Screening of Patients with Respiratory Problems admitted at The 5th floor (The Paid Unit) of Abou El Reesh Tertiary Care Pediatrics' Hospital

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Aim of Study

The aim of this work is to screen all patients suffering from chest problems who required hospital admission, either due to only respiratory diseases or due to other system affection. Accurate and simple diagnostic methods were used to be able to reach accurate diagnosis of different chest troubles and its relation to age and environmental factors.

Abstract

This study was carried on 43 children suffering from chest problems in a 6 months period from March 1, 2007 till September 1, 2007. Diagnosis of patients was based upon full medical history, clinical examination, specific laboratory and radiological examinations. Leading causes are pneumonia, croup, bronchial asthma, suppurative lung diseases and pleural diseases. Prevention and control of disease and injury require information about the leading medical causes of illness and exposures or risk factors.

Keywords:

- Chest problems
- Fever & Cough
- Pneumonia
- Croup

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List of Abbreviations

AAP	American Academy of Paediatrics
ABC	ATP-Binding Cassette
AP	Antroposterior
ARDS	Acute Respiratory Distress Syndrome
ARI	Acute respiratory infections
BTS	British Thoracic Society
CAP	Community Acquired Pneumonia
CF	Cystic Fibrosis
CFTR	Cystic Fibrosis Transmembrane conductance Regulator
Cl	Chloride
CRP	C-Reactive Protein
DPIs	Dry Powder Inhalers
ED	Emergency Department
ESR	Erythrocyte Sedimentation Rate
FEV1	Forced Expiratory Volume in 1 second
FVC	Forced Vital Capacity
GINA	Global Intiative for Asthma
HRCT	High-Resolution CT
ICS	Inhaled Corticosteroid
LDH	Lactate Dehydrogenase
MDS	Multidrug resistance
MRSA	Mecithillin Resistant Staphylococci
NAEPP	National Asthma Education and Prevention Program
NBF	Nucleotide-Binding Folds
PEF	Peak Expiratory Flow
pMDIs	pressurized Metered-Dose Inhalers
RBM	Reticular Basement Membrane
rhDNase	recombinant human DNase
RSV	Respiratory Syncytial Virus
S. pneumonia	Streptococcal pneumonia
TNF	Tumour Necrosis Factor
US	Ultrasonography
VATS	Video-Assisted Thoracoscopic Surgery
WHO	World Health Organization

Contents

Introduction

To hospitalize or not!!

In many situations it can be difficult to decide whether to send children to hospital because they fall neither into the category of "primary survey positive patients" nor that of the relatively well child. The signs of serious illness in children are subtle and it is usually wise to be on the safe side and ask for a second opinion from hospital specialists ***(Woollard, 2004)***.

Influenza-like illness in children is associated with a high rate of inappropriate hospital admissions. Training of emergency department pediatricians in the application of specific clinical practice guidelines (CPG) may result in a substantial decrease of the admission rate and of inappropriate admissions. ***(Giulio, 2005)***

Although mortality is low and largely confined to those with congenital heart disease and other pulmonary diseases, subsequent respiratory problems are common. ***(Sigurs et al, 1995)***

Respiratory disease is the most common cause of mortality in children in underdeveloped economies and the commonest cause of morbidity in developed economies. The baseline report on respiratory health in the framework of the European Environment and Health Strategy stated that acute respiratory infections (ARI) are common causes of death and serious morbidity in young children in underdeveloped and emerging economies. ***(Jan, 2003).***

Respiratory problems account for about 40% of children admitted to hospital and many of these children have asthma. Croup is usually viral and presents with a seal like bark with or without systemic illness or associated stridor. Sudden onset, short history, drooling because of pain, and a very toxic child support the diagnosis of the now rare epiglottitis, which should be considered to be immediately life threatening. Significant respiratory tract infections, including pneumonia, also occur in children and can occasionally result in respiratory failure, septicaemia, hypoglycaemia, or dehydration because of the inability to feed. **.(Jewkes,2004)**

Fever is a common presenting complaint in children, accounting for nearly one-third of pediatric complains and that infection is the most common cause of fever in children such as viral and bacterial illnesses like colds, gastroenteritis, ear infections, croup, and bronchiolitis. ***(Sarrell et al, 2006).***

Pneumonia is the largest single killer of children under five years old around the world. Almost four children die from pneumonia every minute. About 60% of pneumonia cases in the developing world are caused by bacteria and can be treated with antibiotics, whereas most cases of pneumonia in developed countries are viral ***.(WHO,2008)***

The term "community-acquired pneumonia" (CAP) refers to a pneumonia in a previously healthy person who acquired the infection outside a hospital. CAP is one of the most common serious infections in children, with an incidence of 34 to 40 cases per 1,000 children in Europe and North America. Although death from CAP is rare in industrialized countries, lower respiratory tract infection is one of the leading causes of childhood mortality in developing countries***.(Michael et al, 2004)***

Croup (laryngotracheitis and spasmodic croup) is an illness of infants and children younger than 6 years of age, with a peak incidence between 7 and 36 months of age. During the second year of life, about 5% of children have croup. The incidence in boys is about 1.5 times that in girls. ***(Segal et al, 2005)***

Before the 20th century, all croup-like illnesses were thought to be diphtheria. Today, the word "croup" is used to refer to a number of respiratory illnesses that are characterized by varying degrees of inspiratory stridor, barking cough, and hoarseness due to obstruction in the region of the larynx. ***(Alberta, 2007).***

Pleural empyema is a collection of pus between the lungs and the chest wall. Approximately 50% of cases complicate pneumonia. ***(Bouros et al, 1997)***

Aspiration of foreign bodies by children can lead to serious illness and sometimes even death. Most of these deaths occurred in children younger than 1 year of age (81 deaths, accounting for 10% of all unintentional deaths in children younger than 1 year of age). Fortunately, the number of deaths has decreased over the past decade, which has been attributed to better education of the public and stricter guidelines for toy manufacturers. Nevertheless, foreign body aspiration continues to account for a significant number of preventable childhood deaths. ***(Joshua and Bradley, 2000)***

Cystic fibrosis (CF) is the most significant autosomal recessive disorder in the white population, occurring in approximately one in 2,500 live births. Approximately one in 20 whites carry a mutant CF gene allele . Only about one in 17,000 black infants are afflicted, and CF is very rare in Asian populations.Cystic fibrosis (CF), earlier believed to be non existent in non Caucasians, is now a pan ethnic disease, having being reported from various regions of the world over last one decade.***(Kabra, 2006)***

Recently, bronchiectasis has been described as "an orphan disease," with a prevalence estimated to be low and decreasing, but no reliable statistical estimates are available. The true prevalence of bronchiectasis most likely is underestimated, as less severe forms of bronchiectasis have been documented with the increased use of high-resolution CT (HRCT). It should also be recognized that an underlying cause for bronchiectasis is found in < 40% of patients, and that HRCT features alone do not allow a confident distinction between idiopathic bronchiectasis and known causes of bronchiectasis. ***(Lee et al, 1995)***

Tuberculosis is a common and serious global infection that is spread exclusively from person to person. Following primary infection progressive disease is more likely to develop in children younger than 5 years old or those who are immunocompromised. ***(Powell and Hunt, 2006)***

Asthma is one of the most common chronic diseases worldwide and the prevalence is increasing, especially among children. The prevalence of asthma symptoms in children varies from 0 to 30 percent in different populations with the highest prevalence occurring in Australia, New Zealand and England. Asthma causes recurring episodes of wheezing, breathlessness, chest tightness, and coughing particularly at night or in the early morning. ***(GINA, 2005)***

The diagnosis of chest symptoms should only be considered after a through diagnostics and treatment approach for the most common causes. Also uncommon causes should be adequately evaluated.***(Melvin et al, 2002)***

Diagnosis includes history and full clinical examination, general and chest examination, chest radiograph, routine laboratory work up including complete blood picture and blood culture when required. ***(Shields, 2004)***

Epidemiological research in the field of respiratory diseases (RD) and its association with the environment is experiencing a growing interest from health planners. The increasing morbi-mortality due to respiratory diseases in urban and rural areas since the 1950s makes the implementation of study designs necessary in order to approach these problems from diverse perspectives.***(Simon et al, 2002)***

Cystic Fibrosis

Cystic fibrosis is a heterogeneous recessive genetic disorder with pathobiologic features that reflect mutations in the cystic fibrosis transmembrane conductance regulator (*CFTR*) gene. Classic cystic fibrosis reflects two loss-of-function mutations in the *CFTR* gene and is characterized by chronic bacterial infection of the airways and sinuses, fat maldigestion due to pancreatic exocrine insufficiency, infertility in males due to obstructive azoospermia, and elevated concentrations of chloride in sweat. ***(Micheal, 2002).***

Aetiology:

Cystic fibrosis (CF), an autosomal recessive disorder of exocrine gland function, is caused by a defective transmembrane conductance regulator located on chromosome 7. CF involves multiple organ systems and has pulmonary manifestations in 90% of patients. Affected neonates presently have a life expectancy of 40 years. ***(Lugo et al., 1998).***

Genetics:

CF is caused by mutations in a single large gene on chromosome 7 that encodes the cystic fibrosis transmembrane conductance regulator (CFTR) protein. ***(Guggino et al., 2004).***

The normal CFTR gene belongs to the ABC (ATP-Binding Cassette) family of proteins, a large group of related proteins that share transmembrane transport functions. ABC proteins include bacterial transporters for amino acids and other nutrients, surfactant transport proteins, and the mammalian multidrug resistance (MDR) protein (or P-glycoprotein). ***(Mickle et al., 2000).***

CFTR has been shown to function as a regulated chloride channel, which in turn may regulate the activity of other chloride and sodium channels at the cell surface. The CFTR gene spans 250 kilobases on chromosome 7, encoding 1480 amino acids in the mature protein. The protein has two groups of six membrane-spanning regions, two intracellular nucleotide-binding folds (NBFs), and a highly charged "R domain" containing multiple phosphorylation sites. Activation of the chloride channel requires phosphokinase A-mediated phosphorylation of the R domain, and the continuous presence of ATP in the NBFs. ***(Steven, 2005).***

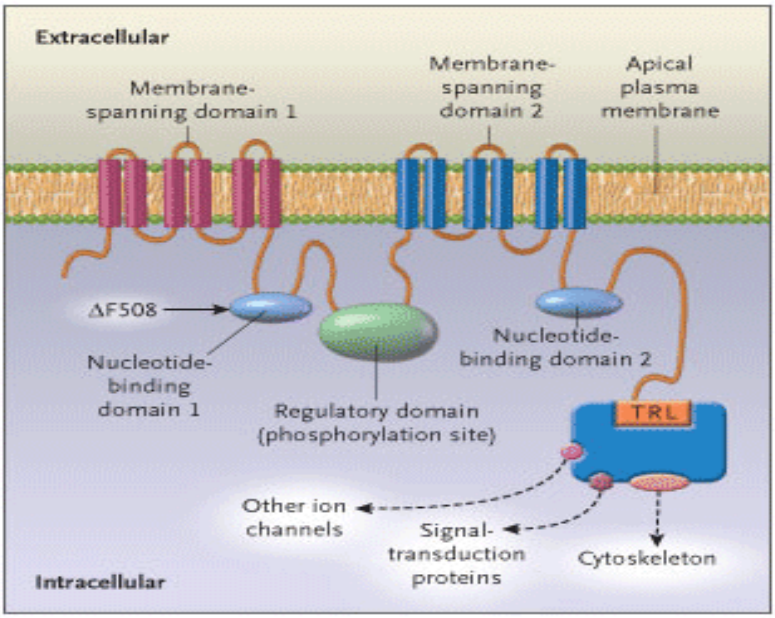
The phenotypic expression of disease varies widely, primarily as a function of the specific mutation (or mutations) present. More than 1200 distinct sequence changes in the CFTR gene are associated with clinical disease. The severity of clinical disease appears to vary as a function of the specific genetic mutations present in a patient with CF. (***Dugueperoux et al., 2005).***

Variant Cystic Fibrosis Phenotypes in the Absence of CFTR Mutations:

Cystic fibrosis has been recognized as a distinct clinical entity for more than 60 years. The observation that affected patients have excessive salt loss was a major milestone in the diagnosis of cystic fibrosis, leading to the development of the sweat test. The advent of this biochemical test facilitated the diagnosis in patients with a wide range of phenotypes, including older children and adults who had evidence of clinical disease in only a subgroup of the organ systems involved in classic cystic fibrosis. These forms are termed "nonclassic cystic fibrosis" and account for at least 10 % of cases. ***(Welsh et al., 2001).***

Genetic-linkage studies mapped both classic and nonclassic forms to a single locus on chromosome 7. Subsequently, mutations causing loss of function of the cystic fibrosis transmembrane conductance regulator (CFTR) protein were identified in each CFTR gene in patients with classic cystic fibrosis, whereas mutations that reduced but did not eliminate CFTR function were identified in patients with nonclassic forms. ***(Welsh et al.,2001).***

Figure 1. Hypothesized Structure of CFTR



(Steven, 2005)

Epidemiology:

Cystic fibrosis (CF) is the most significant autosomal recessive disorder in the white population, occurring in approximately one in 2,500 live births. Approximately one in 20 whites carry a mutant CF gene allele. Only about one in 17,000 black infants are afflicted, and CF is very rare in Asian populations. Cystic fibrosis, earlier believed to be non existent in non Caucasians, is now a pan-ethnic disease, having being reported from various regions of the world over last one decade. ***(Kabra, 2006).***

Clinical Picture:

Cystic fibrosis is a lethal inherited disorder. It is a disease characterized by exocrine dysfunction with obstructive lesions throughout multiple organ systems and disturbance of electrolyte and mucus secretion. The majority of patients initially have malabsorption, meconium ileus, meconium plug, and pulmonary disease, although a diverse variety of symptoms has been reported. ***(Agrons et al., 1996).***

Respiratory Manifestations:

A. Early Changes:
1. Upper Airway
   - Chronic rhinitis/rhinorrhea.
   - Nasal polyps (15-20%).
   - Acute/chronic sinusitis.
   - Middle ear effusions.
2. Lower Airway
   - Chronic cough (earliest manifestation).
   - Coarse crackles.
   - Obstructive lung disease (hyperinflation, wheezing).

B. Late Changes:
   - Exacerbation of respiratory distress (dyspnea, cough) associated with acute respiratory infections.

C. End Stage:
   - Hypoxemia, pulmonary hypertension, cor pulmonale, respiratory failure.
   - Digital clubbing is often seen in patients with moderate to advanced disease.

(Pier et al., 1996).

The finding of dilated glandular structures implicates abnormal clearance of glandular mucus from the ducts. The levels of CFTR in airway serous glandular cells are among the highest of any cell type in the body. In the small airways, where surface epithelial cells contribute to the production of mucus, an analogous defect in chloride and fluid secretion could result in decreased surface liquid in airways and similar mucosal obstruction. ***(Steven, 2005).***

Pathogens:
Microorganisms isolated from CF respiratory secretions, all ages:

Organism	**Percent With Positive Respiratory Cultures**
Staphylococcus aureus	64
Methicillin sensitive S. aureus	52
Methicillin resistant S. aureus	19
P. aeruginosa	55
Multiple drug resistant	16
H. influenzae	17
Stenotrophomonas maltophilia	13
Burkholderia cepacia complex	
B. cenocepacia	3
B. multivorans	
Others	
Achromobacter (Alcaligenes) xylosoxidans	-
Non-tuberculous mycobacteria	
M. avium complex	-
M. abscessus	
Others	
Aspergillus species	-

(Cystic Fibrosis Foundation, 2006)