

ACUTE BRONCHIOLITIS

EPIDEMIOLOGY

United States:

- Annual incidence is 11.4% in children younger than 1 year and 6% in those aged 1-2 years. The illness accounts for 4500 deaths and 90,000 hospital admissions per year.

India:

- Peak incidence of the disease occurs before 6 months of age in 70 to 80 percent of the cases, peaking between 3 to 4 months.

Mortality/Morbidity:

- The mortality rate is 1-2% of all hospitalized patients and 3-4% for patients with underlying cardiac or pulmonary disease.

ETIOLOGY

- Respiratory syncytial virus (RSV) is the causative agent in 50 to 60 percent of the cases.
- Other viruses responsible are Para influenza I, II and III, Adenoviruses, Influenza virus and Rhinovirus.

CLINICAL FEATURES

- upper respiratory tract infection with serous nasal discharge, cough and sneezing.
- wheezy cough, dyspnea and irritability.
- Retraction of lower intercostal spaces and suprasternal notch.
- Infant pants for breath and may appear cyanosed.
- Diminished feeding.
- Fever of 38.5 to 39°C.

DIAGNOSIS

- WBC count - usually normal
- Arterial Blood Gas analysis- hypoxia and hypercarbia.
- Serum electrolyte estimation - hyponatremia.
- X-ray of the chest AP and lateral view - generalized emphysema, patchy consolidation, atelectasis, and abnormal linear shadows, due to thickening of the bronchioles.
- ELISA or PCR or by culture of nasopharyngeal secretions - Virus may be demonstrated

MANAGEMENT

The management of bronchiolitis includes:

- General management
 - Oxygen
- Medical management
 - Bronchodilators
 - Steroids
 - Antibiotics
 - Ribavirin- It is very useful in infants < 2 months and babies with congenital heart disease, pulmonary hypertension, hyaline membrane disease and bronchopulmonary dysplasia.

The American Academy of Pediatrics (AAP), recommends the use of Ribavirin suggesting that it will be reserved for:

- Infants at high-risk for severe or complicated RSV infection.
- Infants hospitalized with RSV and lower respiratory tract disease who are severely ill.
- Infants hospitalized with lower respiratory tract disease that is not initially severe but may be at increased risk of progressing to complicated course.
- Mechanically ventilated infants may be benefited.

Palivizumab:

- A humanized anti-RSV, monoclonal antibody (palivizumab) had been developed, which is 95 percent human and 5 percent mouse in composition. It is directed at an epitope on the F protein, which is expressed on the surface of the virus envelope.

NURSING MANAGEMENT

- *Physical Assessment*
- *Nursing Diagnoses:*
- Hypoxemia related to impaired oxygen-carbon dioxide exchange.
- Alteration in comfort related to respiratory distress, infectious process and treatments.
- Alteration in fluid and electrolyte balance related to increased respiratory effort, nausea and vomiting, and decreased appetite.
- Potential for infection related to underlying disease condition.
- Anxiety related to respiratory distress and hospitalization.
- Parental anxiety related to uncertainty about the child's well-being.

Nursing Interventions

- ❖ Provide a humidified environment enriched with oxygen in order to combat anoxia and to liquefy secretions
- ❖ Provide the child with adequate hydration
- ❖ Provide the child with both physical and psychological rest
- ❖ Provide good skin care- excoriation from secretions, accompanying diarrhoeas, and breakdown from confinement to bed
- ❖ Provide measures to improve ventilation of affected portion of the lung

- ❖ Assist in control of fever.
- ❖ Provide for adequate nutrition to meet the growth and development needs of the child.
- ❖ Administer appropriate antibiotic therapy.
- ❖ Be alert for the appearance of specific complications that may accompany respiratory infection and notify paediatrician immediately.
- ❖ Include parents in the planning of care and in caring for the child.

BRONCHIAL ASTHMA

ETIOLOGY

Predisposing factors:

- Heredity, with family history of asthma or some other allergic disorder and
- Labile and over conscientious nature.

Excitatory factors:

- Allergy to certain foreign substances produces allergic or extrinsic asthma.
- Inhalation of pollen, wool, feather, animal hair, cotton seeds, smoke, powder and dust (especially house dust with mite *Dermatopagoides pteronyssinus*)
- Ingestion of foods like egg, some fish, meat, chocolate, wheat, some vegetables (brinjal), etc.

ETIOLOGY contd....

- Drugs, like aspirin or morphine.
- Respiratory infections
- Worm infestations
- Change in climate
- Emotional disturbances due to stress, anxiety, tension, fear and conflict.
- Excessive fatigue, exhaustion and exercise

CLASSIFICATION

Allergic or extrinsic asthma:

- It is produced by a hyper immune (IgE) response to the inhalation of specific allergen (pollen, dust, feather, etc).
- The children with extrinsic asthma usually have positive skin test to the offending allergen and a positive family history of allergen.

CLASSIFICATION contd....

Non- allergic or intrinsic asthma:

- It is produced in response to unidentified or non specified factors (triggers) of the environment.
- No hyper immune response is produced.
- There may be positive family history.
- These children have irritable and hyper reactive airway.
- Inhalation of irritants like cigarette smoke, odor of soap and perfumes, air pollution may induce the episodes of bronchospasm and wheezing.
- Exercise, drugs, change in temperature, atmospheric pressure, viral respiratory infections, emotional stress and excitement are also significant triggers of asthma.

CLINICAL MANIFESTATIONS

- The onset of asthmatic attack may be gradual with nasal congestion, sneezing and a watery nasal discharge present before the attack.
- occurs suddenly, often at night, when the child awakens with the following symptoms:
- Wheezing which occur primarily with expiration
- Anxiety and apprehension
- Diaphoresis
- Uncontrollable cough
- Dyspnoea, with increased effort during expansion
- Chest tightness

CLINICAL MANIFESTATIONS contd...

The asthmatic attack may progress, however, and the child will develop the following:

- Increasing dyspnoea
- Thick, tenacious mucus
- Coarse and fine musical rales
- Nasal Flaring
- Use of accessory muscles for respiration
- Cyanosis
- Hypoxemia
- Respiratory alkalosis leading to respiratory acidosis

CLINICAL MANIFESTATIONS contd...

- Hypercapnia
- Increased heart and respiratory rates
- Abdominal pain from sever coughing
- Vomiting
- Extreme anxiety and apprehension
- Efforts to communicate are difficult and frustrating since the child can only speak in gasping, short, broken sentences between rapid and deep respirations.

DIAGNOSTIC EVALUATION

- History
- Physical examination
- Gross and microscopic examination of the sputum- shows bronchial casts and esinophilia
- Absolute Esinophil Count- reveals increased esinophils
- Allergy skin test or RAST (radioallergoabsorbent test) – measures the specific IgE in the serum
- Chest X-rays- shows hyperinflation, bronchial thickening, atelectasis, pneumonia
- Pulmonary function test or spirometry- measures forced expiratory volume (FEV) and forced vital capacity (FVC)

COMPLICATIONS

- Infections – bronchiectasis, pneumonia, bronchiolitis
- Status asthmaticus
- Atelectasis
- Pneumothorax
- Emphysema
- Cor pulmonale
- Misuse of medications (prolonged use of steroids may complicate the condition)

COMPLICATIONS contd...

- Emotional and behavioral problems
- Dehydration
- Hypotension, hypertension
- Cardiac arrhythmias
- Infants up to 2 years- serious respiratory failure due to the stage of development of their anatomical structures and physiological mechanisms, which are not able to cope with the insult and compensatory demands of the disease.

MANAGEMENT

Goals: The **goals of therapy** for management of childhood asthma are:

- Prevention of acute episodes
- Maximum control of symptoms
- Maintenance of normal growth and development

Principles:

- Avoidance of exposure to allergens and non-specific irritants
- Drug Therapy
- Physiotherapy

AVOIDANCE OF EXPOSURE TO ALLERGENS AND NON-SPECIFIC IRRITANTS:

- The bedroom of the child should be kept clean and as free from dust as possible. Wet mopping of the floor should be done because dry dusting increases exposure of the child to house dust.
- Heavy tap
- estry attracts dust and therefore light plain cloth sheets should be used as curtains in the child's room.
- Carpets, stuffed furniture, loose clothing, wall hangings, calendars and books attract lot of dust and should be regularly cleaned at periodic intervals.
- The bed of the child should be made of light material and should be aired regularly.
- Caressing of animal pets should be discouraged, as the child may be sensitive to their fur.

• AVOIDANCE OF EXPOSURE TO ALLERGENS AND NON-SPECIFIC IRRITANTS contd.....

- Generally, it is not necessary to restrict the diet of the child because bronchial asthma due to food allergy is unusual.
- Adolescent patients should be advised to refrain from smoking.
- Exposure to strong or pungent odors such as wet paint, disinfectants and smoke should be minimized.
- The child should not go to attics or basements, especially if these were unoccupied and kept closed for some days. These should be properly cleaned and aired for some time, before the asthmatic patient goes there.

DRUG THERAPY

- **Sympathomimetics**- Salbutamol, Terbutaline, Formoterol, Salmeterol.
- **Salbutamol**- 0.15mg/kg/dose TID orally or 1 to 2 puffs of 100µg/puff metered aerosol dosage 4 - 6 hourly.
- **Terbutaline**- 0.075mg/kg/dose TID orally or 1 to 2 puffs of 250µg/puff metered aerosol dosage 4 - 6 hourly.
- **Action**- Beta-2 adrenergic agonists.
- **Side effects**- Shakiness, cardiac stimulation

DRUG THERAPY contd...

Methylxanthines- Theophylline, Aminophylline.

- **Dosage**- 5mg/kg per dose repeated every 6 hours (in individuals weighing less than 45kg)
- **Action**- Bronchodilator.
- **Side effects**- Irritability, excitability, excitability, continued dehydration, vomiting, diuresis, and tachycardia, hematemesis, proteinuria, stupor, convulsions, coma, death.
- Hypotension occurs with intravenous use and therefore these injections should be given slowly over a period of 20 minutes.

DRUG THERAPY contd...

- **Corticosteroids-** Beclomethasone, Budesonide, Prednisolone, Adrenaline.
- **Action-** Anti-Inflammatory Agents; Diminish the inflammatory component of asthma, thus reducing airway obstruction.
- **Side effects-** Persistent use for mild attacks may lead to suppression of adrenal activity. Prolonged use may lead to growth retardation and steroid dependency.

DRUG THERAPY contd...

- **Disodium cromoglycate**
- **Action-** It inhibits the release of histamine and the slow reacting substance anaphylaxis (SRS-A). It has prophylactic action. It should not be used in acute attack.
- **Side effects-** Palpitations, tachycardia, pruritus, rash, constipation, cough.

DRUG THERAPY contd...

- **Anticholinergics-** Atropine derivative such as Ipratropium bromide.
- **Action-** Anticholinergic, chemically related to atropine, which blocks vagally mediated reflexes by antagonizing the action of acetylcholine.
- **Side effects-** Immediate hypersensitivity reactions, including rash, angioedema of the tongue, lips, and face, urticaria, bronchospasm, oropharyngeal edema, and anaphylactic reaction.

DRUG THERAPY contd...

- **Ketotifen**
- **Action-** Ketotifen is a mast cell and basophil stabilizer as well as an H₁ receptor antagonist.
- **Side effects-** GI ulcer, bleeding and perforation, drowsiness, rash, bronchospasm, hypotension, psychosis, dry mouth, fever, bradycardia, chest pain, dizziness, headache, sweating, edema, pallor, liver function changes.

DRUG THERAPY contd...

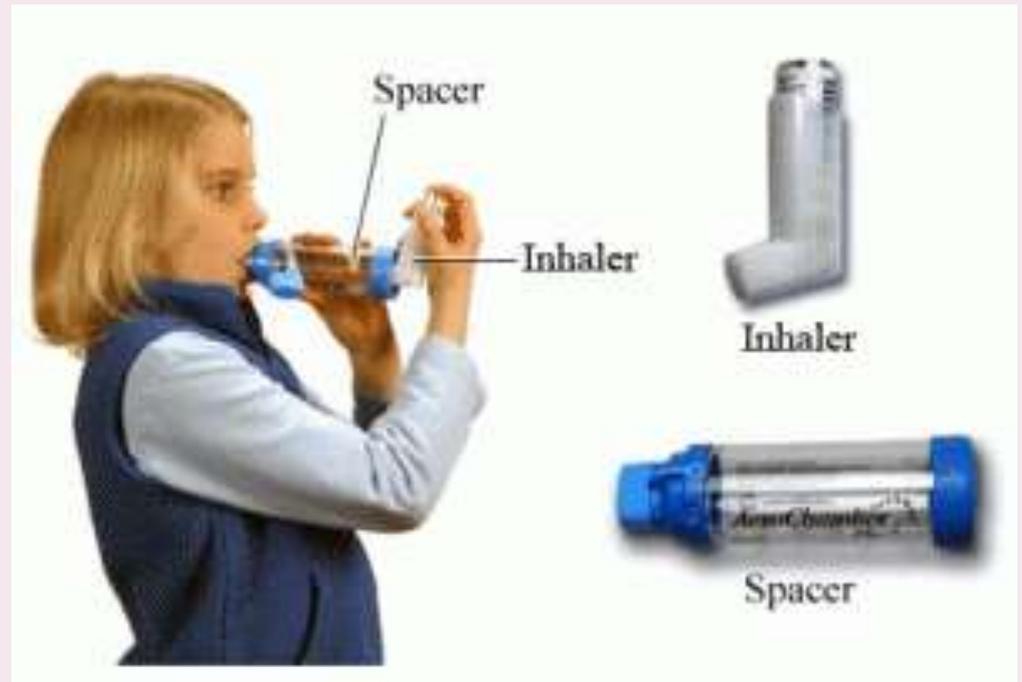
- **Other drugs-**
- In steroid dependent cases of asthma, high dose of IV immunoglobulin can be used.
- Leucotriene antagonists also have shown good results for control of mild o moderate acute asthma.
- These drugs can be delivered orally, parenterally or through various inhalation devices.

INHALATION DEVICES

Metered dose inhaler (MDI):

- This is used for children more than 8 years of age.
- Beta adrenergics (salbutamol, terbutaline, salmeterol), corticosteroids (beclomethasone, budesonide, fluticasone), atropine derivatives (Ipratropium bromide) and cromoglycolate are available in this form.

- **Spacehaler:**
- These are available in 750ml (for children aged 4 years or more) or 150ml (for younger children and infants) capacities.
- They can be used in small children as little patient cooperation is required.



- **Dry powder devices:**
- These consist of spinhaler and rotahaler.
- Spinhaler is used for cromoglycate and rotahaler for inhaled steroids and beta adrenergics.
- These devices are generally not useful for children less than 6 years old.
- Recently a device known as turbuhaler had come up and is useful for delivery of prophylactically inhaled steroids.

Spinhaler, rotahaler, turbuhaler



- **Nebulizers:**
- Their main role is in the delivery of beta adrenergics and ipatropium to patients with acute asthma.
- It can be used at any age.



NURSING MANAGEMENT

- *Physical Assessment*
- *Nursing Diagnoses:*
- Alteration in respiratory function (respiratory alkalosis or acidosis and hypoxemia) related to impaired gas exchange.
- Alteration in hydration related to hyperventilation and decreased oral intake.
- Alteration in electrolyte balance related to respiratory acidosis and dehydration.
- Alteration in comfort related to respiratory distress.
- Anxiety related to difficulty breathing and hospitalization.
- Potential for cardiac malfunction related to over hydration or medications.
- Potential for atelectasis or pneumothorax related to hyperinfiltration of lungs.
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Nursing Interventions

- Provide measures to relieve the respiratory distress the child is experiencing
- Relieve the anxiety and apprehension which results from the respiratory embarrassment
- Provide adequate hydration in order to liquefy bronchial secretions and maintain electrolyte balance
- Beware of the action and side effects of drugs used in the treatment of asthma
- Encourage the child and his parents to maintain optimal health, to prevent acute attacks, to ameliorate chronic symptoms and to prevent onset or progression of respiratory disabilities

Nursing Interventions contd...

- Teach the child and involve the parents in the teaching of proper breathing habits:
- Exercise-I- Abdominal breathing
- Exercise-II- Side expansion breathing
- Exercise-III- Forward breathing
- Exercise-III- Forward breathing

Nursing Interventions contd...

- Health promotion/education:
- Help the parents to develop a realistic attitude towards the child's illness
- Teach the child and his parents' protective measures which will encourage environmental control and help to avoid the offending allergen.
- Help foster a healthy mother-child relationship by understanding the feelings of anxiety, guilt or frustration the mother may have.

STATUS ASTHAMATICUS

- It is the most intractable form of the asthmatic paroxysms, where wheezing continues for hours to days, in spite of administration of bronchodilators.

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Clinical manifestations:

- Tachypnea
- Labored respirations with suprasternal retractions
- Use of accessory muscles
- Diminished breath sounds
- Distressing cough
- Decreased ability to speak in phrases, sentences
- Anxiety

STATUS ASTHAMATICUS contd..

Clinical manifestations contd..

- Irritability
- Fatigue
- Headache
- Impaired mental functioning
- Diaphoresis
- Muscle twitching
- Somnolence
- Tachycardia
- Heart failure
- Death from suffocation

STATUS ASTHAMATICUS contd..

- **Management:**

- It is a paediatric emergency.
- Bed rest should be given in an orthopneic position. This promotes rest and relieves dyspnea.
- No not use sedatives and narcotics.
- Administer oxygen in case of cyanosis.
- Corticosteroids are given intravenously.
- Deriphylline drip id given,
- Antibiotics are administered to treat infection.
- IV fluids and plenty of warm fluids are given orally.
- Nebulization with salbutamol.
- Intermittent positive pressure respiration in severe cases.
- TPR, BP is recorded half hourly,
- Intake-output chart is maintained.

CYSTIC FIBROSIS

ETIOLOGY

- Cystic fibrosis is inherited as an autosomal recessive trait and is expressed clinically only in homozygotes.

CLINICAL MANIFESTATIONS

- Meconium ileus may be found in the newborn.

Other presenting signs:

- salty taste when skin is kissed
- cough (dry and hacking, to loose and productive), wheezing
- failure to gain weight or grow in the presence of a good appetite
- stools are frequent, bulky and foul-smelling; excessive flatus

CLINICAL MANIFESTATIONS contd..

- protuberant abdomen- pot belly
- wasted buttocks
- vomiting following coughing
- recurrent pulmonary infection
- clubbing of fingers- in older child
- increased anteroposterior chest diameter
- rectal prolapse

DIAGNOSTIC EVALUATION

- Family history
- Measurement of sodium and chloride level in sweat
 - chloride level of more than 60meq/litre is diagnostic.
- 40meq/litre is borderline and repeated.
- Sodium levels greater than 70meq/litre are diagnostic.
- Measurement of trypsin concentration in duodenal secretions- absence of normal concentration
- Analysis of digestive enzymes (trypsin and chymotrypsin) in stool- Level is lower

DIAGNOSTIC EVALUATION contd..

- Chest x-ray:
- May be normal initially.
- Later shows increased areas of infection, overinflation, bronchial thickening and plugging, atelectasis and fibrosis.
- Analysis of stool for steatorrhoea.
- BMC (Boehringer-Manheim Corp) – meconium strip test includes lactose and protein content, both present in babies with cystic fibrosis.
- Pulmonary function studies (after 4 years old):
- Decreased vital capacity and flow rates.
- Increased residual volume and/or increased total lung capacity.

COMPLICATIONS

- Pulmonary infections:
- Most frequently caused by Pseudomonas aeruginosa, Staphylococcus and Haemophilus influenza.
- bronchiectasis and bronchiolitis
- Other lung complications:
- Emphysema
- Atelectasis
- Pneumothorax
- Biliary cirrhosis- portal hypertension, esophageal varices, splenomegaly
- Pancreatic fibrosis; islets of Langerhans may be fibrotic, resulting in glucose intolerance diabetes

COMPLICATIONS contd..

- Cor pulmonale
- Enlarged and lugged mucus-secreting glands; chronic sinusitis
- Rectal polyps (3months to 3years)
- Intussusceptions (under 2years of age)
- Pancreatitis
- Nasal polyps
- Heat prostration
- Fibrosis of epididymis and vas defers in male; aspermia
- Haemoptysis
- Growth retardation

MEDICAL MANAGEMENT

- Prevent and control pulmonary infection.
- Establish and maintain good nutrition.
- Promote normal growth and development.

NURSING MANAGEMENT

- *Physical assessment*
- *Nursing diagnoses:*
- Decreased oxygen-carbon dioxide gas exchange related to thick pulmonary secretions.
- Alterations in comfort related to illness and treatments.
- Alteration in nutritional status related to decreased appetite and/or inadequate adsorption.
- Potential for infection related to thick pulmonary secretion.
- Anxiety related to hospitalization and disease process.
- Alteration in parent-child relationships related to hospitalization, disease and inappropriate coping behaviors.
- Difficulties for parents in providing appropriate home care due to limited knowledge and either non-/incomplete compliance to treatment regime.

Nursing Interventions

- Establish and maintain adequate nutrition to allow for growth and development
- Assist in preventing or treating lung infection and support respirations by thinning secretions and clearing them from the respiratory tract
- Understand what medications are given in treatment and why they are given
- Give meticulous attention and care in hygiene to the patient and prevent infection
- Support the child's emotional, psychological and intellectual needs and development

Nursing Interventions contd...

- Make and record observations of the child and his condition and behavior which will give information concerning his condition
- Encourage parental participation in learning to care for and handle the child and foster acceptance of the child and his illness by his parents and family