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Mycoplasma Pneumoniae and Bronchial Asthma in Children

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ABSTRACT

Background: Bronchial asthma is a chronic inflammatory disorder of the airways resulting in recurrent episodes of wheezing, breathlessness, chest tightness and cough, particularly at night and early morning. Mycoplasma pneumonia is a frequent cause of acute respiratory infections in children. It can cause pharyngitis, otitis media, tracheobronchitis or community acquired pneumonia, but may also remain totally asymptomatic.

Aim of the work: The aim of the study is to find out the relation between Mycoplasma Pneumoniae infection and bronchial asthma in children.

Patients and Methods: A cross sectional study carried out at the Al-Azhar University Hospital in Damietta in the period from October 2018 to October 2019. It included 80 asthmatic children in acute attack. Patient demographics, asthma severity and laboratory investigations had been documented. In addition, IgM for Mycoplasma pneumoniae had been determined, and associated with other factors.

Results: Mild asthma reported in (76.25%), moderate asthma (17.5%), and severe asthma (6.25%). Eosinophils had significantly increased in severe asthma (5.00±3.24) when compared to moderate (3.57±1.55) or mild asthma (2.33±1.11). Similarly, IgM of M. pneumoniae was significantly increased in severe asthma (1.03±0.69) when compared to moderate (0.67±0.45) or mild asthma (0.61±0.21). None of children with mild asthma had positive IgM while 14.28% of moderate asthma had positive results and 80.0% of severe asthma had positive IgM for M. Pneumoniae.

Conclusion: Mycoplasma Pneumoniae infection is common in children with acute attacks of asthma and Mycoplasma Pneumoniae infection is associated with the trigger asthma exacerbation and associated with the severity of asthma.

Keywords: Bronchial Asthma; *Mycoplasma Pneumoniae*; Eosinophilia; Community acquired; Pneumonia.

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* Main subject and any subcategories have been classified according to the research topic.

INTRODUCTION

Bronchial asthma is a common prevalent disease that affects both adults and children. The role of respiratory tract infection in the pathogenesis of asthma has been well established, and recently, the role of atypical pathogens, *Mycoplasma pneumoniae*, in asthma has become an active area of investigation[1], and there were many studies that described the association for M pneumoniae with initial onset of bronchial asthma[2].

In Egypt, recent study estimated that 7.2%of Egyptian children aged (6-12 years) suffered from bronchial asthma[3].

The inflammatory response in the airways of patients with asthma is an interaction between genes and environment, resulting in an abnormal immune response to allergens and other triggers in genetically susceptible individuals[4]. Most asthma starts in children in relation to sensitization to common inhaled allergens, such as house dust mites, cockroaches, animal dander, fungi and pollens. These inhaled allergens stimulate T helper type 2 (Th2) cell proliferation, subsequently Th2 cytokines, interleukin (IL)-4, IL-5 and IL-13 production and release [5]. The immune histo-pathologic features of asthma include epithelial injury and infiltration of inflammatory cells, consisting of eosinophils, lymphocytes, mast cells, and phago-cytes. Inflammatory mediators released by these cells are the effectors of chronic inflammation[6]. The products released from leukocytes and epithelial cells causes bronchospasm, damage the epithelium, stimulate airway cells, and recruit additional leukocytes-creating a cycle of inflammation that becomes chronic[7]. Over time, persistent changes in the structure of the airway can occur, such as subepithelial fibrosis, mucus hypersecretion and goblet cell hyperplasia, epithelial cell injury, smooth muscle hypertrophy and angiogenesis[8].

Intermittent dry coughing and expiratory wheezing are the most common chronic symptoms of asthma[9].

Mycoplasma pneumonia is a common respiratory pathogen that produces diseases of varied severity ranging from mild upper respiratory tract infection to severe atypical pneumonia. Although rarely fatal, M. pneumoniae is an important cause of acute respiratory tract infection, especially as a potential etiology of the clinical entity termed "atypical pneumonia". Tracheobronchitis and pneumonia are the most commonly recognized clinical syndromes associated with M. Pneumoniae infection, Cough can last up to 4 weeks and may be accompanied by wheezing. Patient generally recover without complications[10]. Clinical finding is often less severe than suggested by the patient chest radiograph, explaining the term “walking pneumonia” is often used to describe CAP caused by *M. Pneumoniae*[11]

AIM OF THE WORK

The aim of the study is to find the relation between *Mycoplasma Pneumoniae* infection and bronchial asthma in children.

PATIENTS AND METHODS

The present study was a cross sectional study which was carried out at Al-Azhar University Hospital [New Damietta], during October 2018 to October 2019. It included 80 children who had been selected from outpatient clinic and inpatient ward in a working day (3 days\week); any child fulfilled the inclusion criteria had been included. All patients from 6 to 16 years. Both sexes were included provided that, they are known to be asthmatic in acute attack with any grade of asthma. Asthma severity had been graded according to GINA (2019) guideline, into mild, moderate and severe asthma[2].

The exclusion criteria were: children with other chronic chest problem [e.g., Bronchiectasis, cystic fibrosis, T.B., etc], children with chronic disease [e.g., diabetes mellitus [DM], liver or renal disease, etc], children with major congenital anomalies [e.g, congenital heart disease], immunocompromised children [e.g., protein energy malnutrition [PEM] and prolonged corticosteroid therapy].

All patients had been subjected to detailed history taking [e.g., personal, history of asthma, history of early life injury to airways, present management and response, complain and duration of illness, precipitating and/or aggravating factors, exacerbations, asthma medication, family history of asthma, allergy, sinusitis, rhinitis, eczema], thorough clinical examination [general and chest examination], laboratory investigations [serum *Mycoplasma pneumoniae* IgM, and complete blood count [CBC]].

The *Mycoplasma pneumoniae* IgM had been determined by the DRG *Mycoplasma pneumonia* IgM ELISA Kit [SKU: EIA3499]. It is a solid phase enzyme-linked immunosorbent assay. The test had been carried out according to manufacture recommendations.

RESULTS

Studied children were classified according to asthma severity into three groups: Mild asthma defined among 61 children (76.25%), moderate asthma among 14 children (17.5%), and severe asthma among 5 children (6.25%) (Table 1).

Males represented 55% (44 children), while females were 36 (45%). Positive family history was reported by 56 (70%). In addition, 34 children (42.5%) were from rural areas, and 47(58.7%) from urban areas. Smoking parents were reported for 48 children (60%) of cases.

In the current work, there was no significant difference between different asthma grades regarding hemoglobin concentration, white blood cells count, and platelets. On the other side, eosinophils had significantly increased in severe asthma (5.00±3.24) when compared to moderate (3.57±1.55) or mild asthma (2.33±1.11). Similarly, IgM of M. pneumoniae was significantly increased in severe asthma (1.03±0.69) when compared to moderate (0.67±0.45) or mild asthma (0.61±0.21) [Table 2].

In addition, none of children with mild asthma had positive IgM for M. pneumonia, while 14.28% of children with moderate asthma had positive results and 80.0% of children with severe asthma had positive IgM for M. Pneumoniae, with significant difference between different asthma grades (table 3).

Children with positive IgM had significantly higher leucocytic count when compared to children with negative IgM (10.1±2.4 vs 7.40±2.2 respectively). On the other side, eosinophilic count revealed non-significant difference between positive and negative IgM groups (table 4).

Table [1]: Asthma severity among studied populations

	Mild	Moderate	Sever
No.	61	14	5
%	76.25%	17.5%	6.25%

Table (2): Laboratory investigations in relation to asthma severity.

Variable	Mild	Moderate	Severe	ANOVA	P value
Hemoglobin (mg/dl)	10.81±1.18	10.36±1.15	9.60±0.9	3.044	0.053
WBCs [x10^3]/cc	7.70±2.34	7.86±3.35	9.60±3.51	1.220	0.301
Platelets [x10^3]/cc	259.56±73.75	260.71±102.47	268.00±95.50	0.026	0.975
Eosinophils	2.33±1.11	3.57±1.55	5.00±3.24	***11.931***	***0.001****
IgM of *M. Pneumoniae*	0.61±0.21	0.67±0.45	1.03±0.69	***4.495***	***0.014****

Table (3): IgM positivity in relation to asthma severity

	Mild "n=61"	Moderate "n=14"	Severe "n=5"	X^2	P
IgM +ve	0 (0.0%)	2 (14.28%)	4 (80.0%)	43.75	0.001*
IgM –ve	61 (100.0%)	12 (85.71%)	1 (20.0%)		

Table (4): IgM mycoplasma pneumonia in relation to eosinophilic count and total leucocytic count.

	IgM +ve	IgM –ve	t-test	P
Leucocytic count x 10^3/cc	10.1±2.4	7.40±2.2	2.87	0.021*
Eosinophilic count	3.2±1.1	3.4±1.5	0.32	0.68

DISUCSSION

The causes of initial onset of asthma remains unclear and the causes and pathogenesis of this syndrome still remains incompletely understood[12]. It is not known whether these organisms were allowed to persist after an infection or were present prior to the development of asthma. There is evidence to support both possibilities. The observations that these organisms were present first and lead to the development of asthma is intriguing. There have been reports of patients presenting with acute infection of *M. pneumoniae* followed either by the development of asthma or a significant improvement

in lung function and asthma symptoms with antimicrobial therapy directed against these organisms[13].

In the current study, male children slightly predominant among asthmatic children (55%). **Won et al.[14]** reported comparable results. In addition, these results were in agreement with the percentages reported by Hassan et al.[3] in Egypt [boys were 53.6%]. The prevalence of asthma is reduced in children raised in rural setting than urban residence, which may be linked to the presence of endotoxin in these environments[15], as in the current study (58.7% were from urban and 42.3% were from rural area]. **Al-Qerem et al.[16]** also reported increased asthma prevalence among urban than rural children. On contrary, an Australian study reported no protective effect of farming on children living in a primarily crop farming region[17].

Also, we found that the presence of smoking parents, was more frequent among asthmatic children (60%). This agree with El-Mazahy et al.[18] who reported that, parental smoking is associated with a higher prevalence of all forms of asthma especially if both parents are smokers.

Positive family history was significantly increased among asthmatic children in the current study, which come in agreement with **Al-Frayh et al.[19]** from Saudia Arabia who reported a strong familial aggregation linked to increased risk of childhood asthma. Another study from India showed that family history is a strong risk factor for asthma occurrence[20].

Mild asthma was the predominant form of asthma in the current work. This is in agreement with El-Mazahy et al.[18] who reported that mild asthma represented (65.7%) followed by moderate asthma (30%) then severe asthma (4.3%), and Hassan et al.[3] who reported that severity of asthma was mild among (52.4%), moderate (40.5%) and severe in (7.1%).

In the current study, all children with mild asthma were negative for *Mycoplasma Pneumoniae* IgM, while 14.28% of children with moderate and 80.0% of children with severe asthma were positive for IgM. These results are supported by Kassisse et al.[21] who confirmed that children with acute asthma show a high prevalence (46%)of *mycoplasma pneumoniae* infection and there is a close relation between severe acute asthma exacerbation and the presence of *Mycoplasma Pneumoniae*. Also, Iramain et al.[22] suggested that there are association between acute infection of *Mycoplasma pneumoniae* with severe asthma attack in children, the prevalence of *Mycoplasma Pneumoniae* was significantly higher among children with severe asthma as compared to children with moderate asthma and control groups.

On the other side, Duenas et al. [25] did not find significant differences when comparing the severity of the exacerbations with the positive *Mycoplasma Pneumoniae* result.

In our study, eosinophils significantly increased in cases of severe asthma. Eosinophils can affect airway biology as a source of epithelial damage and airway remodeling in asthma. As such eosinophils contribute to the severity of asthma and may persist despite guidelines-based treatment. Eosinophils also may act as biomarkers for severity of asthma and may also identify the response to treatment and control for severe asthma[23, 24].

On the other hand, no significant relation had been reported between white blood cell count and asthma grade, which come in agreement with a Korean study, which reported that, there no significant difference in WBCs, hemoglobin level, eosinophilic count between asthmatic children with positive and negative Mycoplasma pneumoniae IgM[25].

In short, results of the current work revealed that, *Mycoplasma Pneumoniae* infection is common in children with acute attacks of asthma and *Mycoplasma Pneumoniae* infection is associated with the trigger asthma exacerbation and associated with the severity of asthma.

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None declared by the authors

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