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Original Research

Comparison of CRP, Full Blood Count Parameters and Transaminases across Different Age Groups of Children with Mycoplasma Pneumonia

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ABSTRACT

Objective: Mycoplasma pneumonia (MP) is a common cause of community-acquired pneumonia in about 10%–30% of children. The combination of polymerase chain reaction (PCR) with serology tests appears to provide better accuracy in the diagnosis of MP; however, these tests are not widely available. Therefore, its diagnosis could be challenging in younger children and would still require other conventional approaches with clinical examination, chest X-ray, and basic laboratory tests such as full blood count and c-reactive protein (CRP) across the most of the clinical settings. In this regard, the objective of this study is to investigate how CRP, full blood count parameters, and transaminases differ among older and younger children.

Methods: We reviewed the data of 2,246 patients aged between 0 and 18 years who were diagnosed with pneumonia between January 2011 and December 2018, and finally included 49 patients who had positive MP IgM in this study. Thereafter, we divided the patients into two groups as children aged ≤5 years and children aged >5 years, and compared the values of hemoglobin, white blood cell (WBC), neutrophils, lymphocytes, eosinophils, monocytes, platelet, CRP, and transaminases in the groups.

Results: The analyses showed that WBC (p=0.001), lymphocytes (p=0.001) and monocyte counts (p=0.004), and CRP (p=0.013) were significantly higher in the children younger than five years. On the contrary, Hb was significantly lower in the children younger than five years (p=0.001).

Conclusion: Children younger than five years who have been diagnosed with MP might exhibit more inflammatory response, which is represented with higher CRP levels. Although monocyte and lymphocyte counts were also higher in the younger group (less than five years), this might be an age-related finding.

Keywords: Mycoplasma pneumonia, CRP, children, full blood count

INTRODUCTION

Mycoplasma pneumonia (MP) is a common cause of community-acquired pneumonia in about 10%–30% of children (1, 2). Although it is common in school-aged children, MP can be observed at any age. The diagnosis of MP remains challenging. Basically, the diagnosis can be made via serological tests, culture tests, and molecular detection of pathogen-specific antigens. Additionally, polymerase chain reaction (PCR) might be used as an alternative in practice, but can pose various challenges because of its limited worldwide availability. However, none of these methods are accurate enough to establish diagnosis of MP via a single method alone (3-5). The combination of PCR with serology tests appears to provide a better accuracy (6). Furthermore, diagnostic testing is recommended based on the availability of the test and its effect on the management of the disease (6). Hence, the diagnosis of MP still requires other conventional approaches such as clinical exam, chest X-ray, and basic laboratory tests such as full blood count and c-reactive protein (CRP) across the most of the clinical settings. In this regard, the objective of this study is to investigate how CRP, full blood count parameters, and alanine amino transferase (ALT) differ among older and younger children.

METHODS

We reviewed the data of 2,246 patients aged 0–18 years who were diagnosed with pneumonia between January 2011 and December 2018 at our hospital from the patient records. Thereafter, we enrolled the patients who were tested positive for serum-specific MP IgM in this study. We checked MP IgM by EUROIMMUN immunofluorescence kits. MP IgM had been studied as a part of pneumonia panel. The patients who met the criteria of pneumonia provided below were involved in the initial review of records. The definition of pneumonia was based on the clinical manifestations (fever, cough, or wheezing), physical examination findings, and/or chest imaging scans. Patients who met at least one of the aforementioned criteria were included in the cohort, and finally 49 qualified patients were enrolled in this study.

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Table 1. Comparison of laboratory parameters in children aged between ≤5 and >5 years with MP infection±

	≤60 months	>60 months	p
WBC (10^3/μL)	11.84±3.61	8.52±2.91	0.001
Neut (10^3/μL)	6.29±2.9	4.87±2.86	0.098
Lymph (10^3/μL)	4.26±1.87	2.58±0.95	0.001
Eu (10^3/μL)	0.19±0.26	0.19±0.17	0.959
Mono (10^3/μL)	0.94±0.48	0.61±0.14	0.004
Hb (g/dL)	11.10±1.48	12.65±1.65	0.001
PLT (10^3/μL)	402.52±134.30	354.12±110.45	0.182
CRP (mg/mL)	18.71±22.37	5.46±5.51	0.013
ALT (U/L)	20.96±19.15	21.60±18.314	0.906
AST (U/L)	31.65±9.71	28.36±10.73	0.271

WBC: White blood cell count, Neut: Neutrophil, Lymp: Lymphocyte; Eu: Eosinophil, Mono: Monocyte, Hb: Hemoglobin, PLT: Platelets, CRP: C-reactive protein, ALT: alanine amino transferase, AST: aspartate amino transferase.

We classified the patients into two groups: children aged 5 years and children aged >5 years. Next, we compared the values of hemoglobin (Hb), white blood cells (WBC), neutrophils, lymphocytes, eosinophils, monocytes, platelets, CRP, aspartate amino transferase, and ALT between the groups.

Statistical Analysis

We used the Statistical Package for Social Sciences version 20 (IBM SPSS Corp.; Armonk, NY, USA) statistical software for this study's analyses. Importantly, we used frequency analysis and Student's t-test for analyzing the parametric variables. P-value <0.05 were accepted as statistically significant for this study. We obtained ethical permission from the local ethics committee.

RESULTS

The study cohort comprised 49 out of 2,249 patients (2.1%) who had pneumonia with positive IgM specific to MP. The age of the patients ranged between 3 and 150 months, and the average age of patients was 75.9±54.9 months. The male population in this study cohort was 53.1%. The analyses showed that WBC (p=0.001), lymphocyte (p=0.001) and monocyte counts (p=0.004), and CRP (p=0.013) were significantly higher in the group of children younger than five years. On the contrary, Hb was significantly lower in the group of children younger than five years (p=0.001) (Table 1).

Main Points:

- CRP levels might be elevated in children younger than five years during mycoplasma pneumonia infection.
- Pneumonia due to mycoplasma pneumonia can be observed throughout the year but have a slightly higher prevalence in winter seasons.
- Increased transaminases with mycoplasma pneumonia could be observed in one of the ten patients.

We also performed receiver operating characteristic (ROC) curve analysis between the age groups. The results of ROC are as follows: WBC: AUC=0.753, cut-off=12.25 (10^3/μL), sensitivity/specificity=40.9%/95.7% (p=0.004); lymphocyte count: AUC=0.786, cut-off=3.63 (10^3/μL), sensitivity/specificity=50%/95.7% (p=0.001); monocyte count: AUC=0.709, cut-off=0.775 (10^3/μL), sensitivity/specificity=63.6%/87% (p=0.016); and CRP (mg/L) values: AUC=0.771, cut-off=19.25, sensitivity/ specificity=31.8%/95.7% (p=0.002).

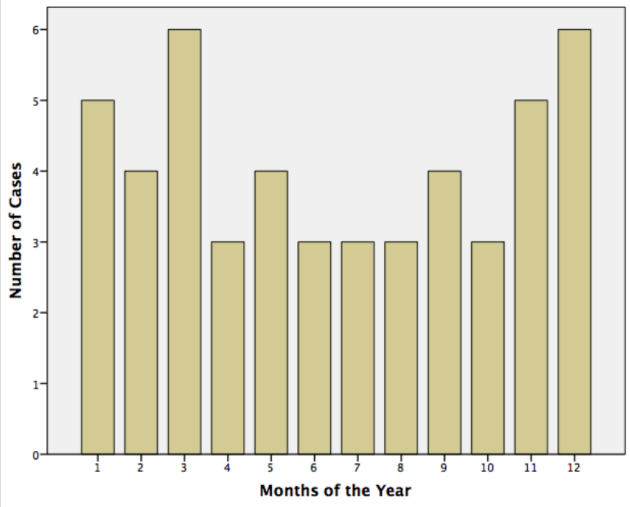
MP infection is observed throughout the year; however, the highest number of cases was recorded in the 3rd and 12th months (Figure 1).

DISCUSSION

MP infection accounts for an important proportion of community-acquired pneumonia cases among children (7). No single test is reliable in terms of detecting MP infection; however, IgM detection was found to be one the most accurate tests in children (8). On the contrary, although PCR has been found to be superior than serological methods, it may underestimate or overestimate the diagnosis in the cases of only the carrier state because of technical issues. Therefore, a combination of these two methods is advised in terms of diagnosis; however, PCR may not be available in most of the clinical settings worldwide and may not be cost effective as well (9). In this context, the differences in basic blood tests such as full blood count and CRP across different age groups might be essential and convenient.

Our study showed significantly increased WBC count and CRP in the children younger than five years. Yun-Ju Ma et al. similarly reported higher WBC and CRP levels in this patient group (10). In contrast, another study showed normal CRP levels in the younger age groups but they reported significantly increased lymphocyte count, which was consistent with our findings (11). Similarly, Defilippi et al. demonstrated higher lymphocyte and monocyte counts in the group of younger children; both of these values

Figure 1. Distribution of the cases over the years



were in agreement with our findings (12). Furthermore, the ROC analysis demonstrated that children younger than five years who are suspected to have MP might have WBC counts greater than 12.5 (10^3/μL) with sensitivity and specificity of 40.9% and 95.7%, respectively. Similarly, while considering lymphocyte counts, values greater than 3.63 (10^3/μL) can be observed in younger children with a possible diagnosis of MP infection with sensitivity and specificity of 50% and 95.7%, respectively. Moreover, the monocyte counts showed a similar pattern, and the values greater than 0.775 (10^3/μL) might be related to a younger age group with sensitivity and specificity of 63.6% and 87%, respectively, during a suspected MP case. The ROC analysis of CRP, which was another significantly higher parameter in the younger age group, showed that values greater than 19.25 (mg/L) can be expected with sensitivity and specificity of 31.8% and 95.7%, respectively, in the context of suspected MP. As it could be observed from the analyses, although the specificities were in the acceptable levels, the sensitivity values were far from the desired levels. However, we need to mention that the given cut-off values along with sensitivity and specificity percentages for WBC, lymphocytes, monocytes, and CRP should not be misinterpreted as a surrogate marker of MP. We analyzed these figures to differentiate the age groups so that these numbers might be helpful to clinicians at limited clinical practice settings for correctly diagnosing children who are suspected to have MP based on the conventional diagnostic methods such as physical examination, history, X-rays, and vital signs.

Additionally, our analysis demonstrated lower Hb values in younger children with MP infection. However, both lymphocyte and Hb counts physiologically differ in the patients who are older and younger than five years (13, 14). Therefore, our findings may not be related to MP infection. We could not prove this statement in either way as we did not had a control group.

We could not find any significant difference in the neutrophil counts across the groups; importantly, neither of the abovementioned studies also could not do the same. Some studies have reported significantly higher platelet counts in younger children. In our study, the platelet counts were also higher in the younger patients; however, this difference was not statistically significant (11, 12).

No specific cumulation of cases with respect to the months of the year was observed; however, the highest number of cases were in the 3rd and 12th months of the year, which are relatively colder months. MP has reported a greater incidence in higher temperatures, whereas some other studies have demonstrated a higher incidence of MP in colder seasons, which was consistent with our findings (10, 15). Generally, MP can be observed throughout the year.

Furthermore, hepatitis, which is one of the extrapulmonary manifestations of MP, was observed in four patients (8.16%) of this study based on their ALT values. Although the data regarding the percentage of hepatitis among patients infected with MP is scarce, our values were in agreement with one of the prospective studies in which the percentage was determined as 7.7% (16).

There are some limitations of this study. One of these limitations is the relatively lower number of patients. Second, as it is known, the retrospective collection of data might lead to data inaccuracy and a lack of information as compared to prospectively acquired data. The reason for high CRP in younger children might be related to co-infections, which we were not able to report as they were not tested but they have been reported in other studies (17, 18).

CONCLUSION

The children younger than five years who were diagnosed with MP infection were found to exhibit more inflammatory responses that are basically represented by increased CRP levels. Furthermore, monocyte and lymphocyte counts were also higher; however, this increase might be related to the age difference rather than MP infection. Overall, while making the diagnosis of MP infection in children younger than five years at limited clinical settings, the findings of higher CRP levels in younger children and lower CRP levels in older children should definitely be interpreted as the support of diagnosis.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Gaziantep University (2020/136 / 02.04.2020).

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