The Role of Mycoplasma Pneumoniae, Chlamydia Pneumoniae and Legionella Pneumophilia in Community Acquired Pneumonia in Children

Thesis

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Abstract

This study was done aiming at investigating the role of M. pneumoniae, C. pneumoniae and L. pneumophilia in (CAP) in children. This study included 200 Egyptian children aged from more than one month to 12 years presented to Emergency Department of Cairo University Children's hospital with CAP. Nasopharyngeal aspirate were examined for these three atypical pathogens using multiplex (PCR). The study showed that atypical pathogens represent 1% of CAP in children.

Key words:

(Atypical pathogens, CAP, children)

CONTENT

List of Abbreviations

ALRTIs	:	Acute lower respiratory tract infection
Ap-CAP	:	Atypical community acquired pneumonia
ARDS	:	Adult respiratory distress syndrome
ARDS	:	Acute respiratory distress syndrome
ARI	:	Acute respiratory infections
B. pertussis	:	Bortedella pertussis
BAL	:	Bronchoalveolar lavage
C. pneumoniae	:	Chlamydia pneumoniae
CA-MRSA	:	Community-associated methicillin-resistant S. aureus
CAP	:	Community acquired pneumonia
CBC	:	Complete blood count
CDC	:	Centres for Disease Control and Prevention
CNS	:	Central nervous system
CRP	:	C-reactive protein
CT	:	Computed tomography
CXR	:	Chest x-ray
CYE	:	Charcoal yeast extract
DFA	:	Direct fluorescent antibody
DIC	:	Disseminated intravascular coagulopathy
DNA	:	Deoxyribonucleic acid
ELISA	:	Enzyme-linked immunosorbent assay
ESR	:	Erythrocyte sedimentation rate
FDA	:	Food and Drug Administration
H. influenzae	:	*Haemophilus* influenzae
IC	:	Internal control
ICU	:	Intensive care unit
IFA	:	Immunofluorescent antibody
IgG	:	Immunoglobulin G
IgM	:	Immunoglobulin M
IV	:	Intravenous
L. pneumophilia	:	Legionella pneumophilia
LD	:	Legionnaires disease
LRTI	:	Lower respiratory tract infection
M. pneumoniae	:	Mycoplasma pneumoniae

Max	:	Maximum
MRSA	:	Methicillin-resistant Staphylococcus aurous
NG	:	Nasogastric
NP	:	Nasopharyngeal
PCR	:	Polymerase chain reaction
PCV7	:	7-Valent pneumococcal conjugate vaccine
PIDS/IDSA	:	The Pediatric Infectious Diseases Society/the Infectious Diseases Society of America
PMN	:	Polymorph nuclear
RB5	:	Red Bull 5
RBC	:	Red blood cells
RD	:	Respiratory distress
S. pneumoniae	:	Streptococcus pneumoniae
SD	:	Standard deviation
Spo2	:	Oxygen saturation
TB	:	Tuberculosis
TLC	:	Total leucocytic count
WBC	:	White blood cells
WHO	:	world health organization

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INTRODUCTION

Pneumonia contributes significantly to global childhood morbidity and mortality. The World Health Organization (WHO) estimates that there are 156 million cases of pneumonia each year in children younger than five years, with as many as 20 million cases severe enough to require hospital admission **(Rudan et al., 2008).**

Overall, viruses are responsible for a large percentage of cases of CAP in the pediatric age group, and they are particularly common in children aged 3 weeks to 4 years**.** Streptococcus pneumoniae is the most common bacterial cause of febrile pneumonia among children aged 3 weeks to 4 years **(McIntosh, 2002).**

The term atypical pneumonia is used to describe pneumonia caused by atypical pathogens such as Mycoplasma, Chlamydia, Legionnaire infection and Pertussis. The clinical course among children infected with these pathogens is different from that of bacterial or viral infection, most of them slowly progress and have no specific symptoms. The findings from chest x ray are different from clinical presentation. Mycoplasma pneumoniae is the most common atypical pathogen found among children with community acquired pneumonia (CAP), Chlamydia pneumonia is the second most common pathogen after Mycoplasma **(Cunha, 2006).**

Atypical pneumonias produce mild symptoms and a dry cough. Mini-epidemics are sometimes seen in school or military settings. It occurs at any age, but it is more common in children and young adults. Organisms that cause atypical pneumonias include:

- Mycoplasma pneumoniae is the most common atypical pneumonia organism. It is a very small bacterium that lacks a cell wall. *Mycoplasma pneumoniae* infection shows a variety of clinical manifestations, ranging from asymptomatic infection to fatal pneumonia and may be associated with neurological and systemic symptoms (e.g. rashes). Mycoplasma pneumoniae pneumonia has been reported in 10 to 40% of community acquired pneumonia cases, and children are the most susceptible group to Mycoplasma infection **(Atkinson et al., 2007).**

- Chlamydia pneumoniae is now thought to cause 10% of all CAP cases. This atypical pneumonia is most common in young adults and children, ranging from mild to severe pneumonia **(Phares et al., 2007)**.

- Legionella pneumophilia may Cause a severe form of pneumonia with a relatively high mortality rate, known as legionnaire disease **(Atkinson et al., 2007).** Atypical bacteria require specific antibiotic coverage because conventional antibiotics used against typical organisms such as streptococci are not effective. Increasing recovery rates of atypical cases of CAP have been reflected in treatment guidelines favoring antibiotics with atypical coverage for certain patient populations **(Mandell et al., 2007)**.

Investigations of typical pathogens causing community acquired pneumonia in children have not included atypical pathogens because it is difficult to detect them by culture methods. This study will use multiplex polymerase chain reaction (PCR) as the principal method for determination of these three atypical pathogens aiming at investigating role of

Mycoplasma pneumoniae, Chlamydia pneumoniae and Legionella Pneumophilia in community acquired pneumonia(CAP) in children **(Huong et al., 2014)**.

AIM OF WORK

The aim of this study is to determine the role of Mycoplasma pneumoniae, Chlamydia pneumoniae and Legionella pneumophilia in community acquired pneumonia in children.

Community acquired pneumonia

Definition:

Pneumonia can be defined as acute infection of the pulmonary parenchyma. Community Acquired Pneumonia (CAP) is Pneumonia that has been acquired in the community in a patient who has not been hospitalized within 14 days prior to the onset of symptoms or has been hospitalized less than 4 days prior to the onset of symptoms. Bronchopneumonia is acute infection of the smaller bronchial tubes and peribronchial alveoli **(Mandell et al., 2007).**

Epidemiology:

Pneumonia contributes significantly to global childhood morbidity and mortality. The World Health Organization (WHO) estimates there are 156 million cases of pneumonia each year in children younger than five years, with as many as 20 million cases severe enough to require hospital admission. In the developed world, the annual incidence of pneumonia is estimated to be 33 per 10,000 in children younger than five years and 14.5 per 10,000 in children 0 to 16 years. Approximately one-half of children younger than five years of age with community-acquired pneumonia (CAP) require hospitalization year **(Rudan et al., 2008).** In 2010, pneumonia was ranked in the United States as the sixth leading cause of death for children one to 4 years of age and the 10th leading cause of death in adolescents **(Murphy et al., 2012).**

Risk factors:

Most studies have shown that pediatric lower respiratory tract infection (LRTI), including pneumonia, are more frequent in boys, with a male-female ratio of 1.25:1 to 2:1. Lower socioeconomic groups have a higher prevalence of LRTIs, which correlates best with family size, a reflection of environmental crowding. Day-care attendance accounts for an increased frequency of acute respiratory infections (ARI), in numbers of both episodes and hospitalizations **(Boyer, 2009).**

Underlying cardiopulmonary disorders and other medical conditions predispose to pneumonia and contribute to increasing severity. These include**:**

- Congenital heart disease.
- Bronchopulmonary dysplasia.
- Cystic fibrosis.
- Asthma.
- Sickle cell disease.
- Neuromuscular disorders, especially those associated with a depressed consciousness.
- Some gastrointestinal disorders (e.g., gastroesophageal reflux, tracheoesophageal fistula).
- Congenital and acquired immunodeficiency disorders.

Cigarette smoke compromises the natural pulmonary defense mechanisms by disrupting both mucociliary function and macrophage activity. Exposure to cigarette smoke, especially if the mother smokes,

increases the risk for pneumonia in infants younger than one year **(Pelton and Hammerschlag 2005**).

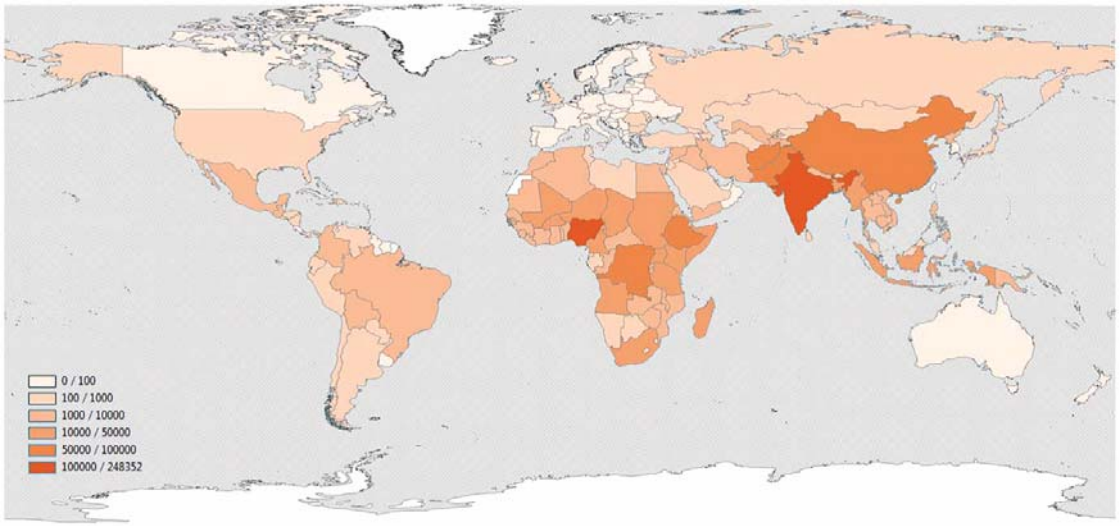

Figure (1): National estimates of number of pneumonia deaths for children 1–59 months **(Theodoratou et al., 2011).**

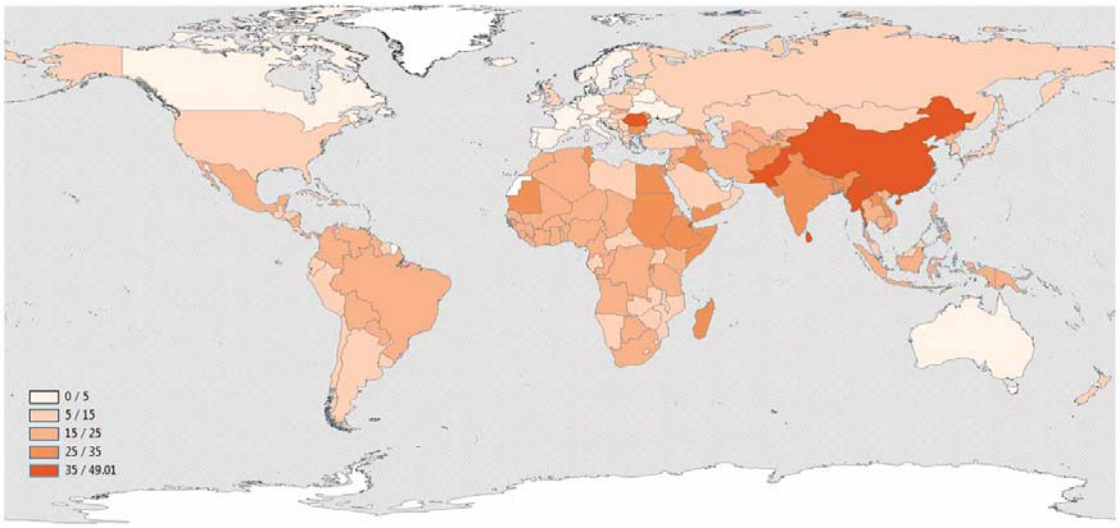

Figure (2): National estimates of % pneumonia deaths for children 1–59 months **(Theodoratou et al., 2011).**