

## **Can We Identify Acute Severe Viral Lower Respiratory Tract Infection Clinically?**

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*Two hundred children below five years of age hospitalized with a clinical diagnosis of acute severe lower respiratory tract infection were enrolled in the study. Nasopharyngeal (NP) aspirate was collected for viral isolation by centrifugation enhanced culture technique. Viruses were isolated from 89 NP aspirates. Clinical features of these 89 children were compared with 111 children whose NP aspirates were negative for viruses. There was significantly higher incidence of breathlessness and rhonchi in children whose nasopharyngeal aspirates yielded virus. Sensitivity, specificity, positive and negative predictive values of breathlessness for severe viral ALRTI were 98%, 10.8%, 46.8% and 85%, respectively. The values for rhonchi were 60%, 56.8%, 58.2%, and 74.1%, respectively. It is concluded that clinical features do not have desirable sensitivity and specificity for identification of ALRTI due to viral etiology.*

**Key words:** *Acute lower respiratory tract infection, Viral pneumonia.*

Acute lower respiratory tract infection (ALRTI) is the leading cause of mortality and a common cause of morbidity in children below five years of age(1). The World Health Organization (WHO) has suggested diagnosis and assessment of severity of ALRTI on the basis of clinical features and empirical antibiotics in all cases of ALRTI. This leads to administration of antibiotics to all children, including those with viral ALRTI. Concerns about unnecessary use of antibiotics for ALRTI have been expressed(2).

Many published studies have addressed the differentiation of bacterial from viral ALRTI using clinical(3-5), radiological(3-11)

and routine hematological investigations(3-6, 12-13). These methods have not been found to be sufficiently reliable. Clinical markers that can differentiate between viral and non-viral ALRTI may be useful in resource poor countries where investigations including chest radiographs are not readily available. Studies(3-5) that have used clinical markers for differentiation between bacterial and viral ALRTI were done on small number of patients, directed towards identification of bacterial pneumonia, used few clinical features (duration of illness, age of the patient, fever) and studied children with non severe pneumonia except in one study(5).

We report our experience of use of clinical features for identification of severe viral ALRTI.

### Subjects and Methods

The study was carried out from March 1995 to February 1997 in the Pediatric wards of a tertiary care hospital situated in Northern India. Children admitted with severe acute lower respiratory tract infection (ALRTI) in absence of underlying chronic illnesses during the study period were enrolled in the study as cases. Standard definitions were used for acute and severe respiratory tract infection(14).

A detailed clinical review, including history and physical examination, was undertaken. Salient features noted in the history were presence of fever, coryza, cough, vomiting, refusal to feed, breathlessness (difficulty in breathing as told by mother), and occurrence of symptoms of upper respiratory tract infection in the family members in the preceding 2 weeks. On clinical examination, respiratory rate, significant pallor, stridor, severe protein energy malnutrition, and presence of crepitations and rhonchi was recorded.

Nasopharyngeal aspirates were collected from all children within 12 hours of hospitalization using sterile mucus extractor. Hank's balanced salt solution with 0.5% gelatin was then aspirated into the mucus extractor and transported to laboratory on ice. Viral isolation was performed by centrifugation enhanced culture for respiratory syncytial virus (RSV), parainfluenza virus (PIV), influenza virus (IV) and adenovirus(15). We attributed ALRTI to viral etiology only if any of the above mentioned virus was isolated from nasopharyngeal aspirate.

The treating physicians decided patient management. All children received parenteral antibacterials along with supportive care.

Univariate analysis for various clinical features was performed. 'P' values less than 0.05 were considered as statistically significant. For clinical utility of clinical variables found to be significantly different between two group, further calculation of sensitivity, specificity and predictive values were carried out considering positive nasopharyngeal aspirate as gold standard for viral ALRTI.

### Results

A total of 200 children below 5 years of age with a diagnosis of acute lower respiratory tract infection (ALRTI) were studied over a period of 2 years. 146 were boys and 54 were girls. 125 children were below the age of 12 months. Mean age of children in virus positive and negative groups was 11.5 and 11.2 months respectively. There was no difference in age and sex distribution between the two groups.

Viruses were isolated from nasopharyngeal aspirates of 89 (44.5%) children while 111 (55.5%) were negative. RSV was isolated in 17%, PIV in 11.5%, IV in 14.5% and adenovirus in 1.5% children.

There was no significant difference between the two groups for clinical features such as cold, cough, fever, vomiting, refusal to feed, family history of upper respiratory tract infection in preceding 2 weeks. Similar proportions in both the groups had stridor, anemia, severe malnutrition and crepitations.

There was significantly higher incidence of breathlessness and rhonchi in children whose nasopharyngeal aspirates yielded virus (*Table I*). Sensitivity, specificity, positive and negative predictive values of breathlessness for severe viral ALRTI were 98%, 10.8%, 46.8% and 85%, respectively. The values for rhonchi were 60%, 56.8%, 58.2%, and 74.1% respectively.

**TABLE 1**—Clinical Features in Viral and Non Viral ALRTI.

Clinical features	Non viral ALRTI (n = 111)	Viral ALRTI (n = 89)	P value
Age mean (m)	11.5	11.22	0.99
Sex (Male)	82 (74)	64 (72)	0.73
Cold	67 (61)	53 (60)	0.82
Cough	109 (98)	84 (95)	0.19
Fever	91 (82)	67 (75)	0.31
Vomiting	9 (8)	4 (5)	0.47
Refusal to feed	46 (42)	33 (37)	0.43
Breathlessness	99 (90)	87 (98)	0.03
Family URTI	54 (49)	46 (52)	0.60
Stridor	4 (4)	1 (1)	0.33
Anemia	16 (14)	11 (14)	0.82
Severe PEM	67 (60)	53 (60)	0.97
Creptitations	54 (49)	46 (52)	0.60
Rhonchi	48 (44)	67 (60)	0.02

Figures in parentheses indicate percentages.

## Discussion

Analysis of our data suggests that breathlessness and rhonchi were significantly more frequently seen in children with viral ALRTI. However, their sensitivity, specificity and predictive values were less than optimal to be clinically useful tools for identification of viral ALRTI. In the present study the subjects were divided into two groups: children suffering from viral ALRTI or children suffering from ALRTI due to non viral pathogens. Second group may include children with ALRTI due to bacteria, atypical organisms or viruses- viral infection other than RSV, influenza, parainfluenza or adeno viruses which were not tested in the present study or children in whom nasopharyngeal aspirates were falsely negative for viruses. The number in this subgroup will be negligible as

almost all community acquired ALRTI are caused by these four viruses and positive NP aspirate for viruses is the only acceptable method for diagnosis of ALRTI due to viruses. Since laboratory work up of these patients for bacterial pathogens and atypical agents was not complete, only valid grouping would be viral and non viral.

Published reports in literature also suggest similar experience. Turner *et al.*(3) in their study of 98 children with ALRTI treated in outpatient could not identify any clinical, laboratory or radiological findings that could reliably differentiate viral from bacterial infection. Bettenay *et al.*(4) observed that the chances of isolating a bacteria as opposed to virus were only 18% if clinical features (duration of illness <2 days, fever >39.5° C) suggested bacterial pneumonia. This study

### Key Message

- Acute lower respiratory tract infection (ALRTI) due to viral infection is more often associated with breathlessness and rhonchi; however, these clinical features do not have acceptable sensitivity and specificity for their use in identification of viral ALRTI.

suggested no utility of clinical features in differentiation of viral from bacterial pneumonia. Isaacs(5) in his study of 57 hospitalized children with community acquired pneumonia concluded that it is not possible to distinguish reliably childhood viral from bacterial pneumonia clinically or by rapid diagnostic tests.

The study enrolled only patients with severe ALRTI admitted in a tertiary care hospital. The results may be different in non-severe ALRTI. In the present study we defined ALRTI due to viral pneumonia if a viral culture was positive in nasopharyngeal aspirate. We did not identify mixed infection due to viral and bacterial pathogens. About 10-20% of all ALRTI may be due to mixed infections(14).

We conclude that it is difficult to differentiate viral ALRTI from non-viral ALRTI on basis of clinical criteria. A documented ALRTI by clinical or radiological criteria should be treated with antibiotics in community till we have a reliable method to identify viral and non-viral ALRTI.

*Contributors:* SKK was involved in designing the study, collection of data and preparation of manuscript. He will act a guarantor of the study. SB was involved in design and writing of manuscript. MG was involved in data collection. RMP was involved in statistical analysis and manuscript writing. RL was involved in manuscript writing and statistical analysis. RSM was involved in isolation of viruses. MP was involved in literature search.

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