

Original Research Article

Mycoplasma pneumoniae among children with acute respiratory infection

Anjali Ann Chacko¹, Ramaraj Subbiah¹, Tharun C. Varghese^{1*}, Kundoly Velayudhan Suseela²

¹Department of Paediatrics, Amala Institute of Medical Sciences, Thrissur, Kerala, India

²Department of Microbiology, Amala Institute of Medical Sciences, Thrissur, Kerala, India

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*Correspondence:

Dr. Tharun C. Varghese,

E-mail: tharunvarg@gmail.com

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ABSTRACT

Background: Acute respiratory infection (ARI) is one of the leading causes of mortality and morbidity in children. *Mycoplasma pneumoniae* remains the most common species causing ARI in school going children. IgM ELISA is considered as the single most appropriate test for diagnosis of acute mycoplasma pneumoniae infection. Objectives of the study was to assess the proportion of mycoplasma pneumoniae among children aged 2-12 years admitted with ARI using IgM ELISA kit.

Methods: Study design included prospective descriptive study. Study carried out at Amala institute of medical sciences, Thrissur, Kerala, India. Study period from January 2019 to June 2020. Inclusion criteria included all children between age group 2-12 years admitted in paediatrics department with clinical features of ARI. Exclusion criteria excluded parents/patients who are not willing to participate in the study and patients who are known cases of reactive airway disease. A total of 124 children, aged 2-12 years with clinical features of ARI admitted during January 2019 to June 2020 were included in this study. This was to know the proportion of *Mycoplasma pneumoniae* among these children using IgM ELISA test kit and to understand their clinical profile.

Results: 71 were males. Mean age of children in the study group was 4.4±2.4. IgM ELISA was positive in 9 subjects (7.3%). Sensitivity, specificity, positive predictive value, negative predictive value and accuracy were 50, 85, 40, 89.7 and 79.5% respectively.

Conclusions: Prevalence of *Mycoplasma pneumoniae* in our population based on IgM ELISA was 7.3%. *Mycoplasma pneumoniae* IgM ELISA test is superior to cold agglutinin test.

Keywords: *Mycoplasma pneumoniae*, Respiratory tract infections, Immunoglobulin M

INTRODUCTION

Acute respiratory infection (ARI) is one of the leading causes of mortality and morbidity in children and is considered as one of the major causes of under-five mortality in the world and in India.¹ According to WHO study 2015 conducted 1.2 million deaths occurred among under five age group in India. Of this, premature and neonatal birth complications (39%) were the biggest killers followed by pneumonia (14.9%), diarrhoea (9.8%) and sepsis (7.9%).^{2,3} Infection of any part of the respiratory tract system and its related structures less than

30 days duration is considered as ARI. About 30-60% of paediatric outpatient cases and 20-30% of inpatient cases are due to ARI. The triad of malnutrition, diarrheal diseases and ARI is the most common reason for morbidity and mortality among under-five age group in developing countries like India. *Mycoplasma pneumoniae* remains the most common species causing respiratory tract infections in school going children and young adults. It accounts for 20% of all community acquired pneumonia in middle and high school children. Out of this, 18% are likely to require hospitalisation.⁴

Most common organisms known to cause ARI among children include bacteria like *Staphylococcus aureus*, *Streptococcus pyogenes*, *Pneumococci*, *Haemophilus influenza* and *Klebsiella pneumonia*. Viruses like Adeno, Corona, Rhino and Influenza are also involved. Atypical organisms like *Mycoplasma*, *Chlamydia*, *Legionella* are also reported to cause ARI. A significant proportion of pneumonia is caused by mixed infection (8-40%) and pathogens are unidentified in 20-60% of cases. *Mycoplasma pneumonia* remains the most common species causing respiratory tract infections in school going children and young adults. It accounts for 20% of all community acquired pneumonia in middle and high school children. Out of this, 18% are likely to require hospitalisation. It is endemic in large communities of the world with cyclic epidemics every 3 to 7 years.⁵ The disease is distributed worldwide without regard to season. Health care seeking behaviour, poverty level and distribution of information affect the occurrence and severity of *Mycoplasma pneumonia*.

METHODS

Study design

Prospective descriptive study. Study setting carried out at Amala institute of medical sciences, Thrissur, Kerala, India. Study period from January 2019 to June 2020.

Inclusion criteria

Inclusion criteria included all children between age group 2-12 years admitted in paediatrics department with clinical features of ARI.

Exclusion criteria

Exclusion criteria excluded parents/patients who are not willing to participate in the study and patients who are known cases of reactive airway disease.

A total of 124 children (71 males and 53 females) aged 2-12 years with clinical features of acute respiratory infection admitted under paediatrics department in a Medical college hospital in central Kerala, India; during a time period of 18 months (January 2019 to June 2020) were included in this study. Patients/parents who were not willing to participate in the study or the patients who were known cases of reactive airway disease, were excluded from this study.

This was a prospective descriptive study to know the proportion of *Mycoplasma pneumonia* among these children using IgM ELISA test and to understand their clinical profile. This study obtained ethical approval from the institutional ethical committee. The *Mycoplasma pneumonia* IgM antibody test kit by demeditec (DEMYKO3) was used. It is based on the principle of enzyme immune-assay (EIA). There was a structured proforma which was filled by the principal investigator.

The validated pretested Performa contained data regarding personal profile, socioeconomic status, details regarding the illness, the main clinical symptoms, the antibiotics used previously and during the present admission, clinical features like respiratory rate, SPO₂, chest retractions, air entry, added sounds, investigations, infective markers, blood culture, cold agglutinin and IgM ELISA. It was done by direct interview with the patient, history taking, and clinical examination, appropriate investigations including haematological and radiological findings. IgM ELISA test using the demeditec kit was done for all 124 patients in the microbiology lab. The response to treatment was noted from the duration of hospital stay.

Measurement data on normal distribution were expressed as the mean \pm standard deviation (SD). Categorical data were expressed as a percentage and were compared with chi-square test or Fisher's exact test, as appropriate. Sensitivity and Specificity measured. A p value of <0.05 was considered as statistically significant. Statistical analysis was performed with SPSS software version 23.0.

RESULTS

Out of 124 cases of children between 2-12 years of age admitted with acute respiratory infections 71 (57.3%) were male. Mean age of the children were found as 4.4 \pm 2.4 years. 44.4% of study population did not receive any antibiotics before admission. Co-amoxiclav and Azithromycin were most commonly received antibiotics prior to the admission (42.7%). Other group of antibiotics received were ceftriaxone, clarithromycin and cefpodoxime. Clinical feature of all the cases shown in Table 1. All the patients had fever and cough while 50.8% of them had crepitations.

Table 1: Clinical features of ARI cases.

Clinical features	Frequency (n)	Percentage (%)
Tachypnoea	36	29
Retraction	41	33.1
SpO₂ \leq94%	7	5.6
Decreased air entry	25	20.1
Bronchial breathing	18	14.5
Crepitations	63	50.8
Crepitations and wheeze	31	25
Fever	124	100
Cough	124	100

All cases were evaluated and investigated. The results showed that 35 (28.2%) were CRP positive, 48 (38.7%) had X-ray infiltrates out of which 27 (21.8) had consolidation. 10 (8.1%) were cold agglutinin test positive. 9 cases (7.3%) were IgM ELISA positive for *Mycoplasma pneumonia*. 6 (66.67%) of them were in 2 to 5 years age group; 2 (22.22%) between 6 and 10 years;

and only 1 (11.11%) was above 10 years. 7 (77.78%) were females with p value 0.026 (statistically significant).

Comparison of x-ray findings with IgM ELISA was done and found that out of 36 normal 2 had IgM positive; out of 45 with x-ray infiltrates only 3 were positive. 23 had consolidation in x-ray of which only 4 were positive. Only one case of pleural effusion and a case of collapse was found but none were positive for IgM ELISA.

Proportion of patients with cold agglutinin test and IgM ELISA positivity was checked and shown in Table 2.

Table 2: Proportion of patients with cold agglutinin test and IgM ELISA positivity.

Cold agglutinin	IGM ELISA		Total
	Negative	Positive	
Not done	74	1	75
Negative	35	4	39
Positive	6	4	10
Total	115	9	124

Sensitivity and specificity of cold agglutinin against IgM ELISA was 50% and 80% respectively. Positive predictive value was 40%; negative predictive value was 89.7% and accuracy of the cold agglutinin test for *Mycoplasma pneumonia* was 79.5%

DISCUSSION

In this study, prospective analysis of 124 cases of ARI was done. The gender distribution of our study population was 71 (57.3%) males and 53 (42.7%) females. This was at par with the findings done by Win et al study.⁶ Similar study done by Kashyap et al also show a male preponderance (1.58:1).⁷ Also, study conducted by Chen et al showed a similar finding of male predominance in population. Males 55.3% and female 44.7% were noted as per demographic details. Age group in our study population was subdivided in to ≤5 years, 6-10 years and ≥11 years. Most of the study subjects fell in the ≤5-year age group (87/124, 70.2%). this is similar to the demographic profile of the study subjects taken by Kashyap et al. The socioeconomic status profile was noted, most of the subjects were from middle class family group followed by upper and then lower-class group. Of the prior antibiotics received in our study population we found out that co Amoxiclav was the most common drug used in our locality as first line (24.2%) in ARI cases. Next to azithromycin (18.5%). This is in concordance to the study findings by Huong et al where beta lactam group of antibiotics were used in treatment of community acquired pneumonia in Vietnam.⁸ This result shows the ethical use of empirical antibiotics policy followed in our geographical area. After admission in the hospital, Co-Amoxiclav (44.4%) administered intravenously was the most common first line antibiotic started followed by azithromycin (15.3%) and ceftriaxone (12.9%). In 33 patients the antibiotics received previously were

continued after confirming the dose and completed the course. Win et al in his study conducted at Myanmar had almost similar findings with ceftriaxone and penicillin groups being used maximum.⁶ This is a reflection of the antibiotic policy followed in our institution for ARI cases. Certain clinical parameters were considered to quantify respiratory distress in the 124 ARI cases. Thus, 36 had tachypnoea (29%), 41 had chest retractions (33.1%), 7 had SPO₂≤94 % (5.6%), 25 had decreased air entry (20.1%), 18 had bronchial breathing (14.5%), 63 had crepitations (50.8) and 31 had wheeze (25%). Fever and cough were observed in 100% study subjects. This is almost same as study conducted by Win et al where tachypnoea was noted in 24.4%, cough and fever noted in 96.3%, crepitations noted in 59.8% and wheezing noted in 14.6% of cases. Kashyap et al also quoted fever, cough and tachypnoea in the criteria for lower respiratory tract infections.⁷

Out of 124 patients CRP was done in 53 cases as per hospital policy. Of which 18 (66%) were positive. Thus, CRP cannot be considered as a specific infective marker. Radiological findings showed normal x-ray in 38 cases (33%) while abnormal radiographic findings were noted in 77 out of 115 patients (66.9%). These abnormal findings include infiltrates (41%), consolidation (23.4%), collapse (0.8 %) and effusion (0.8%). These findings correlate with Saw win et al where normal x-ray was found in 22.2% and an abnormal x-ray in 77.8% of ARI cases.⁶ Similarly, Shenoy et al gives similar findings with 32% normal x-ray and 68 % abnormal x-ray.⁹ In the total population cold agglutinin was done in 49 cases out of which 10 became positive. (8.1%) but this test is nonspecific as they are also elevated in other conditions like Ebstein Barr virus, cytomegalo virus, *Klebsiella pneumonia* and malignancies of lymphoid cells and autoimmune diseases. IgM ELISA was done in all 124 subjects and positivity was seen in 9 cases (7.3%). Our study results are comparable to study conducted by Waris et al where he evaluated mycoplasma pneumonia infection in 278 paediatric patients with IgM immuno assay and obtained a prevalence of 9%.¹⁰ Among the IgM ELISA positive group, though statistically not significant (p value=0.397) most of the cases were in the age group from 2-5 years followed by 6-10-year age group. There was female gender preponderance which was statistically significant (p=0.026) this was similar to the study by Kashyap et al and Shenoy et al.^{7,9} In our study the majority of serologically positive cases had normal respiratory rate, no chest retractions, SPO₂≥95%, air entry bilaterally equal, normal vesicular breath sounds (bronchial breath sounds seen in only 22.2%), had crepitations (77%) along with fever and cough (100%). These findings were similar to study by Shenoy et al where fever and cough was more found to be common in the mycoplasma IgM positive group.⁹ Also, the bronchial breathing was more common in IgM negative group. Radiological findings in mycoplasma pneumonia showed mostly consolidation and infiltrates. This was similar to the study by Win et al at where they had 15.9%

consolidation followed by opacity and collapse.⁶ Kashyap et al also cites a similar finding.⁷ We conducted the study to check whether IgM ELISA can be kept as a standard test for mycoplasma pneumonia. Comparison between cold agglutinin and IgM ELISA was done. Sensitivity of cold agglutinin against IgM ELISA was 50%, specificity was 85%, positive predictive value 40% and negative predictive value 89.7%. Accuracy of cold agglutinin test is 79.5%. Hence through this study we consider IgM ELISA superior to cold agglutinin. Similar finding was quoted by Elizabeth et al by stating that IgM ELISA is the most appropriate among the currently available test. It has 98% specificity and in overall IgM ELISA has a better sensitivity than PCR.¹¹

Limitation of the study was the small sample size but the results with Statistical significance help for further studies and treatment protocols.

CONCLUSION

Male children were more affected by ARI than female in our study population and age group ≤ 5 years were most affected. Co-Amoxiclav was the most common drug used for ARI in outpatient and inpatient cases followed by azithromycin. Most of the IgM positive mycoplasma pneumonia occurred in the age group 2-5 years. There was a female gender preponderance which was statistically significant. Prevalence of mycoplasma pneumonia in our population based on IgM ELISA was 7.3%. IgM ELISA has got more specificity, positive predictive value and accuracy than cold agglutinin test. Female patients of age 2 to 5 years with fever, persistent cough and lower respiratory symptoms, mycoplasma pneumonia must be suspected.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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