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Message From The Editor



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Dear friends,

On behalf of the Ankura team we wish you all a happy children's day. The current journal was started one year ago on November 14th 2020. The aim was to assist practicing paediatricians in their quest for scientific evidence for common pediatric problems. We wish to continue the same with your support.

During the current winter season we are faced predominantly with respiratory problems. We therefore aim to discuss about the evidence based management of asthma and lower respiratory infections.

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APPROACH TO A CHILD WITH RECURRENT WHEEZE

INTRODUCTION

Wheezing is a common symptom encountered by the practicing paediatricians. Whenever paediatricians see children with recurrent cough and wheeze in their clinics, they are faced with the following questions and dilemmas:

- Does this child have asthma, or could it be something else?
- Would the parents accept the diagnosis of asthma?
- Should we start the child on controller therapy or wait and watch?
- Do we need to investigate this child further?

It is important to accurately diagnose asthma in children to avoid unnecessary treatment (antibiotics, cough syrups etc.) and provide appropriate therapy (controllers and relivers). The diagnosis of asthma is based on the characteristic pattern of symptoms supported by evidence of variable airflow obstruction¹. As there is no single definitive test for the confirmation of asthma diagnosis, one practical approach would be to inform the parents of the “probability” of their child having asthma. The probability is based on the findings suggestive of asthma and absence of findings (red flags signs) that suggest alternative diagnosis as illustrated in fig 1.

Diagnosis of asthma

Probability of asthma

- | | | |
|---|---|--|
| <ul style="list-style-type: none">• Low• Intermediate• High | → | <ul style="list-style-type: none">• Factors suggesting asthma• Factors suggesting alternate diagnosis-red flags |
|---|---|--|

Fig1: Approach to the diagnosis of asthma

Factors suggestive of asthma

The following points in the history increase the probability of asthma in the child².

CHARACTERISTIC SYMPTOMS:

The characteristic symptoms of asthma are cough, breathlessness, and wheeze that vary over time and severity.

Cough- many parents complain of diurnal variation with symptoms being worse at night and early morning.

Breathlessness- this can manifest as rapid breathing or increased work of breathing. Parents may not recognize breathlessness or may not mention unless specifically asked for. In many cases, showing them videos of breathlessness will help them recognize the symptoms.

Wheeze-The presence of wheeze documented by a healthcare professional increases the probability. Sometimes parents may not be able to distinguish wheeze from other respiratory sounds. Moreover, audible wheeze can be heard only in severe cases. It is therefore important that health care professionals conform and document wheeze during clinic visits². Repeatedly normal examination and absence of wheeze during symptoms reduces the probability of asthma.

- **EPISODIC SYMPTOMS:** Asthma in children is usually episodic with relatively symptom free period between the episodes. Only a small minority of Indian children suffer from severe chronic symptoms in general practice.

- **VARIABILITY OF SYMPTOMS:** One of the characteristic features of asthma is the variability of symptoms. This variability can be over the course of one day (diurnal), from day to day, from visit to visit or from season to season. Many parents complain worsening of symptoms at night or in the early morning. There is also seasonal variation with symptoms

worse in winter and rainy season compared to the summer.

- **TRIGGERS:** These symptoms can be triggered by multiple triggers including viral infections, exposure to allergens or irritants, exercise, laughter and cry, weather changes etc.¹
- **REVERSIBILITY:** Rapid relief of symptoms acutely with relievers like beta-2 agonists and long-term improvement of symptoms with controllers like inhaled corticosteroids strengthen the diagnosis of asthma. As the investigations like spirometry are not widely available and cannot be performed in young children, many times paediatricians assess clinical improvement following controller treatment and worsening after cessation of therapy to confirm the diagnosis of asthma.
- **ATOPIC HISTORY:** History of atopy in the child (eczema, allergic rhinitis, food allergy) or a family member greatly increases the likelihood of asthma.
- **OBJECTIVE EVIDENCE:** Objective evidence of variable airflow limitation (fig 1) using spirometer or peak flow meter wherever feasible will confirm the diagnosis¹. Wherever possible, objective evidence for variability in airflow obstruction should be documented before starting treatment.

EVIDENCE OF OBSTRUCTION:

Decreased FEV1/FVC ratio
(normal > 0.9 in children)

POSITIVE BRONCHODILATOR REVERSIBILITY:

Increase in FEV1 > 12% predicted.

POSITIVE EXERCISE CHALLENGE:

Fall in FEV1 > 12% predicted.

DIURNAL VARIABILITY:

Average diurnal PEF variability > 13%.

VARIABILITY BETWEEN VISITS:

Variation of FEV1 > 12% between visits

Fig 2: Objective evidence of variable airway limitation

FEV1- forced expiratory volume in 1 second during spirometry.

FVC- forced vital capacity during spirometry.

PEF: peak expiratory flow using peak flow meter.

- **OTHERS:** In addition, factors that increase the probability include- recurrent symptoms (> 3 per year), prolonged symptoms during viral colds (lasting >10 days) and symptoms precipitated by non-viral triggers (exercise and laughter etc.)¹

FACTORS SUGGESTING ALTERNATIVE DIAGNOSIS.

Absence of clinical features to suggest alternative diagnoses (red flag signs) will strengthen the diagnosis of asthma³. The pathology may be in the bronchial wall, airway lining, lumen etc. (fig 3)

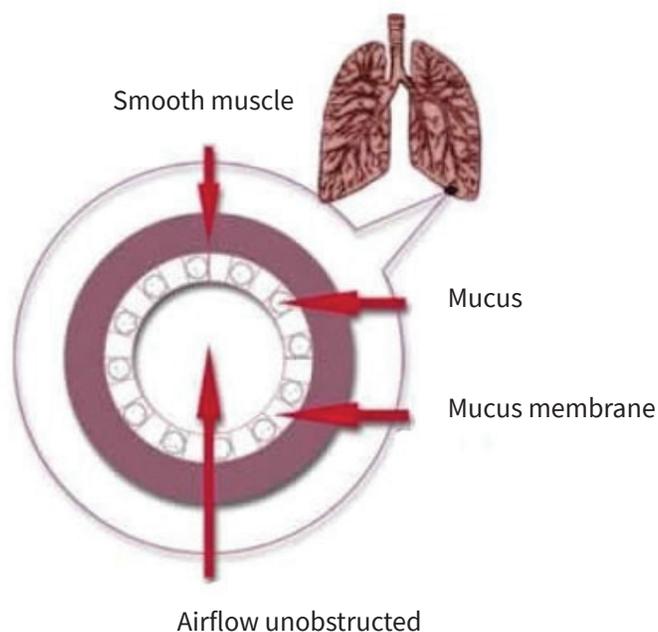


Fig 3: Asthma Mimics

- **BRONCHIAL WALL:** Air way malacia, bronchiectasis, compression (mass, lymph nodes, blood vessels etc.)
- **AIR WAY LINING:** Cystic fibrosis, PCD

- **LUMEN:** Foreign body, endo bronchial TB/tumor, protracted bacterial bronchitis, aspiration
- **OTHERS:** Recurrent viral infections, TB, congenital heart disease, immuno deficiency disease

The clinical features suggestive of alternative diagnosis are summarized in the table below:

Clinical features	Possible diagnoses
Symptoms from birth	Chronic lung disease of prematurity, ciliary dyskinesia, cystic fibrosis
Severe upper respiratory tract disease	Ciliary dyskinesia
Abnormal voice or cry	Laryngeal disease
Inspiratory stridor	Laryngeal or tracheal disorder
Excessive vomiting	GERD (\pm aspiration)
Dysphagia	Swallowing problems (\pm aspiration)
Failure to thrive	GERD, CF
Persistent wet cough	Protracted bacterial bronchitis, bronchiectasis, recurrent aspiration, ciliary dyskinesia
Breathlessness with light headedness and tingling	Dysfunctional breathing, panic attacks
Persistent wheeze	Extrinsic compression (vascular ring, lymph node etc.) Airway anomalies (tracheo bronchomalacia) Luminal obstruction (foreign body, mucous plug)
Family H/O unusual chest disease	CF, neuromuscular disease
Focal signs in the chest	Congenital anomaly, foreign body, post infective syndrome
Focal radiological signs	Congenital anomaly, foreign body, CF, bronchiectasis

Table 1: clinical features that suggest alternative diagnosis.

CONCLUSIONS

- Because there is no definitive investigation for the diagnosis of asthma in children, asthma is mainly a clinical diagnosis supported by spirometry wherever feasible.
- Based on the combination of factors that suggest asthma and the absence of red flag signs, children can be classified into mild, intermediate, or high probability of having asthma.
- Those with high probability can be started on controller therapy through inhaler and spacer.
- Those with intermediate probability can undergo some investigations (spirometry, allergy testing etc.) to support the diagnosis.
- Alternate diagnosis should be looked for in children with low probability.
- Children with low and intermediate probability of asthma can be referred to paediatric pulmonologist for further investigations and management.
- It is important to document the evidence for the diagnosis of asthma at the first visit as the findings might change once the controller therapy is started.

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CLINICAL PRACTICE GUIDELINES FOR PNEUMONIA IN CHILDREN

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Pneumonia is the most common infection causing death in children and accounts for 15% of all deaths in children under 5 years of age. Unfortunately, India contributes to 20% of those deaths and has the greatest burden of pneumonia compared to any other country.

AETIOLOGY

The causative organism for pneumonia was earlier thought to be predominantly bacterial (Streptococcus pneumoniae). From the end of last century and beginning of the current one, significant changes have occurred in the causative organisms. Owing to the widespread vaccination against Hemophilus influenzae and Pneumococcus, the incidence of bacterial

pneumonia has relatively decreased, and the incidence of viral pneumonia has increased in both developed and developing countries¹. Results from the PERCH study have shown that viruses accounted for 61.4%, bacteria for 27.3% and mycobacterium tuberculosis for 5.9%. RSV had the greatest etiological fraction of 31.1% among all pathogens².

Bacteria	Viruses
Streptococcus pneumoniae	Respiratory Syncytial Virus (most common)
Hemophilus influenzae	Adeno virus
Staphylococcus aureus	Influenza A and B
Pseudomonas	Human metapneumovirus
Mycoplasma	Human T-lymphotropic virus
Chlamydia	Parainfluenza virus
Mycobacterium Tuberculosis	Enterovirus
	Coronavirus

Table 1- Common Causative Organisms for Pneumonia

DIAGNOSIS

The diagnosis of pneumonia is based on clinical history, examination findings and supported by radiological and laboratory findings

CLINICAL HISTORY AND PHYSICAL EXAMINATION

The clinical features of pneumonia include fever, cough, and signs of respiratory distress. In a systematic review of 23 prospective cohort studies

(Shah et.al) it was found that the presence of moderate hypoxaemia (<96%), increased work of breathing (grunting, nasal flaring, and retractions)

were signs most associated with pneumonia whereas normal oxygenation (Oxygen saturation >96%) decreased the likelihood of pneumonia³. Tachypnoea (>40 respiratory rate) was not significantly associated with pneumonia³.

Wheezing is significantly associated with viral pneumonia with a positive predictive value of 96.3%⁴. Some of the clinical features that help to identify the etiology are given in the table below⁵:

Bacteria	Viral	Mycoplasma
High Fever >38.5C Chills and rigors Toxic appearance Marked respiratory distress Localised auscultatory findings	Low grade fever General well being Runny nose Myalgia Wheezing Diffuse bilateral findings	Erythema multiforme Non exudative pharyngitis Myocarditis Arthritis Haemolytic anaemia

Table 2: Associated clinical features with various pneumonia etiologies

RADIOLOGICAL DIAGNOSIS:

Chest X-ray is an important investigation and gold standard for diagnosing the disease and its severity. The findings include pulmonary infiltrates which can be alveolar or interstitial. Alveolar infiltrates present with dense fluffy opacities occupying a portion on entire lobe of lung whereas interstitial infiltrates present with linear or patchy densities in a lacy pattern⁶. The sensitivity of radiologically confirmed pneumonia was found to be 93% (80%-98%) and the negative predictive value for normal x-ray was 92% (77%-98%)⁷. In a study conducted in United States, it was observed that findings of moderate or large pleural effusions and bilateral multi lobar infiltrates indicate severe disease⁸.

LABORATORY INVESTIGATIONS:

Procalcitonin and CRP, ESR have been evaluated to be as supportive investigations that help to distinguish viral pneumonia from bacterial pneumonia⁹. These investigations help us in deciding whether to start antibiotic or not.

MANAGEMENT

Depending upon the severity, pneumonia can be managed at home or hospital. The danger signs suggesting severe disease are mentioned in the table below¹⁰:

- Central Cyanosis or oxygen saturation <90%
- Inability to drink/feed
- Vomiting
- Lethargy
- Severe Respiratory distress with nasal flaring, head bobbing, grunting
- Convulsions

Table 3: Danger signs suggesting severe pneumonia

Mortality increases with increasing number of danger signs. No danger signs have 1.5% chance of mortality and presence of 2 or more danger signs at presentation have 33% chance of mortality¹⁰.

ANTIBIOTIC TREATMENT¹¹

MILD PNEUMONIA: Oral Amoxicillin is drug of choice. It can be given at 40 mg/kg/dose twice daily (80 mg/kg/day) for 3 to 5 days depending upon the severity.

SEVERE PNEUMONIA: Children aged 2–59 months with severe pneumonia can be treated with parenteral ampicillin and gentamicin as a first-line treatment. Ampicillin: 50 mg/kg IV every 6 hours for at least five days; Gentamicin: 7.5 mg/kg IM/IV once a day for at least five days

Ceftriaxone should be used as a second-line treatment in children with severe pneumonia having failed on the first-line treatment.

HIV INFECTED: In addition to the above, empirical co-trimoxazole has been advised in case of suspected *Pneumocystis jiroveci* pneumonia.

Lack of response following reasonable duration of appropriate antibiotics should prompt search for complications of pneumonia like empyema.

PREVENTION

Pneumonia can be prevented by immunization, adequate nutrition, and by addressing environmental factors. Immunization against Hib, pneumococcus, measles, and whooping cough (pertussis) is the most effective way to prevent pneumonia. Adequate nutrition is the key to improving children's natural defences, starting with exclusive breastfeeding for the first 6 months of life. Tackling environmental risk factors by providing alternate and clean cooking methods, improving living conditions and avoiding parental smoking will help prevent pneumonia. Hand hygiene prevents spread from one person to another whether at home or school. Avoiding sending children to school during infections will prevent spread to other children.

KEY PRACTICE POINTS:

- Viruses are increasingly being recognized as major causative organisms of pneumonia in children
- Clinical signs like hypoxia and increased work of breathing (grunting, nasal flaring, and retractions) are more likely to suggest pneumonia
- Danger signs include central cyanosis, hypoxaemia (90%), grunting, head bobbing, lethargy, convulsions
- Presence of danger signs indicate severity and warrant admission to hospital
- Chest X-ray is a valuable tool in diagnosing and excluding pneumonia
- Oral amoxicillin is drug of choice in management of community pneumonia. IV antibiotics can be used in severe cases and hospitalized patients.

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