

Epidemiological, Clinical, and immunological characteristics of Mycoplasma pneumoniae infections among a group of hospitalized children in Suleimani city/Iraq

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ABSTRACT

Background: Mycoplasma pneumoniae (M. pneumoniae) is an important respiratory bacterial pathogen, especially among children. It causes acute upper and lower respiratory infections.

Objective: This study was aimed to measure anti- M. pneumoniae antibodies among hospitalized children who were admitted to hospital diagnosed with acute respiratory tract infections.

Method: Automated ELISA technique was performed to detect anti- M. pneumoniae antibodies (IgM and IgG antibodies) in serum from 108 children less than 5 years old. The children were admitted to the Pediatric Teaching Hospital in Suleimani city/Kurdistan Region/Iraq because of acute respiratory tract infections. A questionnaire was designed to collect demographic and clinical data from those children.

Results: IgM anti- M. pneumoniae antibodies were positive in 15 (13.9%) out of 108 children. The highest seroprevalence was found in the age group 25-36 months while the lowest is in the age group 1-12 months. M. pneumoniae infections were more common among males than females though results were statistically not significant, and attendance of kindergarten or nursery, residency, history of chronic diseases, history of contact with similar conditions, and family history of chronic diseases, they were all statistically not significant. The IgM

seropositive children were suffering from bronchitis, croup, pneumonia, or other respiratory infections, in frequencies of 7 (46.6%), 4 (26.7%), 3 (20%), and 1 (6.7%) respectively. Increased erythrocyte sedimentation rate, diagnosis of croup, and diagnosis of bronchitis were more frequent in M. pneumoniae infected group and the results were statistically significant. The IgG anti- M. pneumoniae antibodies were positive in 31 (28.8%) out of the 108 children, and the greatest IgG seroprevalence was highest in age group 49-60 months.

Conclusion: M. pneumoniae is an important respiratory pathogen among hospitalized children in Sulaimani governorate/Kurdistan/Iraq, and nearly one third of children had experienced M. pneumoniae infection by the age of five years

Keywords: Mycoplasma pneumoniae, respiratory infection, ELISA technique.

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Mycoplasma pneumoniae is an important bacterial pathogen of upper and lower respiratory tract infections. Currently, 16 species of mycoplasmas were isolated from human, and out of these 16 species, six of them are known to cause diseases in human. M. pneumoniae is the most common and the most well-known among the six species¹.

M.pneumoniae causes symptomatic as well as asymptomatic infections and these infections might be either respiratory or systemic infections². However, acute respiratory tract infections ranging from mild upper respiratory tract infections, to severe, life - threatening pneumonias are the most diseases that are caused by M. pneumoniae³. Pharyngitis and tracheobronchitis are the most frequent clinical presentations of M. pneumoniae⁴.

M. pneumoniae infections are diagnosed by antigen detection methods, molecular technique like polymerase chain reaction (PCR), and detection of positive titer of IgM anti- M. pneumoniae antibody or four fold rises in IgG anti- M. pneumoniae antibodies⁵.

The aim of this study was to look for M. pneumoniae infections among hospitalized children who were admitted due to acute respiratory tract infections

Method. Systematic sampling was performed to collect serum samples from children less than five years whom were hospitalized at Pediatric Teaching Hospital in Suleimani city/ Kurdistan Region/ Iraq. The study was a

cross - sectional study. To get permission for participating in the study, informed

consent was taken from the parent or legal guardian of children. The diseased children (n=108) were admitted to hospital because of acute respiratory tract infections (ARTIs). Sample collection was performed from September 2012 through March 2013.

A questionnaire was designed to collect clinical and demographic data from all participants. Nearly seven milliliters of blood was aspirated by venipuncture. Complete blood count and erythrocyte sedimentation rate were investigated, and serum was separated and stored at - 20°C until tested. Automated quantitative ELISA technique was performed using Chorus automated immunoanalyzer to measure anti- M. pneumoniae antibodies. Two types of ready to use ELISA kits were utilized for targeting IgM or IgG antibodies specific to M. pneumoniae respectively. Those children with IgM positive (positive result with index is ≥ 0.9) were considered as M. pneumoniae respiratory tract infection cases, while IgG positive (positive result with concentration is ≥ 15 AU/ml) cases were considered as past infection with M. pneumoniae.

The Statistical Package for Social Science (SPSS, Chicago, II, USA), version 16 was used for data entry and analysis. Chi-square test (X²) and Fisher's exact test were used to test the level of significance between categorical variables . P value of ≤ 0.05 was considered as statically

significant.

Results. The children were divided into five age groups: 1-12 months, 13-24 months, 25-36 months, 37-48 months, and 49-60 months.

The children with positive IgM anti-MP antibodies were considered as *M. pneumoniae* - infected children. Among children enrolled in the study (n=108), only fifteen (n=15) were IgM positive (13.9%). The highest percentage of IgM anti- *M. pneumoniae* antibodies was in age group 25-36 months (40%), while the lowest percentage was in age group 1-12 months (6.7%), and the percentages in age groups 13-24 months, 37-48 months, and 49-60 months were (13.3%), (13.3%), and (26.7%) respectively (figure 1). Among *M. pneumoniae* - infected group, male to female ratio was 2.75: 1 which was higher than in IgM anti- MP

negative group (1.58: 1), and the results were statistically not significant (p = 0.5655). Some risk factors related to respiratory tract infection were estimated and their results showed no differences between positive anti -MP antibodies group and negative anti -MP antibodies group and the results were statistically not significant (table 1). Apart from age and sex, some other risk factors were also estimated and these were involve attendance kindergarten or nursery, residency, history of chronic disease, history of contact with similar clinical features, and family history of chronic respiratory diseases; all these risk factors were statistically not significant when compared between IgM anti -MP antibodies positive group and the IgM anti -MP antibodies negative group.

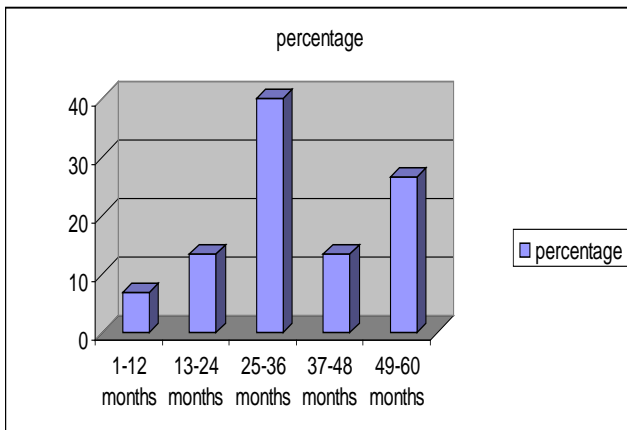


Figure 1: Percentages of seroprevalence of IgM anti-mycoplasm pneumonia antibodies to different age groups.

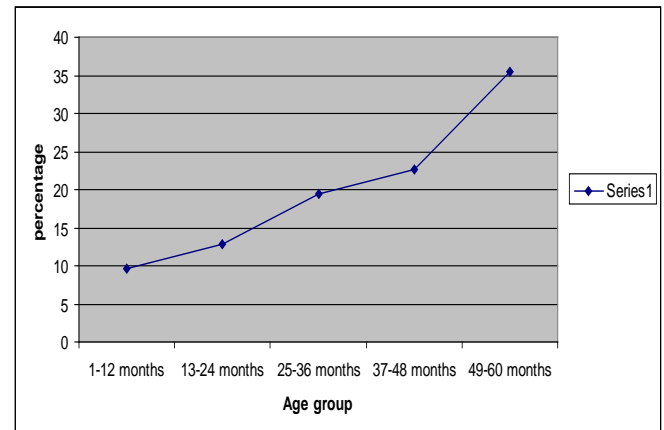


Figure 2: percentages of IgG seropositivity among different age groups of children enrolled in the study.

Table 1: The frequencies and percentages of some risk factors related to ARTIs in children enrolled in the study.

Variable	Patients with positive IgM anti- <i>M. pneumoniae</i> (n=15)	Patients with negative IgM anti- <i>M. pneumoniae</i> (n=93)	P value
Sex			
Male	11 (73%)	57 (61%)	0.5655
Female	4 (27%)	36 (39%)	
Attendance kindergarten or nursery	3 (20%)	19 (20%)	0.9747
Residency			
City	10 (67%)	73 (78%)	0.5801
District	4 (27%)	15 (16%)	
Village	1 (6%)	5 (5%)	
History of chronic diseases	0 (0%)	1 (1%)	0.6864
History of contact with ARTIs' patients	3 (20%)	18 (19%)	0.9563
Family history of chronic respiratory disease	1 (6%)	4 (4%)	0.6855

Table 2: The frequencies and percentages of clinical features and laboratory results among IgM anti - mycoplasma pneumoniae positive group and negative group.

Variable	Patients with positive IgM anti- <i>M. pneumoniae</i> (n=15)	Patients with negative IgM anti- <i>M. pneumoniae</i> (n=93)	P value
Fever	12 (80%)	72 (78%)	1.0000
Dyspnoea	9 (60%)	63 (68%)	0.5659
Cough	12 (80%)	65 (70%)	0.5471
Sputum	8 (53%)	54 (58%)	0.7830
Wheezing	6 (40%)	58 (62%)	0.1554
Tachypnoea	4 (27%)	19 (21%)	0.7339
Runny nose	3 (20%)	47 (%)	0.0481*
Abnormal breathing sounds	11 (73%)	78 (84%)	0.2972
Added breathing sounds	5 (33%)	51 (55%)	0.1655
Cyanosis	2 (13%)	14 (15%)	1.0000
High total WBCs count	10 (67%)	58 (62%)	1.0000
Increase in ESR	13 (87%)	29 (31%)	0.0001*
Clinical illness			
Croup	7 (47%)	10 (11%)	0.0002*
Bronchitis	4 (27%)	9 (10%)	
Pneumonia	3 (20%)	34 (37%)	
Others	1 (6%)	40 (42%)	
SpO₂ (%)			
Normal	3 (7%)	20 (22%)	1.0000
Subnormal	12 (80%)	73 (78%)	
Chest x-ray			
Normal	4 (27%)	26 (28%)	1.0000
Abnormal	11 (73%)	67 (72%)	
Type of treatment			
Supportive	15 (100%)	93 (100%)	1.0000
Antibacterial drugs	15 (100%)	92 (99%)	
Condition at discharge			
Complete recovery	2 (13%)	21 (23%)	0.65148559
Discharged with medication	13 (87%)	71 (76%)	
Death	0 (0%)	1 (1%)	

Table 3: IgG seroprevalence among children enrolled in the study M. pneumoniae.

	<i>M. pneumoniae</i> infected group	<i>M. pneumoniae</i> non-infected group	P value
IgG positive	5 (33.3%)	26 (27.9%)	0.7599
IgG negative	10 (66.7%)	67 (72.1%)	

In addition to laboratory result of increased erythrocyte sedimentation rate, 31 (28.8%) out of the 108 children. the percentage were higher in age group 49-60 months and lowest in age group 1-12 months; there was gradual increase in anti- *M. pneumoniae* IgG seroprevalence with increasing in the age groups, figure 2. IgG anti- *M. pneumoniae* antibodies were positive among only 5 (33.3%) anti-IgM positive patients (*M. pneumoniae* - infected group), and it was positive in 26 (27.9%) anti-IgM negative patients (*M. pneumoniae* non-infected group); the differences among the two groups were statistically not significant. ($p>0.05$), Table 3.

Discussion. There is deficiency in hospital reports about *M. pneumoniae* infections in Iraq due to lack of specific clinical and radiological features, lack of rapid, precise, and cost - acceptable laboratory diagnostic tests for respiratory pathogens, and difficult culturing of the mycoplasma pneumoniae. previous studies about *M. pneumoniae* were done in other parts of Iraq, thus the results of a study done in Basra city showed that 19.4% of hospitalized patients with ARTIs were diagnosed as *M. pneumoniae* infections⁶ which was higher than our result (13.9%), this difference might be due to smaller sample size in our study, different method of detection as we depended on IgM anti- *M. pneumoniae* antibodies as marker of infection while the other study was depending on bacterial culturing of respiratory specimen, or environmental differences between the two cities.

Regarding the nearby countries, an Iranian study done in 2006 found that *M. pneumoniae* was the causative respiratory pathogen in 10% of children hospitalized with ARTIs using PCR technique for throat swabs⁷. Another study which was performed in Saudi Arabia revealed that 9 % of children hospitalized with ARTIs were admitted to hospital because of *M. pneumoniae*⁸.

Our results showed slightly higher frequency of infections with *M. pneumoniae* than those in the Iranian or the Saudian studies, thus more attention should be paid for detection of *M. pneumoniae* among children hospitalized with ARTIs. Zhengrong Chen et al. found that, in a study done in China, 12.6% of children admitted to hospital were having *M. pneumoniae* infections⁹. Several risk factors were assessed in this study and they included: sex, attendance of kindergarten or nursery, residency, history of chronic diseases, history of contact with similar condition, and family history of chronic respiratory diseases. All the mentioned risk factors were statistically not significant in *M. pneumoniae* infected group when compared to *M. pneumoniae* non-infected group.

The highest incidence of *M. pneumoniae* infections was in age group 25-36 months which might reflect decrease in protective maternal antibodies or the children start walking and communicating to others and more chance of acquiring *M. pneumoniae* infections from asymptomatic or symptomatic persons as symptomatic children who are temporary carriers have been implicated as silent spreaders of the disease¹⁰, while Madani TA et al. found that infections with *M. pneumoniae* were more common in infants and preschool children¹¹.

Most of *M. pneumoniae* cases in the current study were diagnosed as having croup which is in contrast to two Saudian studies which found that pneumonia is the main disease caused by *M. pneumoniae*^{8, 11}; these differences might be due to wide spectrum of diseases caused by *M. pneumoniae*.

The respiratory clinical features of *M. pneumoniae* infections were indistinguishable from *M. pneumoniae*

negative group which imply the need for laboratory diagnosis to distinguish different respiratory pathogens from each other. However, non specific laboratory findings showed an increase in ESR was more frequent among *M. pneumoniae* infected group than in *M. pneumoniae* non - infected group, thus children with ARTIs with increase in ESR should raise the suspicion of *M. pneumoniae* infections, while Principi N, et al. did not find a differences in ESR or other laboratory findings among different etiological respiratory groups including *M. pneumoniae* and these laboratory findings did not altering the therapeutic decision-making¹².

The current study showed that 28.8% of children had previous infection with *M. pneumoniae*; this result reflects the high prevalence of this pathogen among many other possible respiratory pathogens. This result was in accordance to a study done in Turkey (27%)¹³, and higher than a previous Argentinean study (12.4%)¹⁴. There was a gradual raise in IgG seropositivity with increase in age; this result indicates the high incidence of *M. pneumoniae* infections whether symptomatic or asymptomatic infection among population of Suleimania city. The *M. pneumoniae* infections are most frequent in age group 25 months - 36 months. Croup is the main presenting disease among *M. pneumoniae* infections and clinical features of *M. pneumoniae* infections are nearly similar to that of other respiratory infections. The raised ESR is a feature favoring *M. pneumoniae* infections among children with ARTIs. The seroprevalence of IgG anti-MP antibodies indicated that nearly one third of children had experienced *M. pneumoniae* infection by the age of five years.

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