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# Frequency of Respiratory Syncytial Virus Positivity in Children Aged Less Than Two Years Admitted with Bronchiolitis

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## ABSTRACT

**Background:** Bronchiolitis is the leading cause of lower respiratory tract infection in infants and young children, with respiratory syncytial virus (RSV) being the most common etiological agent. **Objective:** To determine the frequency of respiratory syncytial virus positivity in children aged less than two years admitted with bronchiolitis. **Methods:** This cross-sectional study was conducted in the Department of Pediatrics, Hameed Latif Hospital, Lahore, from 14 Dec 2024 to 14 June 2024. A total of 100 children aged 1–24 months admitted with bronchiolitis were enrolled through non-probability consecutive sampling. Demographic and clinical details were recorded, and severity was assessed using the Wood-Downes Clinical Scoring System modified by Ferres. Cotton swab samples were obtained and tested for RSV antigen using Mouse Monoclonal anti-RSV Antibody (Novatetra) and Goat Anti-Mouse Antibody conjugated with FITC. **Results:** Out of the 100 children included, the mean age was 9.8 ± 5.6 months, with 58% males and 42% females. RSV positivity was detected in 16% of cases. Infants younger than six months showed higher RSV positivity (22.5%) compared to those aged 6–24 months (11.7%) ($p = 0.04$). RSV was most frequently observed during winter (25.0%) compared to autumn (10.7%) and spring (4.2%) ($p = 0.03$). **Conclusion:** It is concluded that RSV is a significant contributor to bronchiolitis in children under two years, particularly in those younger than six months and during the winter season.

## INTRODUCTION

The most common lower respiratory tract infection in infants and young children is bronchiolitis, which causes bronchospasm, increased mucus production, acute inflammation, edema, and necrosis of the small airways. Bronchiolitis is a major cause of hospitalization in infants, particularly in the first six months of life, with approximately 60–80% of admissions due to respiratory syncytial virus (RSV) infection. Currently, no prophylactic options are available for healthy infants [1]. RSV is a common respiratory pathogen and a leading cause of bronchitis and bronchiolitis among young children [2]. Most children have been infected with RSV by 2 years of age, and, although most have mild respiratory symptoms, RSV infection can cause severe disease in some groups, including infants, premature infants, and immunocompromised individuals [3]. RSV infection has a substantial global impact, representing the second most frequent cause of death in infants (second only to malaria) and imparting annual global inpatient and outpatient costs of approximately €5 billion [4].

RSV is the most common cause of bronchiolitis; it represents about 60% to 80% of all cases, especially during epidemic peaks. However, several other viruses are associated with bronchiolitis; they include rhinovirus, parainfluenza virus, human metapneumovirus, seasonal coronaviruses, and adenovirus among others [5]. Worldwide, RSV is the most common reason for young children's respiratory-related hospitalizations [6, 7]. In the US, RSV annually accounts for approximately 57,000 hospitalizations in children younger than 5 years and is the leading cause of hospitalizations in the first year of life; approximately 1 in 5 RSV-positive hospitalized young children were admitted to the intensive care unit [8,9]. In an Indian study, it was reported that RSV infection was positive in 13.6% children who were admitted with

bronchiolitis.10 In another study, conducted in Italy, it was reported that RSV infection was positive in 70.5% infants who were admitted with bronchiolitis [1].

Rationale of this study is to determine the frequency of RSV positivity in children aged less than two years admitted with bronchiolitis. Literature showed that frequency of RSV positivity is varying in different regions of the world and there is currently no study or data available for local population. Therefore, it is important to conduct a study to confirm whether the extent of problem is high in local population. Therefore, we have planned to conduct this study to get evidence for local population. This will help us to improve our knowledge and practice and in future, we will implement findings in local setting.

**Objective:** To determine the frequency of respiratory syncytial virus positivity in children aged less than two years admitted with bronchiolitis

## METHODOLOGY

This cross-sectional study was conducted at the Department of Pediatrics, Hameed Latif Hospital, Lahore from from 14 Dec 2024 to 14 June 2024. Sample size is calculated by using WHO calculator, sample size of 100 cases is calculated with 95% confidence level, 7% margin of error and percentage of RSV infection i.e. 13.6% in children with bronchiolitis [10]. Data were collected through non-probability, consecutive sampling

**Inclusion Criteria:**

- Children aged 1-24 months old
- Both genders
- Admitted with bronchiolitis (as per operational definition)

**Exclusion Criteria:**

- Children with history of hospital admissions after birth, asthma (on medical record)
- Children with congenital defect including congenital heart disease.

### Data Collection

After obtaining ethical approval, eligible infants fulfilling the inclusion criteria were enrolled through the Pediatrics Emergency Department. Written informed consent was obtained from parents or guardians. Demographic and clinical details such as name, age, gender, weight, duration of symptoms, residence, socioeconomic status, season, overcrowding (>5 persons per room), feeding pattern (liquid, semi-solid, solid), history of breast feeding, and any previous episodes of bronchiolitis were recorded. Clinical severity was assessed using the Wood-Downes Clinical Scoring System modified by Ferres. Sterile cotton swab samples were collected from the oral cavity and transported to the hospital laboratory for virological analysis. Samples were tested for RSV antigen using Mouse Monoclonal anti-RSV Antibody (Novatetra) and Goat Anti-Mouse Antibody conjugated with FITC as the secondary antibody. A positive laboratory report was taken as confirmation of RSV infection. Infants with RSV infection were managed according to standard protocols. All data were documented in a structured proforma.

### Data Analysis

Data were entered and analyzed using SPSS version 26.0. The Shapiro-Wilk test was applied to assess normality of continuous variables. Continuous variables (age, weight, duration of symptoms, Wood-Downes Clinical score) were expressed as mean ± standard deviation (SD). Categorical variables (gender, residence, socioeconomic status, season, overcrowding, feeding pattern, history of breastfeeding, history of previous bronchiolitis, and RSV positivity) were summarized as frequencies and percentages. Data were stratified for age, gender, weight, duration of symptoms, residence, socioeconomic status, season, overcrowding, feeding pattern, breastfeeding, history of bronchiolitis, and Wood-Downes Clinical score. Post-stratification, the chi-square test was applied to compare stratified groups with RSV positivity. A p-value ≤0.05 was considered statistically significant.

## RESULTS

A total of 100 children with bronchiolitis were included in the study. The mean age of the participants was 9.8 ± 5.6 months. Out of these, 58 (58.0%) were males and 42 (42.0%) were females, with a male-to-female ratio of 1.4:1. The mean weight was 7.4 ± 2.1 kg. The majority of children were from urban areas (62, 62.0%) while 38 (38.0%) resided in rural areas. Most belonged to the low socioeconomic group (67, 67.0%), and 44 (44.0%) of the households reported overcrowding (>5 persons per room). A large proportion (72, 72.0%) of the children were breastfed, while 28 (28.0%) were not. Nineteen (19.0%) children had a previous history of bronchiolitis. The mean duration of symptoms before admission was 3.6 ± 1.8 days, and the mean Wood-Downes Clinical Score was 6.2 ± 2.4 (Table 1).

**Table 1**

*Baseline Demographic and Clinical Characteristics of Children with Bronchiolitis (N = 100)*

| Variable | Category | n (%) / Mean ± SD |
|---|---|---|
| Age (months) | | 9.8 ± 5.6 |
| Gender | Male | 58 (58.0) |
| | Female | 42 (42.0) |
| Weight (kg) | | 7.4 ± 2.1 |
| Residence | Urban | 62 (62.0) |
| | Rural | 38 (38.0) |
| Socioeconomic status | Low | 67 (67.0) |
| | Middle | 33 (33.0) |
| Overcrowding (>5 persons/room) | Present | 44 (44.0) |
| | Absent | 56 (56.0) |
| Breastfeeding | Yes | 72 (72.0) |
| | No | 28 (28.0) |
| Previous bronchiolitis episode | Yes | 19 (19.0) |
| | No | 81 (81.0) |
| Duration of symptoms (days) | | 3.6 ± 1.8 |
| Wood-Downes Clinical Score | | 6.2 ± 2.4 |

Overall, RSV infection was detected in 16 (16.0%) of the children, while 84 (84.0%) tested negative. RSV was slightly more common in males (17.2%) compared to females (14.3%), but this difference was not statistically significant (p = 0.72). Infants younger than 6 months had a higher RSV positivity rate (22.5%) compared to those aged 6–24 months (11.7%), and this association was statistically significant (p = 0.04). Seasonal variation was also observed, with the highest positivity recorded during winter (25.0%), followed by autumn (10.7%) and spring (4.2%), which was statistically significant (p = 0.03) (Table 2).

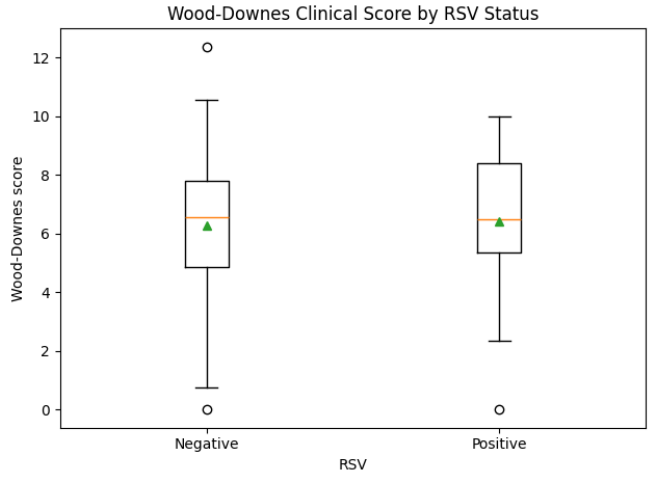
**Table 2**

*Frequency of RSV Positivity in Children with Bronchiolitis (N=100)*

| Variable | Category | RSV Positive n (%) | RSV Negative n (%) | p-value |
|---|---|---|---|---|
| Overall | — | 16 (16.0) | 84 (84.0) | — |
| Gender | Male | 10 (17.2) | 48 (82.8) | 0.72 |
| | Female | 6 (14.3) | 36 (85.7) | |
| Age group | <6 months | 9 (22.5) | 31 (77.5) | 0.04* |
| | 6–24 months | 7 (11.7) | 53 (88.3) | |
| Season | Winter | 12 (25.0) | 36 (75.0) | 0.03* |
| | Autumn | 3 (10.7) | 25 (89.3) | |
| | Spring | 1 (4.2) | 23 (95.8) | |

*Significant at $p \leq 0.05$

**Figure 1**



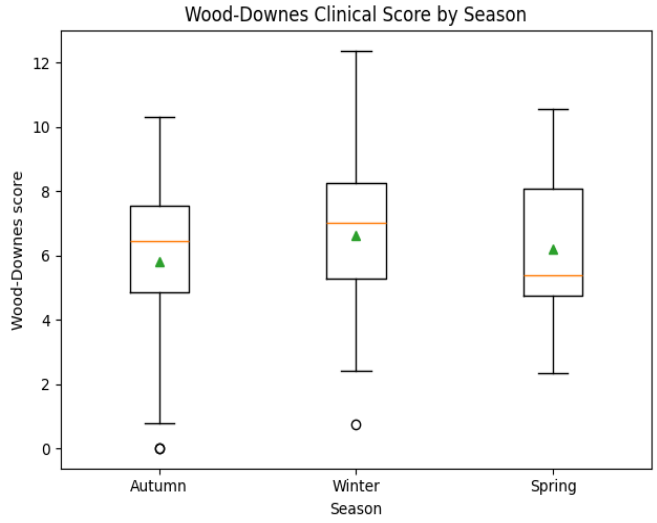

When stratified by clinical severity, RSV was detected in 10.5% of children with mild disease, 17.8% of those with moderate disease, and 25.0% of those with severe disease. Although the frequency of RSV positivity increased with greater severity, the association did not reach statistical significance (p = 0.18) (Table 3).

**Table 3**

*Association of RSV Positivity with Clinical Severity (N = 100)*

| Wood-Downes Clinical Score | RSV Positive n (%) | RSV Negative n (%) | p-value |
|---|---|---|---|
| Mild (≤5) | 4 (10.5) | 34 (89.5) | |
| Moderate (6–8) | 8 (17.8) | 37 (82.2) | 0.18 |
| Severe (≥9) | 4 (25.0) | 12 (75.0) | |

**Figure 2**




RSV infection was more frequent among children from overcrowded households (20.5% vs. 12.5%), though the difference was not statistically significant (p = 0.21). Similarly, RSV positivity was higher among non-breastfed children (21.4%) compared to breastfed children (13.9%) (p = 0.39). Children from low socioeconomic status families showed higher RSV positivity (19.4%) compared to those from middle-class families (9.1%), but this difference was also not significant (p = 0.27) (Table 4).

**Table 4**

*RSV Positivity Stratified by Risk Factors (N = 100)*

| Risk Factor | Category | RSV Positive n (%) | RSV Negative n (%) | p-value |
|---|---|---|---|---|
| Overcrowding | Present | 9 (20.5) | 35 (79.5) | 0.21 |
| | Absent | 7 (12.5) | 49 (87.5) | |
| Breastfeeding | Yes | 10 (13.9) | 62 (86.1) | 0.39 |
| | No | 6 (21.4) | 22 (78.6) | |
| Socioeconomic status | Low | 13 (19.4) | 54 (80.6) | 0.27 |
| | Middle | 3 (9.1) | 30 (90.9) | |

## DISCUSSION

In this study, the frequency of respiratory syncytial virus (RSV) infection among children under two years admitted with bronchiolitis was found to be 16%. This finding underscores RSV as a key etiological agent in bronchiolitis within this age group, consistent with its established role as the most common viral pathogen associated with severe lower respiratory tract infections in infancy. The higher prevalence of RSV in infants under six months of age in our cohort highlights the vulnerability of this subgroup, likely due to immature immune responses, smaller airway caliber, and limited prior viral exposure. Our findings are comparable to international data, though the reported frequency of RSV positivity in bronchiolitis varies widely depending on season, region, and testing methodology [11]. For instance, a study from India reported RSV detection rates of 13–20% in bronchiolitis cases, while multicenter European data showed rates closer to 25–40% during peak RSV season. The relatively lower frequency in our study may reflect geographical variation, seasonal timing of data collection, or reliance on antigen detection rather than molecular techniques, which are known to have higher sensitivity. Nonetheless, our results align with regional studies from South Asia that typically report RSV positivity rates in the range of 12–22% [12].

The majority of RSV cases occurred during the winter, demonstrating the clear seasonal variation in incidence. This pattern mirrors global epidemiology, where RSV epidemics peak in colder months, particularly in temperate climates. It is thought that viral stability and transmission are enhanced by climatic conditions like lower temperatures and higher humidity, and that wintertime indoor crowding may also play a role. Recognizing this seasonal trend has important implications for hospital preparedness, as it allows for planning of pediatric bed allocation, oxygen supply, and infection control measures in anticipation of annual RSV surges [13]. Risk factor analysis in our cohort suggested higher RSV positivity among children exposed to overcrowded living conditions and those not exclusively breastfed, although these associations did not reach statistical significance. These findings are biologically plausible, as overcrowding increases viral transmission

opportunities, and breastfeeding is known to confer passive immunity that may reduce the risk or severity of RSV infection [14]. Low socioeconomic status was also associated with a trend toward higher RSV detection, consistent with prior studies linking poverty with both increased exposure and poorer access to preventive and supportive healthcare [15].

The relationship between RSV positivity and disease severity, as assessed by the Wood-Downes Clinical Score, showed a gradient, with RSV-positive children more likely to present with moderate-to-severe disease compared to their RSV-negative counterparts. Although this difference was not statistically significant in our dataset, it supports existing literature that RSV bronchiolitis is more frequently associated with severe clinical outcomes, particularly in younger infants and those with comorbidities [16-18]. This observation highlights the need for vigilant monitoring of RSV-positive cases and careful triaging in resource-limited settings. This study has certain limitations. First, the sample size was relatively modest and drawn from a single tertiary care hospital, which may limit generalizability to the wider population. Second, the use of antigen detection methods, while practical, may have underestimated the true RSV positivity rate compared to molecular testing. Thirdly, because of the cross-sectional design, there was no way to follow up on outcomes like length of stay in the hospital or need for intensive care, which would have given more information about the clinical burden of RSV bronchiolitis. Despite these limitations, our study highlights priority areas for future research and policy interventions and provides valuable baseline data on RSV prevalence in a local pediatric population.

## CONCLUSION

It is concluded that respiratory syncytial virus (RSV) is a significant cause of bronchiolitis in children under two years of age, with a frequency of 16% in our study population. The infection was more common in infants younger than six months and showed a clear seasonal peak during winter months. These findings reinforce the importance of considering RSV in all cases of bronchiolitis and highlight the need for heightened clinical vigilance during peak seasons. Public health measures, including improved infection control practices, promotion of breastfeeding, and reduction of household overcrowding, may contribute to lowering the burden of RSV-related hospitalizations.

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