P-1199 The burden of respiratory syncytial virus among Brazilian infants (BONSAI study): preliminary results

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RODEO Taming RSV

INTRODUCTION

Several studies have emphasized the importance of RSV in the morbidity and mortality of children under five years of age, highlighting it as the leading cause of lower respiratory tract infections and hospitalizations in various countries. [1-3]

The main risk factors for RSV infection include age, low birth weight, prematurity and chronic conditions. Lower socioeconomic status, living in crowded environments, and male gender further increase the risk of severe infection. [3-4] Infants born during the RSV season are at a greater risk for hospitalization. [2].

In Brazil, the RSV surveillance system is part of SIVEP-GRIPE, which has been in place since 2009. All cases of Severe Acute Respiratory Syndrome must be notified by both public and private hospitals in Brazil. Recent data have demonstrated the disease burden among full-term infants[4], but the RSV surveillance system in Brazil does not capture information regarding gestational age.

OBJECTIVE

- To estimate incidence of hospitalization due to RSV according to gestational age among infants in Brazil

METHODS

- Retrospective cohort study was conducted through the linkage of the National Influenza Surveillance System (SIVEP-Gripe) and the National Information System on Live Births (SINASC) (Figure 1).
- The linkage process, combining deterministic and probabilistic procedures, was carried out based on date of birth, city of residence, gender and mother´s name.
- Cases of Severe Acute Respiratory Syndrome hospitalized in São Paulo hospitals are universally reported through SIVEP-GRIPE system. In this study, we prefer to use the term Acute Respiratory Distress Syndrome (ARDS) to refer to these cases, distinguishing them from SARS-CoV-related cases.
- Therefore, all children born between 2017 and 2019 who lived in São Paulo state, Brazil, and were admitted to hospitals with clinical presentation of ARDS and tested for RSV up to 24 months of age, were included.
- Gestational age was categorized into extreme preterm (19-31 weeks), preterm (32-36 weeks), and full term (37 or more weeks).
- Incidence rates (IR) were calculated per 10,000 live births. Relative risk and corresponding 95% confidence intervals were estimated.

RESULTS

Figure 1: Data Sources for live births cohort, 2017-2019.

Data Sources 2017-2019	Cases and Population São Paulo State	Rates /10,000 live births
National Influenza Surveillance System **SIVEP**	11,003 cases of ARDS	60.87 ARDS cases /10,000 live births
	1,801 cases of ARDS RSV +	9.96 ARDS RSV+ cases /10,000 live births (before linkage)
National Information System on Live Births **SINASC**	1,807,703 children born 2017 to 2019	

RESULTS (continued)

- During the study period, a total of 1,807,703 live births were registered in São Paulo State, as well as 11,003 cases of ARDS, of which 1,801 (16.4%) were positive for RSV **(Figure 1).**
- The incidence rates (IR) of ARDS and RSV-associated ARDS were 60.87 per 10,000 live births 9.96 per 10,000 live births, respectively (before linkage) **(Figure 1).**
- We successfully linked 1,436 RSV cases to the SINASC database, achieving a linkage rate of 79.7%.
- The incidence rate (IR) of RSV-associated ARDS was 7.94 per 10,000 live births (linked cases) **(Figure 2)**.
- No statistically significant differences were found between the linked and non-linked cases from a sociodemographic perspective, and some statistical differences indicate that the linked cases are slightly more severe.
- **Figure 3** show us the monthly incidence with the marked peak in April and May, characteristics of the seasonality of RSV incidence in São Paulo before the COVID-19 pandemic.

FIGURE 3: ARDS RSV+ CASES COHORT OF LIVE BIRTHS ACCORDING TO THE MONTH OF SYMPTOMS ONSET, 2017-2019, SÃO PAULO STATE, BRAZIL.

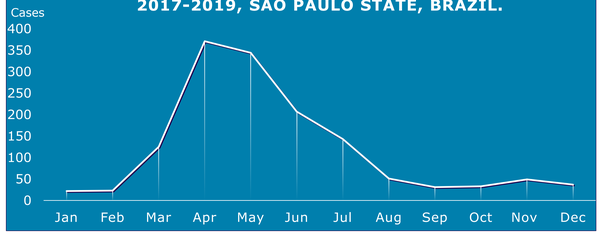


Table 1 - Incidence rates and Relative Risks of RSV+ ARDS cases by demographic and socioeconomic characteristics, 2017-2019, São Paulo, Brazil.

Characteristics	n	% pop	RSV+ Cases (%)	Rate (per 10,000)	RR	95% CI
Child´s Gender*						
Female	882,300	48.8	597 (41.7)	6.77	1.00	
Male	925,147	51.2	835 (58.3)	9.03	**1.33**	**1.21-1.48**
Maternal Ethnicity**						
White	1,003,027	55.8	889 (62.1)	8.86	1.00	
Black	112,646	6.3	80 (5.6)	7.10	0.80	0.64-1.01
Yellow	10,642	0.6	14 (1.0)	13.16	1.48	0.88-2.52
Mixed	667,678	37.2	449 (31.3)	6.72	**0.76**	**0.68-0.85**
Indigenous	2,198	0.1	0 (0.0)	-	-	-
Maternal Education***						
0-7 Years	149,943	8.3	88 (6.2)	5.87	1.00	
8-11 Years	1,185,537	65.7	652 (45.6)	5.50	0.94	0.53-1.17
12 + Years	468,753	26.0	689 (48.2)	14.72	**2.50**	**2.01-3.13**

*256 classified as unknown gender; **11,512 without maternal ethnicity information; **3,470 without maternal education information.
Numbers in bold indicates statistically significant

Figure 2: Linkage

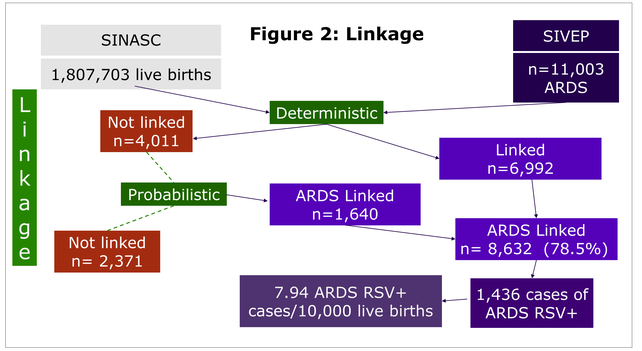


Table 2- Incidence Rates and Relative Risks of RSV-Associated ARDS by Pregnancy Type, Gestational Age, Birth Weight, and Sibling Status, cohort of live births, 2017-2019, São Paulo, Brazil.

Characteristics	n	% pop	RSV+ Cases (%)	Rate (per 10,000)	RR	95% CI
Type of Pregnancy*						
Unique	1,761,642	97.5	1333 (93.1)	7.57	1.00	Ref.
Multiple	45,719	2.5	99 (6.9)	21.65	**2.86**	**2.33-3.51**
Gestational Age**						
19-31 weeks	28,648	0.8	47 (3.3)	16.41	**2.26**	**1.68-3.02**
32-36 weeks	173,145	9.6	220 (15.4)	12.71	**1.75**	**1.51-2.02**
37 + weeks	1,601,981	88.8	1164 (81.3)	7.27	1.00	Ref.
Birth Weight***						
≥ 2500 g	1,640,559	90.8	1218 (85.1)	7.42	1.00	Ref.
<2500 g	167,096	9.2	214 (14.9)	12.81	**1.72**	**1.49-2.00**
Has Siblings****						
No	798,388	44.4	549 (38.4)	6.88	1.00	Ref.
Yes	1,000,285	55.6	880 (61.6)	8.80	**1.28**	**1.15-1.42**

*342 without type of pregnancy information ; **3,929 without gestational age information;
*** 48 without birth weight information;****9,030 without sibling information
Numbers in bold indicates statistical significance of the confidence intervals.

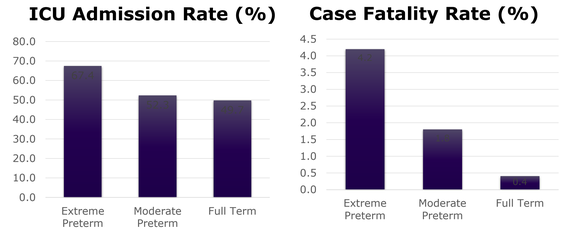
- Male infants exhibited a higher incidence and a significantly increased risk of RSV-associated ARDS compared to female infants **(Table 1).**
- Regarding maternal ethnicity, children of mixed ethnicity had a significantly lower risk than those of White ethnicity. Interestingly, higher maternal education (12+ years) was associated with a significantly elevated risk of RSV-associated ARDS in infants **(Table 1).**
- Multiple pregnancies had a significantly higher incidence and risk of RSV-associated ARDS. Preterm demonstrated significantly higher risks of developing RSV-associated ARDS, with the highest risk observed in infants born between 19-31 weeks **(Table 2).**
- Low birth weight (<2500 g) and the presence of siblings were also associated with an increased risk of hospitalization due to RSV-associated ARDS.

RESULTS (continued)

Regarding the severity of RSV cases, we found that 50.3% of the cases were admitted to an ICU, and the case fatality rate was 1.6%, with 11 deaths occurring during the study period.

The data regarding ICU admission and mortality in ARDS RSV+ cases support an association of severity and prematurity **(Figure 4).**

Figure 4: ICU admission rate and case-fatality rate of ARDS RSV+ cases, cohort of live births, 2017-2019, São Paulo, Brazil.



Obs: Extreme preterm: 19-31 weeks; Moderate preterm: 32-36 weeks; Full term 37+ weeks

DISCUSSION

- The incidence rates of hospitalizations due to RSV+ ARDS were lower than those reported in the literature. On the other hand, the severity of cases, considering ICU admissions and case-fatality, seems to be higher. This suggests that the surveillance system might be underreporting RSV.
- With the exception of the increased risk related to maternal education, the other risk factors show patterns similar to those in the literature.
- Prematurity is shown to be an important risk factor; however, the Population Attributable Fraction (PAF) was 8.41% (95% CI: 6.33-10.88%), which means that only this small percentage of cases in the population can be attributed to this risk factor. Additionally, 81% of all cohort RSV cases occurred in full-term babies.

CONCLUSIONS

Our results showed that the burden of RSV among full-term infants is high. Although risk is higher among premature infants, a significant proportion of full-term babies can have unfavorable prognosis requiring ICU admission, which can generate an overload of healthcare system during seasonality. Preventive strategies for all infants are crucial to reduce the burden of RSV in Brazil.

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DISCLOSURES

Karina Ribeiro, Aline Tolardo, and Sheila Homsani are Sanofi employees (Vaccines Unit, Medical Area, Brazil)

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