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Brief Report

Survival of Inpatients under 5 Years Old with Bronchiolitis by Laboratory-Confirmed Respiratory Syncytial Virus Infection

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Abstract: Background: The respiratory syncytial virus infection (RSV) spread has been unusually high during 2022 and increasing trends have been documented. We aimed to assess the survival experience of children hospitalized due to bronchiolitis by laboratory-confirmed RSV. Methods: A nationwide and retrospective cohort was conducted in Mexico and data from 436 children aged 5 years and younger, with symptoms onset from August 2021 to November 2022, were analyzed. Survivor functions and 95% confidence intervals (CI) were computed by using the Kaplan-Meier method. Results: The survival rates were high, particularly within the first three weeks of admission. The 3-day survival was 99.8% (CI 95% 98.4-99.9%) and went to 98.9% (CI 95% 96.5-99.7%), 97.5% (CI 95% 91.9-99.3%), 86.7% (95% CI 48.2-97.2%), and 69.4% (95% CI 24.2-91.0%) on days 7, 14, 21 and 28 of hospital stay, respectively. We documented 5 fatal outcomes, and the mortality rate was 2.1 per 1,000 person-days. Conclusions: We analyzed a large set of pediatric patients with bronchiolitis by RSV and the presented results contribute to achieving a better understanding of the in-hospital evolution of this disease.

Keywords: Respiratory Syncytial Virus Infections; Child; Bronchiolitis; Survival

1. Introduction

The human respiratory syncytial virus (RSV) is a common and highly contagious pathogen in children and typically causes mild upper respiratory symptoms. In younger patients, the RSV infection may also cause bronchiolitis and, rarely, pneumonia [1]. Worldwide, this virus causes nearly 3.5 million hospitalizations and around 130 thousand deaths in children aged 5 years old or above [2].

The RSV spread has been unusually high during 2022 and increasing trends have been documented [3, 4], coinciding with the relaxation of non-pharmacological interventions to prevent the transmission of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). In addition, published data regarding the clinical course of RSV pediatric inpatients are scarce. The aim of this study was to describe the survival experience of children (aged 5 years old and younger) inpatients with laboratory-positive infections by RSV.

2. Materials and Methods

We performed a retrospective and nationwide cohort study in Mexico from October 2022 to December 2022. Hospitalized children aged 5 years and older due to bronchiolitis (rhinorrhea, cough and any grade of respiratory distress), with laboratory-confirmed (reverse-transcription polymerase chain reaction test from nasopharyngeal swabs) RSV infection and symptoms onset from August 2021 to November 2022, were eligible. A broader description of the analytical procedures employed for the surveillance of respiratory viral pathogens was previously published [5].

Eligible children were identified from the nominal records of a normative system for the epidemiological surveillance of respiratory viral diseases that belongs to the Mexican Institute of Social Security [6]. Medical records and death certificates, when applicable, are the primary sources of the audited surveillance system.

We used the Kaplan-Meier method to compute survivor functions and 95% confidence intervals (CI) at different cut-offs. In hospital death was the failure variable and children with hospital discharge due to clinical improvement, as well as those that were still hospitalized on November 31, 2022, were censored.

3. Results

Data from 436 children were analyzed. Most of the enrolled patients were male (56.4%) the overall median age was 6 months and ranged (interquartile range) from 0 to 2 years. As observed in Figure 1, most of the cases occurred during the autumn and winter seasons.

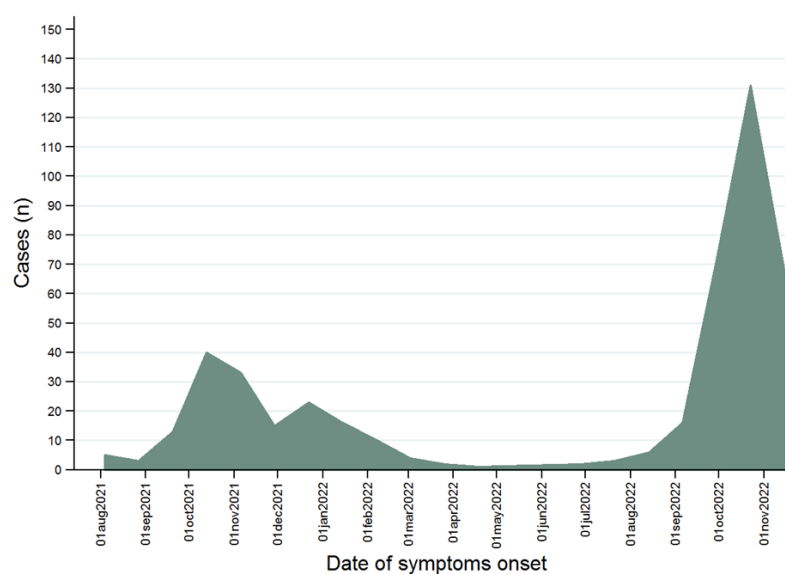


Figure 1. Date of symptoms onset of the analyzed children with laboratory-confirmed respiratory syncytial virus infection, Mexico 2021 - 2022.

The total follow-up was 2,337 person-days and 5 deaths were registered. Therefore, the mortality rate in the study sample was 2.1 per 1,000 person-days. Three of the fatal

outcomes occurred within the first 96 hours of hospital admission and the remaining deaths took place on day 9 and 20, respectively. All the deaths occurred in children < 2 years old, and three of them were under the age of 6 months.

The survival functions (Figure 2) were 99.8% (CI 95% 98.4-99.9%), 98.9% (CI 95% 96.5-99.7%), 97.5% (CI 95% 91.9-99.3%), 86.7% (95% CI 48.2-97.2%), and 69.4% (95% CI 24.2-91.0%) at day 3, 7, 14, 21 and 28 from hospital admission, respectively.

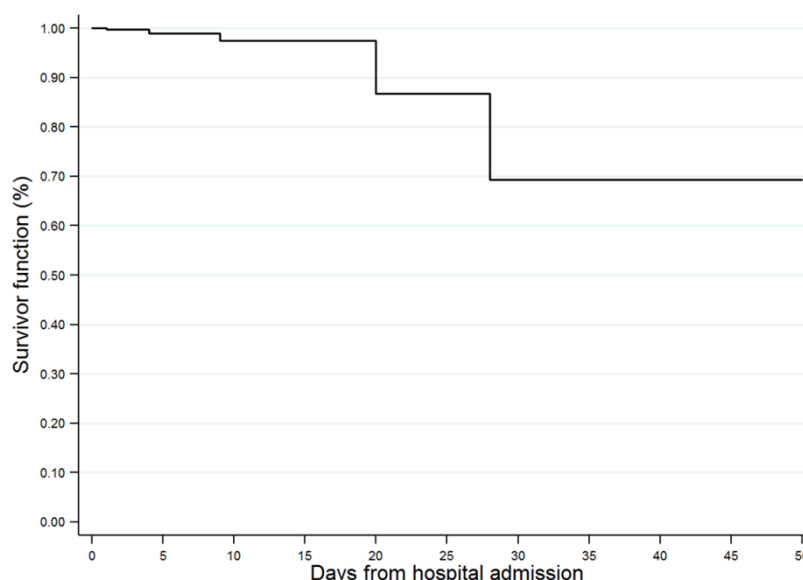


Figure 2. Survivor functions of children inpatients with respiratory syncytial virus infection, Mexico 2021 - 2022.

4. Discussion

Our study characterized the survival experience of a large set of hospitalized children with laboratory-confirmed RSV infection. The presented results suggest that the first four days of hospital admission were particularly important when evaluating the survival probabilities in the study population since 60% of fatal outcomes occurred within this time framework. To the best of our knowledge, there are no published studies evaluating the survival experience of children inpatients with RSV infection.

The mortality in our study was significantly higher than the mortality observed in a population with similar characteristics from Singapore (11.5 vs. 1.9 per 1,000 children; $p = 0.003$) [7]. We also found that younger children, particularly those aged 0-6 months, were at higher risk of dying due to RSV infection, as previously described [8].

The potential limitations of the study must be cited. First, we lacked of genomic data regarding the specific RSV strain identified in each of the analyzed cases. Published data documented that RSV A/GA5 infections are at increased risk for severe symptoms [9]. Second, the number of deaths was (fortunately) low ($n = 5$), and we were unable to identify factors predicting the survival of children inpatients through a Cox regression model. The analyzed surveillance system collects relevant information, such as patients' age and comorbid conditions, which impact on survival rates and that would have enriched our analysis [10].

5. Conclusions

We analyzed a large set of pediatric patients with bronchiolitis by RSV and the presented results contribute to achieving a better understanding of the in-hospital evolution of this disease. The first four days of hospital stay seem to be relevant for the survival probabilities of these patients and opportune and accurate medical management must be ensured to reduce the related disease burden.

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Data Availability Statement: The data that support the findings of this study are not openly available and are available from the corresponding author upon reasonable request.

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Conflicts of Interest: The authors declare no conflict of interest.

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