 46 | 0,44% |
| Rio de Janeiro ² | 20 | | 20 | 0,19% |
| Pernambuco ² | 4 | | 4 | 0,04% |
| Sergipe ² | 4 | | 4 | 0,04% |
| Bahia ² | 3 | | 3 | 0,03% |
| Sao Paulo ² | 3 | | 3 | 0,03% |
| Rondônia ² | 2 | | 2 | 0,02% |
| Federal District ² | 1 | | 1 | 0,01% |
| TOTAL | 10.326 | 28 | 10.354 | 100% |

Source: Ministry of Health/SVS - Notifiable Diseases Information System - SINAN Net. Accessed: 06/04/2019. (¹ states with active outbreaks; ² states with isolated cases).

Table 2. Number of deaths recorded from measles in Brazil in 2018.

| State | Deaths (2018) | % |
|-------------------|---------------|----|
| Amazon | 6 | 50 |
| Roraima | 4 | 33 |
| Stop | 2 | 17 |
| Rio Grande do Sul | | |
| Rio de Janeiro | | |

| | | |
|------------------|-----------|------------|
| Pernambuco | | |
| Sergipe | | |
| Bahia | | |
| Sao Paulo | | |
| Rondonia | | |
| Federal District | | |
| Total | 12 | 100 |

Source: Ministry of Health/SVS - Notifiable Diseases Information System - SINAN Net. Accessed: 06/04/2019.

Table 3. Vaccination coverage with triple viral by dose type (%).

| State | Routine vaccination coverage (%) | |
|-------------------|----------------------------------|-------------|
| | Dose 1 (D1) | Dose 2 (D2) |
| Rondonia | 89,67 | 76,07 |
| Amazon | 88,48 | 77,03 |
| Roraima | 84,95 | 76,24 |
| Stop | 68,84 | 52,25 |
| Rio de Janeiro | 84,51 | 60,32 |
| Sao Paulo | 78,15 | 65,71 |
| Rio Grande do Sul | 87,85 | 81,90 |
| Pernambuco | 103,32 | 67,66 |
| Sergipe | 93,2 | 68,94 |
| Federal District | 85,78 | 87,41 |
| Bahia | 60,66 | 47,13 |

Source: Ministry of Health/SVS - Notifiable Diseases Information System - SINAN Net. Accessed: 06/04/2019.

Currently due to globalization, migrations had a consequent increase that caused a resurgence and a high incidence of communicable diseases that had been controlled in the past. Outbreaks have been confirmed, thus determining a public health problem. Therefore, serious and extremely contagious diseases, such as measles, are becoming relevant in some regions of Brazil⁸.

Measles is a disease of mandatory, viral, severe notification, and marked by the high contagiousness that occurs through droplets emitted in speech, cough or sneezing. In the pre-vaccine era, it infected many susceptible populations, causing a mortality rate between 3% and 15%. However, as humans are the only deposits for this virus, the disease can be potentially eliminated, mainly through the preventive and effective vaccine: triple viral⁹.

In the 1960s in the United States, the first program of this vaccine used against measles, mumps and rubella (SCR) was effective. This immunization has been proven to be one of the most beneficial interventions for public health, and has a

higher cost-effective for measles. It is considered an urgent effort to achieve regional elimination targets, substantial and sustained additional investments in health systems when measles is prudent, and increased overall coverage with two doses of the vaccine against it. A valuable information for a possible global eradication is the additional evaluation of the cost of the schemes of the two doses and their serology, since both are necessary for primary immunization with the great objective of protecting children who at the first dosage failed to develop immunity¹⁰.

Although some authors identify situations of percentage increase in relation to the incomplete vaccination status of children belonging to the upper class, immunization aims to prevent deaths caused by measles, and improve the quality of life, especially in populations with greater social vulnerability, such as economic situation, low schooling, race and ethnicity. Therefore, one of its objectives is the reduction of infant mortality, since it is related to low maternal education, less favored class and black skin, directly affecting the non-vaccination of children, making them conducive to greater infant morbidity and mortality¹¹.

The SCR vaccine is present in the national vaccination calendar of the Ministry of Health, and is indicated to be taken from one year of age. In national campaigns that work against measles, according to the epidemiological situation and accumulation of susceptible people over the years, the target audience is children from early childhood (1 to 5 years of age). And individuals who present in the age group 10 to 19 years, should receive two doses, and from 20 to 49 years a dose¹².

The World Health Organization (WHO) has stipulated the eradication of measles in Europe and globally, respectively in 2015 and 2020. To accelerate this objective, a supplement carried out in 2013 by the WHO Regional Office for Europe, analyzed some strategies involving the strengthening of the immunization system, establishment and improvement of case surveillance, laboratory and epidemiological data, and responses to cases with consequent reduction of the same¹³.

In the Americas, measles was eliminated in 2016. However, the high migrations mainly caused by Venezuela's socio-political and health crises have led to an increase in the number of confirmed cases of measles in many countries in recent years, including Argentina, Antigua and Barbuda, Brazil, Canada, the United States, Guatemala, Mexico, Peru and Venezuela. Thus, populations living near Venezuelan borders are more vulnerable to outbreaks, as an example of indigenous peoples, and part of the northern region of Brazil, in the states of Amazonas, Roraima and Pará¹⁴.

It was observed, then, a higher prevalence of confirmed cases in the states of Amazonas and Roraima, and in recent months a significant growth in Pará, including in 2019 in the area of outbreaks still active. Thus, the same regions were the only ones that had the occurrence of deaths. When comparing routine vaccination coverage in these three states, and in the other eight that had isolated cases, they demonstrated heterogeneity¹⁵.

Given what has been exposed, it is possible to observe the importance of carrying out a strategic plan for measles control, mainly due to the high number of confirmed cases predominant in some states, but also isolated in others, and which should receive certain attention. It is necessary to reduce these numbers, together with epidemiological surveillance by knowing about all of them, and allowing the use of measures to stop the transmission of the virus to vulnerable individuals, i.e., those not vaccinated. It is suggested to carry out campaigns to raise awareness of the relevance of the use of vaccines as a form of prevention, guidance on the disease, and training of the entire health team.

4. Conclusions

Currently, there is a high rate of measles cases in Brazil. Therefore, it is important to encourage and increase epidemiological surveillance in the detection of cases. The present study proved the high incidence of reported and confirmed cases, with consequent deaths from measles, mainly in the northern region, in the states of Amazonas, Roraima and Pará, but also having the appearance of some isolated cases in eight other state units. As the number of people with the disease increases, the importance of evaluating vaccination coverage due to its preventive effectiveness also increases, being presented by the study in a heterogeneous way in the states.

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