

## Clinical Predictors of Hospital Admission in Children Aged 0-24 Months with Acute Bronchiolitis

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### Abstract

#### Introduction

Bronchiolitis is a significant cause of acute morbidity in children less than 2 years old and some children with bronchiolitis are admitted to the hospital. In this study we aimed to identify the clinical predictors of hospital admission in children aged 0-24 months with acute bronchiolitis.

#### Materials and Methods

All children in the age group of 0-24 months presenting with acute bronchiolitis to a dedicated pediatric emergency department of GB Pant Cantonment Children Hospital, Government Medical College Srinagar, India; during April 2012 to March 2013 were included in the study, provided they met the inclusion criteria. The data was analyzed using SPSS software version 17.0.

#### Results

763[552(72.3%) male, mean age  $8.52 \pm 3.59$  months] children (0-24 months) presented with acute bronchiolitis during the study period. 435[313 (72%) male, mean age  $6.69 \pm 3.8$  months] patients were admitted to the hospital. The eight best predictors of admission (age, respiratory rate, heart rate, oxygen saturation, fever, grunt, dehydration and duration of symptoms) were determined.

#### Conclusion

This study has identified clinical predictors of admission in children aged 0-24 months with acute bronchiolitis. This information can be used as a guide in deciding whether to admit a child with bronchiolitis.

**Key Words:** Bronchiolitis, Children, Clinical predictors, India.

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## Introduction

Bronchiolitis is an acute infectious, inflammatory disease of lower respiratory tract resulting in obstruction of small airways (1, 2). It is the most common, serious, acute respiratory illness in infants and young children (3-9). It occurs most often in children between the ages of 0 to 24 months with peak infection occurring at 6 months of age (10). Male: Female ratio being 1.5:1. The diagnosis of bronchiolitis is a clinical one. The main clinical features of bronchiolitis are difficulty breathing, coryza, poor feeding, cough, wheeze and crepitations on auscultation. The disease is predominantly associated with viral infection (most commonly respiratory syncytial virus) and generally occurs in a seasonal pattern, with the highest incidence in the winter months (11).

The clinical course of children with acute bronchiolitis is variable, most children have a mild severity of illness, but some children have a severe course manifested by apnea, intensive care unit admission, intubation or even death. Even among children with apparently mild bronchiolitis, the clinical course is often unpredictable, making it difficult for physicians in the emergency department to determine the appropriate disposition for a child with bronchiolitis. Nevertheless, most children who present to the emergency department with bronchiolitis are discharged to home. Some patients will be discharged inappropriately due to errors in clinical judgment, which can have devastating consequences.

A number of studies have attempted to explore the factors which are taken into account when deciding whether to admit a child with bronchiolitis (12-17), but few have examined a list of potential factors at play a role in clinical decision making.

## Materials and Methods

All children in the age group of 0-24 months presenting with acute bronchiolitis to a pediatric emergency department of GB pant cantonment children hospital, Government Medical College Srinagar, India; during April 2012 to March 2013 were included in the study, provided they met the inclusion criteria. Data for each child was extracted through history and clinical examination.

Children presenting in the age group of 0-24 months were considered for inclusion in the study. The inclusion criterion was a clinical diagnosis of acute bronchiolitis documented by a clinician in a child under the age of 24 months.

### *Identification of clinical predictors for admission*

In order to ensure that all potentially significant predictors of admission were considered, we conducted a literature review and devised a list of 10 potentially relevant clinical predictors through expert discussion. Both objective and non-objective predictors were considered as long as they could be determined from the child's care while in the emergency department. The list of potential predictors can be found in (Table.1).

**Table 1:** Potential clinical predictors of admission in acute bronchiolitis

➤ Age at presentation (months)
➤ Gender
➤ Presence of cough
➤ Temperature (>100 F)
➤ Duration of symptoms (days)
➤ Heart rate <sup>18</sup> (<120, 120-160, >160 beats/min)
➤ Respiratory rate <sup>18</sup> (<40, 40-60, >60 breaths/min)
➤ Oxygen saturation <sup>18</sup> (>98, 94-98, >98%)
➤ Presence of grunt
➤ Clinical signs of dehydration

The data was analyzed using SPSS software version 17.0. Non-parametric numerical variables were analyzed using Mann-Whitney U test. Chi square was used to analyze categorical variables, p value < 0.05 was considered significant. Post hoc analysis was used for heart rate, respiratory rate and oxygen saturation.

## Results

A total of 763 [552(72.3%) male] patients with clinical features suggestive of acute bronchiolitis were included in the study. The mean age at presentation was  $7.47 \pm 4.3$  months.

The mean duration of symptoms at presentation was  $3.83 \pm 1.2$  days. Out of 763 patients, 435(57%) patients were admitted to the hospital. The mean age of admitted and non-admitted patients was  $6.69 \pm 3.8$  months and  $8.52 \pm 3.59$  months respectively. The difference was statistically significant ( $p < 0.05$ ). The mean duration of symptoms in admitted and non-admitted group was  $4.02 \pm 1.2$  days and  $3.59 \pm 1.2$  days respectively which is statistically significant ( $p < 0.05$ ). In the admitted and non-admitted group males were 313(72%) and 239(72.9%), a statistically insignificant ( $p > 0.05$ ) predictor. Total of 259(59.5%) patients in the admitted group and 200 (60.9%) patients in the non-admitted group presented with cough, the difference was however statistically insignificant

( $p > 0.05$ ). Fever was present in 99(22.7%) patients in the admitted group and 130(39.6%) patients in the non-admitted group, the difference was statistically significant ( $p < 0.05$ ). 62(14.2%) patients in the admitted group had heart rate  $> 160$  beats/min against 44(13.4%) patients in the non-admitted group which was statistically significant ( $p < 0.05$ ). In the admitted group 194(44.5%) patients had respiratory rate  $> 60$  breaths/min as against 34(10.3%) patients in the non-admitted group which shows statistical significance ( $p < 0.05$ ).

43(9.8%) patients in the admitted group had oxygen saturation  $< 94\%$  as against one patient in the non-admitted group which was highly significant statistically ( $p < 0.05$ ). Grunt was present in 135(31.0%) patients in the admitted group and 78(23.7%) patients in the non-admitted group, the difference was statistically significant ( $p < 0.05$ ). Dehydration was present clinically in 128(29.4%) patients in the admitted group and 70(21.3%) patients in the non-admitted group, the difference was highly significant ( $p < 0.05$ ).

Total of eight predictors: age, fever, duration of symptoms, grunt, dehydration, heart rate  $> 160$  beats/min, respiratory rate  $> 60$  breaths/min and oxygen saturation were statistically significant ( $p < 0.05$ ) and hence significant predictors of hospital admission.

**Table2:** showing the significance of various predictors

Predictor	OR	p- value
1. Age	0.911	<0.05
2. Gender	0.741	>0.05
3. Duration symptoms	1.510	<0.05
4. Fever	0.304	<0.05
5. Grunt	1.242	<0.05

6. Dehydration	1.398	<0.05
7. Cough	0.675	>0.05
8. Heart rate >160	1.072	<0.05
9. Respiratory rate >60	6.960	<0.05
10. Oxygen saturation <94%	35.869	<0.05

## Discussion

In our study we found eight predictors of admission in children (0-24 months) with acute bronchiolitis. Although in some countries bronchiolitis is diagnosed up to the age of five, a large majority of those admitted to hospital with bronchiolitis are infants. Notably, 72.0% of admitted patients were males. This correlates with the findings of other studies, where it has also been noted that males are more likely to be hospitalized with bronchiolitis (19-21). The mean age of admitted patients in our study was  $6.69 \pm 3.8$  months which correlates with other studies (22). In our study the mean duration of symptoms in admitted patients was  $4.02 \pm 1.2$  days (22). Marlais (2011) reported 2.9 days as the mean duration of symptoms in acute bronchiolitis which is consistent with our study. Cough was present in 259(59.5%) of patients admitted with acute bronchiolitis ( $p > 0.05$ ), an insignificant predictor of hospital admission. No study has reported that cough is a predictor of hospitalization in children with acute bronchiolitis. Fever was present in 99(22.8%) patients admitted with acute bronchiolitis ( $p < 0.05$ ), a significant predictor of hospital admission in patients with acute bronchiolitis. No study has determined the significance of fever as a predictor of hospitalization in children with acute bronchiolitis. We found that heart rate more than 160 beats/min is a significant predictor of hospitalization,

consistent with other studies (12-17). We also found respiratory rate more than 60 breaths/min as a significant predictor of admission in children less than 2 years with acute bronchiolitis (13,17,19). Oxygen saturation less than 94% was present in 43(9.8%) patients in the admitted group, a statistically significant predictor of hospital admission. Voets reported that oxygen saturation less than 95% predicted the severity of pulmonary disease and need for hospital admission. The findings of our study are similar to those of Walsh et al., they found that dehydration predicted the need for admission and a longer hospital stay. We also determined grunt as a significant predictor of hospital admission (23). Shaw et al. reported grunt as a predictor of severe disease and hence a predictor of hospitalization in children with acute bronchiolitis.

## Conclusion

This study has identified clinical predictors of admission in children aged 0-24 months with acute bronchiolitis. This information can be used as a guide in deciding whether to admit a child with bronchiolitis.

**Conflict of interests:** None

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