A Study of Community acquired viral pneumonia in children

Thesis Submitted for partial fulfillment of
MD degree of Pediatrics

By
Mohamed Yassin Aly Darwish
M.B., B. Ch., M.Sc.

Under supervision of

Prof. Dr. Azza Abdel Gawad Tantawy
Professor of Pediatrics, Faculty of Medicine
Ain Shams University

Prof. Dr. Manal Essam Kandil
Professor of Pediatrics
National Research Center

Prof. Dr. Mohamed Ahmed Ahmed Ali
Professor of Virology
National Research Center

Prof. Dr. Amira Abd El Moneam Adly
Professor of Pediatrics, Faculty of Medicine
Ain Shams University

Faculty of Medicine
Ain Shams University
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Abbreviations:

°C	Degree Celsius
ALRI	Acute Lower Respiratory Infection
BMC	BioMed Central
C. pneumoniae	Chlamydia pneumoniae
CAP	Community Acquired Pneumonia
CHERG	Child Health Epidemiology Reference Group
CRP	C-Reactive Protein
CT	Computerized Topography
CXR	Chest X Ray
DNA	Deoxyribo-Nucleic-Acid
E. coli	Escherichia Coli
ESR	Erythrocyte Sedimentation Rate
FiO_2	Fraction Of Inspired Oxygen
GHE	Global Health Estimates
H.influenzae	Haemophilus influenzae
HBoV	Human Bocavirus
HCoV	Human Coronavirus
HIS	Hospital Information System
HmPV	Human Metapneumovirus
HSI	Health Services Inspection
Ht	Height
ICU	Intensive Care Unit
IDSA	Infectious Disease Society of America
Inf.A	Influenza A
Inf.B	Influenza B
IV	Intravenous
LRTI	Lower Respiratory Tract Infection

M. pneumoniae	Mycoplasma pneumoniae
MRSA	Methicillin Resistant Staphylococcus aureus
NF-kappa B	Nuclear Factor-kappa B
PCR	Polymerase Chain Reaction
PCT	serum Procalcitonin
PIDS	Pediatric Infectious Disease Society
PIVs	Parainfluenza Viruses
RD	Respiratory distress
RSV	Respiratory Syncytial Virus
S. aureus	Staphylococcus aureus
S. pneumoniae	Streptococcus Pneumoniae
S. pyogenes	Streptococcus Pyogenes
SaO_2	Saturation of Oxygen
SD	Standard Deviation
TNFα	Tumor Necrosis Factor Alpha
U/S	Ultrasonography
WHO	World Health Organization
Wt	Weight

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Introduction

One of the commonest serious diseases in children is community acquired pneumonia. It accounts for approximately five million deaths per year among children less than five years old in the developing countries alone **(Sinaniotis, 2004)**.

Acute respiratory infections overall incidence is similar in developing and developed countries. The incidence of pneumonia is 10 times higher in the developing world than in developed countries **(McCracken, 2000)**.

According to one of the child health epidemiology reference group related to WHO publication cited that incidence of community-acquired pneumonia among children less than 5 years in developed countries is nearly 0.026 episodes per child-year **(Rudan I et al., 2004).**

CAP is defined as acquiring pneumonia outside a hospital or health care facility. Starting within 48 hours following admission or patient having pneumonia without any characteristics of healthcare-associated pneumonia (i.e. hospitalized for 2 or more days within 90 days of infection; accommodated in a nursing home or health care facility; have taken recent IV antibiotic therapy, chemotherapy, within the last 30 days **(Mandell GL et al., 2010)**.

Acute viral respiratory infections became apparent through large epidemiologic studies done soon after cell culture techniques were available. Respiratory syncytial virus (RSV), adenoviruses, parainfluenza viruses (PIVs), and influenza viruses were initially identified as common causes of serious lower respiratory tract illness in infants and children. Recently, human metapneumovirus was addressed as a major cause of serious illness **(J E Crowe Jr, 2010)**.

The detection of causative agent of pneumonia is considered a difficult diagnostic problem since appropriate specimens cannot be obtained from the lower respiratory tract. The recent techniques that detect antigens of the causative agent's nucleic acid in serum, nasopharyngeal secretions, and urine, by means of the polymerase chain reaction assay, and antibody responses to bacteria and viruses had significantly improved the identification of the responsible pathogen **(Juven et al., 2000)**.

Viruses cause up to 90% of pneumonias, especially in the first 12 months of life and this percent decreases to 50% by school age **(McCracken, 2000)**.

Seasonality of viruses that cause pneumonia has been proved by many epidemiological studies. Influenza, Parainfluenza, and Respiratory Syncytial virus (RSV) are seen during the winter months whereas the common viral pathogen during the remaining of the year is Adenovirus. Viruses are more prominent than bacteria as aetiological agents of pneumonia in pediatric groups younger than 5 years of age specifically during the first year of life **(Hall, 2001)**.

Respiratory syncytial virus (RSV) is the major cause of severe lower respiratory tract infection (LRTI) among infants less than 2 years and it is currently considered as the single most important aetiology of childhood respiratory infection, and the leading cause of hospitalizations during respiratory virus season **(Tatochenko et al., 2010)**.

Adenovirus infections occur mostly in children less than 5 years of age, accounting for 4–10% of childhood pneumonia and 2–5% of pediatric respiratory illnesses. The adenovirus lower respiratory tract infections (LTRIs) severity varies according to age of onset, serotype, immunological status, and environmental and socioeconomic factors. Recovery from adenovirus LRTIs occurs in most patients, but severe infection can cause considerable morbidity and mortality **(Palomino et al., 2004)**.

New viruses have recently been identified in children, including human bocavirus (HBoV) and human metapneumovirus (HmPV). Human metapneumovirus has been addressed as a common cause of upper and lower respiratory tract infections in pediatrics. Being second cause of bronchiolitis in infants following Respiratory syncytial virus was recently identified in the airway of children, codetection of other viral pathogens with HBoV and detection of the HBoV in the stool have raised questions about its role as a cause of respiratory infections **(Milder, 2009)**.

One of the recognized viruses in children having respiratory tract illnesses is Human coronavirus (HCoV). It is usually surveyed and is found worldwide **(Huang S-H et al., 2015)**.

It is essential to understand the significance of viral detections in acute respiratory illness, especially in pneumonia, to manipulate management decisions and research priorities, especially in the fields of vaccinations and antiviral agents development **(Niederman MS, 2010)**.

Objectives of the study:

Aim of the work:

The aim of the present work is

- To delineate the spectrum of respiratory viruses causing pneumonia in infants and children less than 3 years in age.
- To examine seasonality and clinical manifestations of these infections as well as the relation to disease severity.

Pneumonia definition

Pneumonia is the inflammation of lung tissue caused by injurious agent **(Mizgerd et al., 2008).**

CAP is defined as acquiring pneumonia outside a hospital or health care facility. Starting within 48 hours following admission or patient having pneumonia without any characteristics of healthcare associated pneumonia i.e. patient is hospitalized for 2 or more days in the last 90 days before infection or patient had recently received intravenous antibiotics in the last 30 days **(Mandell GL et al., 2010).**

Pneumonia occurring 48 hours or more after hospitalization is considered Nosocomial pneumonia **(Flanders et al., 2006).**

The occurrence of acute infection clinical picture and radiologic findings are absolutely necessary for pneumonia diagnosis. Radiologic verification is essential in the developed countries where it is important to recognize other acute lower respiratory tract conditions as bronchiolitis and wheezy bronchitis from pneumonia, as they are only viral infections and do not require antibiotics treatment **(Mandell et al., 2007).**

Pneumonic infiltrates development is a active process. Therefore the chest x ray findings depend on the time of imaging, and if the chest radiograph is obtained early it may be misleadingly normal **(Mandell et al., 2007).**

In developed world pneumonia can be confirmed by consolidation in the chest radiograph. In the developing world as there is difficulties in getting a chest x ray the term acute lower respiratory Infection is more practically used **(British Thoracic Society Standards of Care Committee 2002).**

Epidemiology and Risk factors:

In developing world CAP is the main killer of children less than five years of age and in developed world CAP is considered as a cause of substantial disease burden **(Prayle A et al., 2011).**

In Europe and North America Community acquired pneumonia is one of the common life threatening infections in children, with an incidence rate of 34 to 40 cases per 1,000 children **(British Thoracic Society Standards of Care Committee 2002).**

Death from CAP is rare in industrialized countries; Wheras lower respiratory tract infection a leading killer in developing countries **(Pinto BC et al., 2004)**

In developing countries the incidence of pneumonia is 0.29 episodes per child in a year, with approximately an annual occurrence of 150 million cases. This is closely to worldwide occurrence of childhood pneumonia since 95 % of pneumonias occur in the developing countries **(Rudan et al., 2004**

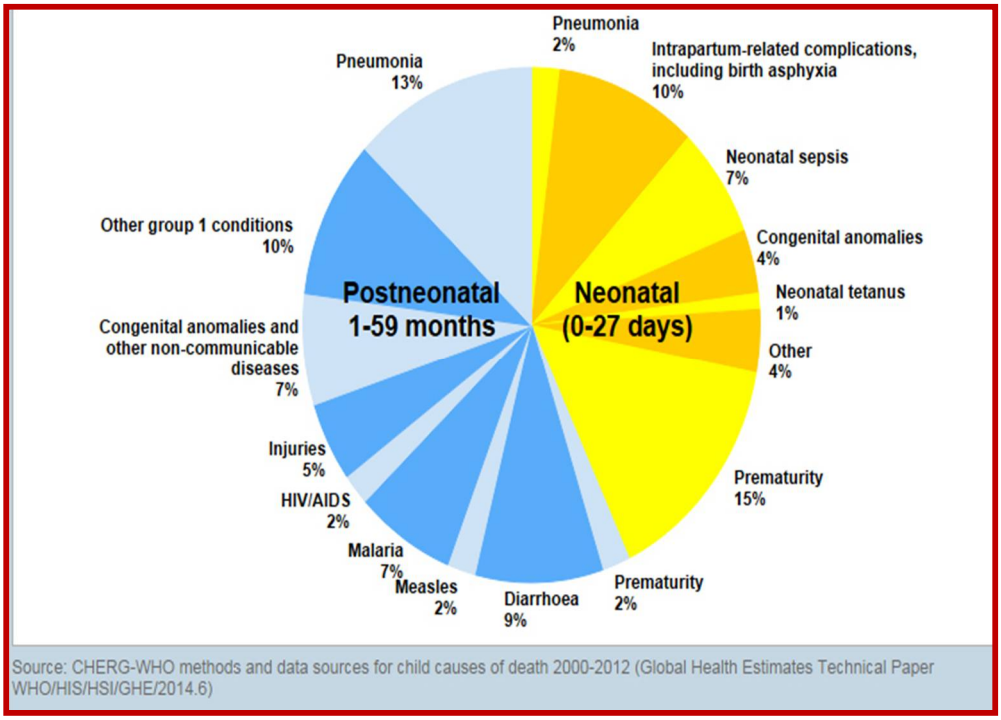

Figure (1): Child causes of death 2000-2012

In 2012, 6.6 million children died before their fifth birthday; 99% of them were in low and middle income countries. The major causes of death were prematurity, birth asphyxia, pneumonia and birth trauma, and diarrhoeal diseases. About 44% of deaths occurred within 28 days of birth (in neonatal period). The main cause of death was prematurity, that was responsible for 35% of deaths during this period **(WHO estimates of global aetiologies of mortality in children less than five years of age 2012).**

Pneumonia frequency decreases with age; 80% of all pneumonia occur under the age of seven years with the peak in children aged two to four years **(Low DE et al., 2003).**

It is estimated that 25 % of all pediatric hospital entries resulting mainly from lower respiratory tract infections **(Yorita et al., 2008)**.CAP is responsible for 30% to 40% of hospital entries that is accompanied by case fatality rates between 15% and 28%. The risk factors for CAP include are many they include medical risk factors as age less than 1 year,