CHAPTER: 1
RESPIRATORY TRACT INFECTION

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Acute Respiratory Infections in Children

- **Introduction:**

- Respiratory tract infections are described according to the areas of involvement.

- The upper respiratory tract or upper airway consists of primarily the nose & pharynx.

- The lower respiratory tract consists of bronchi & bronchioles.
Anatomy of the Respiratory system

Nasal passages
Mouth
Epiglottis
Trachea
Pulmonary vein
Left bronchus
Left upper lobe
Pulmonary arteries
Bronchioles
Pleura
Alveoli
Left lower lobe

RIGHT LUNG
LEFT LUNG

Right upper lobe
Right bronchus
Right middle lobe
Right lower lobe

oxygen-rich blood
oxygen-poor blood
A- Upper respiratory tract infections in children (URIs)

• Acute naso-pharyngitis
• pharyngitis (including tonsillitis)
• Otitis media
B- Lower respiratory tract infections in children

• Bronchitis.
• Brochiolities.
• **Bronchial asthma.**
• Pneumonia
• T.B. Infection.
Acute Respiratory Infections in Children

- Factors affecting type of illness:
• Age of child.
• Frequency of exposure.
• Size of airway.
• Ability to resist invading organism.
• Presence of greater conditions: e.g., malnutrition, congenital heart diseases, anemia, or immune deficiencies leading to decrease normal resistance to infection.
• Presence of respiratory disorders, such as allergy worsening the condition.
• Season: epidemic appearance of respiratory pathogens occurs in winter and spring months.
Acute Respiratory Infections in Children

• Etiology & characteristics:

Viruses cause the largest number of respiratory infections. Other organisms that may be involved in primary or secondary invasion are group A beta-hemolytic streptococcus, homophiles influenza, & pneumococci.

Infections are seldom localized to a single anatomic structure, it tends to spread to available extent as a result of the continuous nature of the mucous membrane lining the respiratory tract.
Acute Upper Respiratory Tract Infections in Children:

- Most URTIs are caused by viruses & are self-limited.

- Acute naso-pharyngitis & pharyngitis (including tonsillitis) are extremely common in pediatric age groups.
Acute Upper Respiratory Tract Infections in Children:

- **Naso-pharyngitis:** = Common cold.

**Def:**

Viral infection of the nose & throat.

**Assessment (S &S):**

1. **Younger child**
   
   Fever, sneezing, irritability, vomiting & diarrhea

2. **Older child**
   
   Dryness & irritation of nose & throat, sneezing, & muscular aches.
Acute Upper Respiratory Tract Infections in Children:

• Complications of nasopharyngitis:
  - Otitis media
  - Lower respiratory tract infection
  - Older child may develop sinusitis

® Medication: Acetaminophen
Acute Upper Respiratory Tract Infections in Children:

- **Pharyngitis:** = Sore throat including tonsils.
  - Uncommon in children under 1 yr. The peak incidence occurring between 4 & 7 yrs of age.
  - **Causative organism:** viruses or bacterial (group A beta-hemolytic streptococcus).
Acute Upper Respiratory Tract Infections in Children:

Assessment (S &S) of pharyngitis:

1. Younger child
Fever, anorexia, general malaise, & dysphagea

2. Older child
Fever (40 c), anorexia, abdominal pain, vomiting, & dysphagea.
Acute Upper Respiratory Tract Infections in Children:

- **Complications of pharyngitis:**
  - Retro pharyngeal abscess.
  - Otitis media.
  - Lower respiratory tract infection.
  - Complications of GABHS Infection: **Peritonsillar abscess**; occurs in fewer than 1% of patients treated with antibiotics that leads to **rheumatic fever**, or acute glomerulonephritis.
Acute Upper Respiratory Tract Infections in Children:

• Management of pharyngitis:
  - A throat culture: This test that may help the pediatrician to learn which type of germ is causing the sore throat.
  - Antibiotic medicine is needed if a germ called streptococcus found to be the causative organism.
  - No special treatment is needed if your child's sore throat is caused by a virus. Antibiotic medicine will not help a sore throat caused by a virus.
Acute Upper Respiratory Tract Infections in Children:

• **Management of pharyngitis:**
  - Help the child to rest as much as possible. Do not smoke around this child.
  - If the child's throat is very sore, he may not feel like eating or drinking very much. Introduce soft foods or warm soups. These foods may feel good going down the child's throat while it is very sore. Give this child 6 to 8 glasses of liquids like water and fruit juices each day.
  - Run a cool mist humidifier in the child's room.
  - If this child is 8 years or older, have him gargle with a mixture of 1 teaspoon salt in 1 cup warm water.
Acute Upper Respiratory Tract Infections in Children:

- **Tonsillitis:**

  What is tonsillitis?

  - Tonsillitis is a viral or bacterial infection in the throat that causes inflammation of the tonsils. Tonsils are small glands (lymphoid tissue) in the pharyngeal cavity.

- In the first six months of life tonsils provide a useful defense against infections. Tonsillitis is one of the most common ailments in pre-school children, but it can also occur at any age.
Acute Upper Respiratory Tract Infections in Children:

• **Tonsillitis:**
  
  • Children are most often affected from around the age of three or four, when they start nursery or school and come into contact with many new infections.
  
  • **A child may have tonsillitis if he/she has a sore throat, a fever and is off food.**
Tonsillitis

- Palatine tonsils
  (Visible during oral examination)
Definition:

Tonsillitis is a viral or bacterial infection in the throat that causes inflammation of the tonsils. Tonsils are small glands (lymphoid tissue) in the pharyngeal cavity.
Causes of tonsillitis

- Tonsillitis is caused by a variety of contagious viral and bacterial infections.
- It is spread by close contact with other individuals and occurs more during winter periods.
- The most common bacterium causing tonsillitis is streptococcus.
Advice and treatment:

• Encourage bed rest.
• Introduce soft liquid diet according to the child's preferences.
• Provide cool mist atmosphere to keep the mucous membranes moist during periods of mouth breathing.
• Warm saline gargles & paracetamol are useful to promote comfort.
• If antibiotics are prescribed, counsel the child's parents regarding the necessity of completing the treatment period.
Management:

• *The controversy of tonsillectomy:*

• Surgical removal of chronic tonsillitis (tonsillectomy) is controversial. Generally, **tonsils should not removed before 3 or 4 yrs of age**, because of the problem of excessive blood loss & the possibility of re-growth or hypertrophy of lymphoid tissue, in young children.
Otitis media:

**Background:**

Otitis media (OM) is the second most common disease of childhood, after upper respiratory infection (URI).

**Definition:**

It is defined as an inflammation of the middle ear.
Otitis media

- Healthy Tympanic Membrane
Etiology of (O .M) :-

• Obstruction of Eust. Tube by edematous mucosa during URI or enlarged adenoid.

• Eustachian tube obstruction lead to high –ve pressure in the middle ear cavity lead to occurrence of trasudative middle ear (ME) effusion.

• Organisms contaminate the ME effusion…..otitis media occur.
Organisms reach ME cavity by:

- **REFLUX** from nasopharynx
  Particularly if drum is perforated.
- **ASPIRATION:**
  due to high –ve ME pressure
- **INSUFFLATION** during:
  Crying
  Nose- blowing
  Sneezing
  Swallowing
Acute Upper Respiratory Tract Infections in Children

- **Pathophysiology:**
  - Otitis media is the result of dysfunctioning Eustachian tube.
  - The Eustachian tube, which connects the middle ear to the naso-pharynx, is normally closed, narrow & directed downward, preventing organisms from the pharyngeal cavity from entering the middle ear.
  - It opens to allow drainage of secretions produced by middle ear mucosa & to equalize air pressure between the middle ear & outside environment.
  - Impaired drainage causes the pathological condition due to retention of secretion in the middle ear.
Anatomic position of Eustachian tube in adult
Acute Upper Respiratory Tract Infections in Children:

- **Acute Otitis media:**
- **Predisposing factors of developing otitis media in children:**

  In children, developmental alterations of the Eustachian tube (short, wide, & straight), an immature immune system, and frequent infections of the upper respiratory mucosa all play major roles in AOM development.

  Furthermore, the usual lying-down position of infants favors the pooling of fluids, such as formula.
Types of O.M.

1- Acute otitis media (AOM) :-

• It implies rapid onset of disease associated with 1 or more of the following symptoms:
  • Irritability, vigorous crying, rolling head, rubbing ear (in young child).
  • Plus sharp pain due to pressure on mastoid area.
  • Otalgia, Fever, otorrhea, recent onset of anorexia, vomiting, & diarrhea (in older child).
• **Acute Otitis media (AOM):**

These symptoms are accompanied by abnormal otoscopic findings of the tympanic membrane (TM), which may include the following:

- Opacity
- Bulging
- Erythema
- Middle ear effusion (MEE)
2- Otitis media with effusion (OME):

• Is middle ear effusion (MEE) of any duration that lacks the associated signs and symptoms of infection (e.g., fever, otalgia, irritability). OME usually follows an episode of AOM.

3- Chronic otitis media:

• Is a chronic inflammation of the middle ear that persists at least 6 weeks and is associated with otorrhea through a perforated TM, an indwelling tympanostomy tube (TT).
Otitis media

- Tympanostomy tube in place.

Chronic OM

- Acute Otitis media with purulent effusion behind a bulging tympanic membrane.
Therapeutic management of otitis media:

- Administration of *antibiotic* (Ambicillin or Amoxicillin).
- *Anti-inflammatory* (analgesic & antipyretic).
Complications of O.M

*Extr-acranial complication:-*

- Hearing loss
- Chronic suppurative O.M
- Adhesive otitis
- Facial palsy
- Perforation
- Mastoiditis
- Tympanosclerosis
Intra-cranial complication:-

• Meningitis.
• Focal encephalitis.
• Brain abscess.
• Sinus thrombophlebitis
Nursing care

• Apply hot water bag over the ear with the child lying on the affected side may reduce the discomfort (applied during the attack of pain).
• Put ice bag over the affected ear may also be beneficial to reduce edema (between pain attacks).
• For drained ear; the external canal may be frequently cleaned using sterile cotton swabs (dry or soaked in hydrogen peroxide).
• **Excoriation** of the outer ear should be prevented by frequent cleansing & application of **zinc oxide** to the area of oxidate.

• Give special attention to th tympanostomy tube i.e., avoid water entering the middle ear and introducing bacteria.

• Educate family about care of child, & keep them aware with the potentil complications of acute otitis media e.g., conductive hearing loss.

  • Provide emotional support to the child & his family.
B- Lower respiratory tract infections in children

- Bronchitis.
- Brochiolities.
- Bronchial asthma.
- Pneumonia
- T.B. Infection.
Bronchial asthma
(long-term respiratory dysfunction):

**Definition:**

- A chronic inflammatory disorder of the airway (trachea, bronchi, & bronchioles) characterized by attacks of wheezy breathlessness, sometimes on exertion, sometimes at rest, sometimes mild, sometimes severe.
OR Bronchial asthma is a chronic, diffuse, obstructive lung disease that causes wide-spread narrowing of the tracheobronchial tree and is characterized by:

Hyperreactivity of the airways to a various stimuli.

Acute exacerbations of varying degrees of severity.

A high degree of reversibility of the obstructive process either spontaneously or as result of treatment.
Predisposing factors for occurrence of asthma:

*Lower airway hypersensitivity to:*

- Allergens as e.g.: pollens, air pollution, and dust.
- Irritants as e.g.: Tobacco smoke, and sprays.
- Exercise.
- Temperature or weather changes.
- Exposure to infection.
- Animals as: e.g.: cats, dogs, rodents, horses.
- Strong emotions as: e.g.: fear, laughing.
- Food as e.g.: Nuts, chocolate, milk.
- Medication as e.g.: Aspirin.
Bronchial Asthma

Anatomy of the respiratory system.
(The main windpipe, bronchi and bronchioles are known as ‘the airways’.)
Pathophysiology:
Bronchial Asthma

• Pathophysiology:

  Asthma trigger

  - Inflammation & edema of the mucous membranes.
  - Accumulation of tenacious secretions from mucous glands.
  - Spasm of the smooth muscle of the bronchi & bronchioles decreases the caliber of the bronchioles.
CONT. Pathophysiology (Reviewing)

- Inflammation & edema of the mucous membranes.
- Accumulation of tenacious secretions from mucous glands.
- Spasm of the smooth muscle of the bronchi & bronchioles, leading to decreases the caliber of the bronchioles.
Clinical manifestations:

A-General manifestations:

• The classical manifestations are: dyspnea, wheezing, & cough.

• The episode of asthma is usually begins with the child feeling irritable & increasingly restless. Asthmatic child may complain headache, feeling tired, & chest tightness.
B) *Respiratory symptoms:*

- Hacking, paroxysmal, irritating and non productive cough due to bronchial edema.
- Accumulations of secretion stimulate cough that becomes rattling & productive (frothy, clear, gelatinous sputum)
- Shortness of breath, prolonged expiration, wheezy chest, cyanosed nail beds, & dark red color lips that may progress by time to blue.
C) *On chest examination:*

- **Inspection reveals** major changes in the form of supraclavicular, intercostals, subcostal, & sternal retractions due to the frequent use of accessory muscles of respiration.

- **With repeated episodes:** chest shape is changed to barrel chest, & elevated shoulder.

- **Auscultation reveals** loud breath sounds in the form of course crackle, grunting, wheezes throughout the lung region.
Bronchial Asthma

- Barrel chest

*Figure 1 – Chest X-ray with glove-finger shadow (arrow) and nodular opacities in the right middle third*
Diagnostic evaluation:

• **Clinical manifestations**, history, physical examination, & **Lab tests**.

• **Radiographic examination**.

• **Pulmonary function tests** provide an objective method of evaluating the degree of lung disease, **Peak Expiratory Flow Rate (PEFR)**.

• **Allergy skin test**.
Lab tests:
• Eosinophilia (>250 cells/mm3).
• Searum IgE may be increased.
• Arterial Blood Gases (in severely ill child, 
  - PO2 is decreased,
  - PCO2 is decreased,
  at first due to hyperventilation,
  later it increase PH tends to decrease
  (respiratory acidosis at first, later metabolic acidosis).
Therapeutic management:

- **Allergic** control to prevent attacks.
- **Drug therapy:**
  β-adrenergic, theophyllin & corticosteroids preparations.
- **Chest physiotherapy** (only in between attacks) but not in severe attack.
Nursing diagnosis

• Ineffective breathing pattern related to allergic response in bronchial tree.

• Activity intolerance related to imbalance between O2 supply and demand.

• Altered family process related to having a child with a chronic illness.

• High risk for suffocation related to interaction between individual and allergen.
Nursing Intervention:

• Teach child and family correct use of bronchodilator, corticosteroids.
• Teach child and family how to avoid conditions or circumstances that precipitate asthmatic attack.
• Assist parents in eliminating allergens or other stimuli that trigger attack.
• Meal planning to eliminate allergic food.
• Removal of pets.
• Modification of environment (allergy proof) home especially no smoking in home.
• Avoid extremes of environmental temperature.
• Avoid under excitement and/or physical exertion.
• Assist parents in obtaining and/or installing device to control environment. (Humidifier air conditioner, electronic air filter).
• Teach child to understand how equipment works.
• Teach child correct use of inhalers.
• Nursing care plan of a child with bronchial asthma:
1- **Nursing diagnosis:** Ineffective breathing pattern related to allergic response in bronchial tree.

- **Goal:** Patient with exhibit evidence of improved ventilatory capacity.
- **Expected outcome:**
  - child breaths easily and without dyspnea.
  - Child engages in activities according to abilities and interest.

- **Nursing intervention:**
  - Instruct and/ or supervise breathing exercise, controlled breathing.
  - Teach correct use of prescribed medication.
  - Assist child and family in selecting activities appropriate to child's capacity and preferences.
  - Encourage regular exercise.
  - Encourage good posture.
  - Encourage physical exercise
  - Discourage physical inactivity.
Nursing diagnosis: Activity intolerance related to imbalance between O2 supply and demand.

- **Goal**: Patient will receive optimum rest.
- **Expected outcome**: 
  - Child engages in appropriate activities.
  - Child appears rested.
- **Nursing intervention**: 
  - Encourage activities appropriate child's capabilities.
  - Provide ample opportunities for – rest and quite activities.
3- **Nursing diagnosis:** Altered family process related to having a child with a chronic illness.

- **Goal:** Patient will exhibit positive adaptation the disorder.
- **Expected outcome:** Family copes with symptoms and affects of the disease and provides a normal environment for the child.

**Nursing Intervention:**
- Foster positive family relationships.
- Be alert to signs of parental rejection or overprotection.
- Intervene appropriately of these is evidence of maladaptation.
- Use every opportunity to increase parent's and child's understanding of the disease and its therapies.
- Be alert to signs that child us depressed.
- Refer family to appropriate support groups and community agencies.
- Nursing diagnosis: High risk for suffocation related to interaction between individual and allergen.
  
  • **Goal (1):** Patient will experience no asthmatic attack.
  
  • **Expected outcome:**
  - Family makes every effort to remove possible allergens or precipitating events.
  - Family and / or child are to detect signs of an impending attack and implement appropriate actions.
  
  • **Nursing Intervention:**
  - Teach child and family correct use of bronchodilator, corticosteroids.
  - Teach child and family how to avoid conditions or circumstances that precipitate asthmatic attack.
  - Assist parents in eliminating allergens or other stimuli that trigger attack.
  - Meal planning to eliminate allergic food.
  - Removal of pets.
  - Modification of environment (allergy proof) home especially no smoking in home.
  - Avoid extremes of environmental temperature.
  - Avoid under excitement and/or physical exertion.
  - Assist parents in obtaining and/or installing device to control environment. (Humidifier air conditioner, electronic air filter).
  - Teach child to understand how equipment works.
  - Teach child correct use of inhalers.
• **Goal (2):** Patient will experience optimum health

For promoting optimum health.

*Nursing intervention*

• Encourage sound health practices.
• Balanced nutrition diet.
• Adequate rest.
• Hygiene.
• Appropriate exercises.
• Prevent infection (avoid exposure to infection, employ good hand washing).