



## Factors influencing pediatricians' prescribing behaviour in the treatment of bronchiolitis: knowledge may not be the key.

### KEYWORDS

Bronchiolitis, antibiotics, bronchodilators, steroids, RDAI score

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**ABSTRACT** *There is unjustified use of drugs like bronchodilators, corticosteroids and antibiotics for treatment of bronchiolitis by the pediatricians despite well framed recommendations. This study was conducted to identify the factors determining prescribing practices of pediatricians for treatment of bronchiolitis and to possibly correlate therapeutic choices to the severity of clinical presentation. Fifty three infants with bronchiolitis were included in the study and prospectively analyzed. RDAI (Respiratory Distress Assessment Instrument) score was assessed at the time of admission in the hospital. To find out the therapeutic behavior of the clinicians a specific questionnaire was submitted to them. The study reveals no statistically significant association between the drugs used with severity or RDAI score. The study confirmed the over prescription of drugs in bronchiolitis management. The reasons of pediatricians to prescribe drugs were mainly the perception of clinical severity of the disease and parental anxiety.*

### Introduction:

Bronchiolitis is an acute respiratory tract infection in infants characterized by fever, coryza, cough, expiratory wheezing and respiratory distress [1]. It is a virus induced acute bronchiolitis inflammation associated with signs and symptoms of airway obstruction. The American Academy of Pediatrics defines bronchiolitis as "acute inflammation, edema and necrosis of epithelial cells lining small airways, increased mucus production and bronchospasm" [2]. Typically affects children less than 2 years with peak incidence between 2 months and 6 months of age. In prospective hospital-based study from southern India, out of 114 children with bronchiolitis, 76% were less than 1 year and 94% less than 2 years age. Bronchiolitis occurs in epidemics in winter months and outbreaks in India occur between September to March [2]. It occurs most commonly between 1 and 6 months of age, although it may occur anytime within first 2 years of life [3, 4]. It is one of the most common lower respiratory tract infections in infants and represents a common reason for hospital admission. Typical bronchiolitis in infants is a self-limited disease that is little modified by aggressive evaluations, use of antibiotics or other therapies. Many guidelines were framed to address diagnosis, management and prevention strategy. Cincinnati guidelines [5] suggest that neither bronchodilators nor steroids, antiviral and antibacterial agents should be routinely used. In particular, use of antibiotics and steroids should be strongly discouraged, whereas administration of bronchodilators or epinephrine may be considered as an option, particularly when there is a family history for allergy, asthma, or atopy. On the other hand, it has been stated that clinical practice guidelines are intended to assist clinicians in decision-making, not replacing clinical judgment and not providing the only appropriate approach to the management of children with bronchiolitis [5]. Moreover, re-

cent evidences have demonstrated advantages of the use of inhaled hypertonic saline in improving clinical score and shortening duration of hospitalization [6,7]. In spite of various guidelines and recommendations, many clinicians persistently and routinely use drugs in bronchiolitis, including bronchodilators, steroids and antibiotics [8]

### Aim:

In this study we analyze a group of infants admitted with bronchiolitis in department of Pediatrics of 3 apex hospitals in Bhubaneswar, describe the therapeutic approaches of pediatricians and try to evaluate main reasons for the irrational therapeutic behavior.

### Methods:

Children with bronchiolitis admitted to Pediatric Departments of 3 apex hospitals of Bhubaneswar from September 2012 to September 2014 were included in the study and prospectively analyzed.

### Inclusion criteria:

Infants of age group 2-12 months with 1<sup>st</sup> lower respiratory infection associated with at least one of the following: history of rhinitis and cough, tachypnea, use of accessory muscles, and/or nasal flaring, wheezing/ crackles, low oxygen saturation (SaO<sub>2</sub>), cyanosis, with/without fever.

### Exclusion criteria:

Cystic fibrosis, broncho-pulmonary dysplasia (BPD), known heart disease. Patients with life-threatening complications of bronchiolitis, including apnea, respiratory failure, or the clinical appearance of sepsis or shock, were also excluded from the study.

Though many scores have been developed to assess the

clinical severity of the disease, in our study clinical evaluation of patients was done on basis of RDAI (Respiratory Distress Assessment Instrument) score at time of admission, according to Langley et al. [9]. In relation to severity, RDAI score <8 was attributed to mild and moderate forms, whereas > 9 to severe forms [10].

Table 1 RDAI (Respiratory Distress Assessment Instrument) score<sup>x</sup>

| SCORE    |                 |      |                    |                    |                  |            |             |
|----------|-----------------|------|--------------------|--------------------|------------------|------------|-------------|
|          | Symptoms        | 0    | 1                  | 2                  | 3                | 4          | Maxm. score |
| Wheezing | Expiration      | None | End expiration     | Half expiration    | 3/4th expiration | Continuous | 4           |
|          | Inspiration     | None | Partial            | Continuous         |                  |            | 2           |
|          | Location        | None | <2/4th lung fields | >3/4th lung fields |                  |            | 2           |
| Chest    | Supraclavicular | None | Mild               | Moderate           | Severe           |            | 3           |
|          | Intercostal     | None | Mild               | Moderate           | Severe           |            | 3           |
|          | Subcostal       | None | Mild               | Moderate           | Severe           |            | 3           |
| TOTAL    |                 |      |                    |                    |                  |            | 17          |

[\*Both wheezing and retractions are scored. The RDAI score is the sum of the row scores, with total range 0 to 17; higher scores indicate more severe disease.]

The therapeutic choices of the pediatricians were analyzed by proposing them a specific questionnaire. For the drugs used mainly, bronchodilators (salbutamol), antibiotics and steroids 7, 8 and 10 questions were submitted to pediatricians respectively.

We used chi square test and Fisher's exact test for smaller samples to compare of effectiveness of different treatments/conditions. Significance was defined as p < 0.05.

Fifty six infants were admitted to the 3 with Hospitals because of symptoms of bronchiolitis. Three were excluded because of BPD (1 patient) and known heart disease (2 patients). Fifty three children were enrolled in the study, 31 males (58.4%), 22 females (41.5%). Mean age was 4.2 months (range 2-12 months), 27 patients aged < 4 months (50.9%). Twenty patients (37.7%) were already on treatment when admitted with antibiotics, and/or bronchodilators, and/or corticosteroids. Twenty eight (52.8%) children presented with chest retractions, and 4 (7.5%) with

low SaO<sub>2</sub> (less than 92%). Twenty seven (50.9%) presented with increased RR, with mean starting RR of 53 (range 30-76), and 2/53 were cyanotic (3.7%) at admission.

All the infants enrolled in the study had RDAI score assessment. Twenty five out of 53 patients (47.1%) presented with a RDAI score > 9 at time of admission (8 was mean starting RDAI). Chest X ray was done in 32 patients (60.7%). Among twenty seven infants with bronchiolitis younger than 4 months, 18 (33.9% of total admitted patients) were presented with a mild form (RDAI < 8) of the disease and they were admitted mainly because of age < 4 months more than because of clinical severity

Table 2: clinical characteristics of admitted patients

| clinical characteristics             | No. of patients (%) |
|--------------------------------------|---------------------|
| Total patients                       | 53                  |
| Male                                 | 31                  |
| Female                               | 22                  |
| Mean age (months)                    | 4.2                 |
| 1-4 months                           | 27/53 (50.9%)       |
| 5-12 months                          | 26/53 (49.1%)       |
| Direct access to hospitals           | 33/53 (62.2%)       |
| Patients already on treatment        | 20/53 (37.7%)       |
| Increased Respiratory rate           | 27/53 (50.9%)       |
| Patients with chest retractions      | 28/53 (52.8%)       |
| Patients with SaO <sub>2</sub> < 92% | 4/53 (7.5%)         |
| Chest X ray                          | 32/53 (60.3%)       |
| Cyanosis                             | 2/53 (3.7%)         |
| Starting RDAI score of > 9           | 25/53 (47.1%)       |

Admitted infants with bronchiolitis were undergone following therapeutic interventions - humidified oxygen administration in 13 patients (13%), antibiotics in 31 (58.4%), corticosteroids in 5 (9.4%) and bronchodilators in 46 (86.7%).

Table 3: Therapeutic interventions of admitted patients affected by bronchiolitis

| interventions                            | no of patients |
|------------------------------------------|----------------|
| Humidified oxygen administration         | 13/53 (24.5%)  |
| Bronchodilators (total)                  | 46/53 (86.7%)  |
| Antibiotics (total)                      | 31/53 (58.4%)  |
| Steroids (total)                         | 5/53 (9.4%)    |
| Antibiotics + Steroids                   | 4/53 (7.5%)    |
| Steroids + Bronchodilators               | 5/53 (9.4%)    |
| Antibiotics + Bronchodilators            | 30/53 (56.6%)  |
| Antibiotics + Steroids + Bronchodilators | 5/53 (9.4%)    |
| Antibiotics (alone)                      | 1/53 (1.8%)    |
| Steroids (alone)                         | 0/53 (0%)      |

Antibiotics were used in 14 mild cases and in 17 severe

cases; conversely, they were not used in 14 mild cases and in 8 severe cases, respectively. Bronchodilators were used in 22 mild cases and in 24 severe cases, whereas in 6 mild and 1 severe cases they were not used. Corticosteroids were used in 1 mild case and in 4 severe cases; were not used in 27 mild and in 21 severe cases, respectively. The differences were not statistically significant (P = 0.184 for antibiotics, P = 0.061 for bronchodilators, P = 0.12 for corticosteroids). From this we found that there is no correlation among antibiotics, bronchodilators, or steroids and RDAI score or clinical severity.

Twenty one of 53 patients (39.6%) were already on treatment when admitted, 14 with antibiotics and bronchodilators, 4 with antibiotics and steroids, 2 with steroids and bronchodilators, 2 with antibiotics and bronchodilators, 5 with bronchodilator alone, 1 with antibiotics alone, 1 with steroid alone. Thirty two patients out of 53 (60.3%) were not taken treatment at home, they all started treatment in hospital. Out of these 9 showing a RDAI score > 9 and 13 with RDAI score < 8, at time of hospitalization.

We asked the pediatricians the reasons for their drug choices in bronchiolitis by inviting them to fill in a specific questionnaire to For each question, choices can be multiple. Twenty seven pediatricians from 3 hospitals were included in study. They provided 68 answers about antibiotics use, 56 about bronchodilators and 51 about steroids. Examining their answers it appears that antibiotics were usually prescribed because of clinical severity of the disease (38.2%), parental anxiety (10.2%), frequently at beginning of hospitalization (4.4%), or after 24-48 hours if patient did not improve (13.2%) and to prevent from possible bacterial super infection (11.7%). Bronchodilators were used because pediatricians noticed some improvement after their administration (33.9%), on basis of severe clinical course (25%), on basis of chest clinical examination (19.6%) and independently from clinical course (14.2%). Similarly steroids were usually prescribed on basis of clinical severity (37.2%) or depending on chest clinical examination (23.5%); a marginal group prescribes steroids (either inhaled or systemic), if the child not improved with other medication (9.8%) or because they notice some improvement after their administration (19.6%). Parental anxiety also influences them to use steroids (5.8%).

**Table 4 :Answers of pediatricians to the questionnaire on therapeutic choices.**

| <b>Antibiotics prescribed by you because no of answers</b> |              |
|------------------------------------------------------------|--------------|
| Clinical severity                                          | 26/68(38.2%) |
| only after laboratory investigation                        | 9/68(13.2%)  |
| Patient not improved after 24-48 hours of treatment        | 9/68(13.2%)  |
| To prevent from bacterial super infection                  | 8/68(11.7%)  |
| Parental anxiety                                           | 7/68(10.2%)  |
| If the patient is already on treatment                     | 3/68(4.4%)   |
| At beginning of the hospitalization                        | 3/68(4.4%)   |
| Because of detection of improvement after administration   |              |

|                                                     |            |
|-----------------------------------------------------|------------|
| Administered always irrespective of clinical course | 2/68(2.9%) |
| For personal (medical safety)/just to do something  | 1/68(1.4%) |
| Total no of answers                                 | 68         |

**Bronchodilators prescribed by you because No. of answers clinical improvement of patient after administration**

|                                                                                       |              |
|---------------------------------------------------------------------------------------|--------------|
| 19/56(33.9%)                                                                          |              |
| on the basis of severity                                                              | 14/56(25%)   |
| On the basis of chest examination administered always irrespective of clinical course | 11/56(19.6%) |
| patient is already on treatment                                                       | 8/56(14.2%)  |
| for Personal (medical safety)                                                         | 2/56(3.5%)   |
| Parental anxiety                                                                      | 1/56 (1.7%)  |
| Total answers                                                                         | 1/56 (1.7%)  |
|                                                                                       | 56           |

**steroids prescribed by you because No of answers**

|                                                                             |              |
|-----------------------------------------------------------------------------|--------------|
| of clinical severity                                                        | 19/51(37.2%) |
| On the basis of chest examination clinical improvement after administration | 12/51(23.5%) |
| if patient does not improved with other medications                         | 10/51(19.6%) |
| If patient is already on treatment                                          | 5/51(9.8%)   |
| Personal (medical safety)/just to do something                              | 1/51(1.9%)   |
| Parental anxiety                                                            | 1/51(1.9%)   |
| Administered always irrespective clinical course                            | 3/51(5.8%)   |
| Total answers                                                               | 0/51(0%)     |
|                                                                             | 51           |

**Discussion:**

We analyzed the characteristics of patients admitted, therapeutic approach of the pediatricians and the reasons of their therapeutic choices from the study. Though treatment of bronchiolitis is controversial, recent literatures demonstrated the ineffectiveness of most drugs. Apart from nebulized hypertonic saline [6,7], humidified oxygen administration when necessary [5] and epinephrine in particular circumstances (especially in combination with oral steroids) [11], other interventions are not appropriate in respect to international guidelines. Clinical guidelines for treatment of bronchiolitis only assist the clinicians in decision making, but not by replacing their own clinical judgment in diagnostic and therapeutic choices. Even if the pediatricians are aware of fact of this inappropriate practice of drug use in bronchiolitis management, they still largely use drugs for it [8]. In a Cochrane review, it is reported that antibiotics are used at rates of 34 to 99% in

uncomplicated cases of bronchiolitis [8]. In a study of the Dutch Pediatric Respiratory Society [12] a questionnaire on the use of diagnostic and therapeutic procedures and prescription of drugs after discharge was forwarded to 110 hospital-based pediatric practices. This study reported about a great deal of variation in management of bronchiolitis between respondents. Most used supplemental oxygen therapy (100%) and tube feeding (96%) if needed, antibiotics (69%) for suspected bacterial co-infection and nebulized bronchodilators, either as a trial therapy (59%) or in a fixed schedule therapy (33%). Corticosteroids were used for severe cases by 35% of respondents, whereas ribavirin in 11% of hospitals for treatment of children from high-risk groups. They concluded that a considerable variation in management of bronchiolitis exists between hospitals in the Netherlands, and several therapeutic approaches are used which are not evidence based [12]. From the present study, we found that bronchodilators were used in 86.7% of cases, antibiotics in 58.4% cases, corticosteroids in 9.4% cases and at least one of these drugs is used in all the hospitalized patients. Bronchodilators were more frequently used by our group than the Dutch one (59% in the Dutch study vs. 86.7% in our study) and steroids used less frequently than Dutch study (35% in the Dutch study vs. 9.4% in present study). There is a quiet similarity in antibiotics use between the Dutch study and our data (69% vs. 58.4%). We also found that use of drugs is independent of clinical severity which was demonstrated by the absence of correlation among drugs used and RDAI score.

About 39.6% patients were already on treatment when admitted to the hospitals and therapy was continued in hospital. This group of patients with home treatment might be a possible reason for hospital pediatricians to continue the therapy on admission, but it cannot explain why the other group of patients without home treatment started drugs after hospitalization, independent of clinical severity. Perception of bronchiolitis to clinicians often as a severe condition (particularly in hospitalized patients) may be the probable explanation of this behavior and let them to start aggressive therapeutic intervention. Parents and other family members often think of to bronchiolitis as a severe disease, seeing their baby to breathe with difficulty,, poor suck or decrease feeding, cough: frequently their anxiety influences therapeutic choices of clinicians. By going through their answers it appears that drugs were prescribed primarily because of the perception of clinical severity (38.2% of answers for antibiotics, 25% for bronchodilators, 37.2% for steroids), or on the basis

of chest clinical examination (19.6% for bronchodilators, 23.5% for steroids), or because of some noticed improvement after their administration (33.9% for bronchodilators, 19.6% for steroids). Also we found that parental anxiety influences the therapeutic choices of pediatricians (10.2% of answers for antibiotics, 1.7% for bronchodilators, and 5.8% for steroids).

#### Conclusion:

From the present study, we found that the differences in the treatment of mild/moderate and severe cases of bronchiolitis is not statistically significant ( $P = 0.184$  for antibiotics,  $P = 0.061$  for bronchodilators,  $P = 0.12$ , for corticosteroids). So we conclude that, no correlation has been found among the drugs (antibiotics, bronchodilators, or steroids) prescribed and RDAI score or clinical severity. The study also revealed that drugs are over prescribed in bronchiolitis because it is perceived as a severe condition by pediatricians and in a minority of cases due to parental anxiety.

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