

## STUDY OF C-REACTIVE PROTEIN IN ACUTE RESPIRATORY TRACT INFECTION IN CHILDREN OF NORTH KARNATAKA

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Received : 10/05/2023  
Received in revised form : 14/06/2023  
Accepted : 26/06/2023

**Keywords:**

*C-reactive protein, RHE LAX-CRP, Acute respiratory infection, White blood count, inflammatory Bio marker.*

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DOI: 10.47009/jamp.2023.5.4.18

Source of Support: Nil,  
Conflict of Interest: None declared

*Int J Acad Med Pharm*  
2023; 5 (4); 77-79



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### Abstract

**Background:** Respiratory tract infection is a common disease in children. C-reactive protein is an indicator of bacterial co-infection. An elevated CRP level is an indicator of the severity of a respiratory tract infection. **Materials and Methods:** 90 (ninety) children with acute respiratory tract infections were studied. CBC and CRP were evaluated, and a chest x-ray, if necessary, was studied to rule out the CRP level. The CRP level was also correlated with the WBC count. **Results:** Clinical manifestations were 88 (97.6%) fever, 90 (100%) cough, 73 (81%) rhinitis, 9 (10%) throat pain, 2 (2.2%) ear ache, and 17 (18.8%) breathlessness. The highest CRP level of 18.8 mg/dl was observed in 4 children; 6.8 mg/dl was observed in 3.8 children; and >15000 WBC/mm was observed in 16 children. **Conclusion:** The data of the present pragmatic study provide important insights into the role of CRP levels in acute respiratory tract infection in children.

## INTRODUCTION

Respiratory tract infection is the most common disease in children, accounting for approximately 50% of all diseases.<sup>[1]</sup> In addition, RTI is one of the most contagious communicable pathogens and can rapidly infest a large number of individuals. Because different respiratory viruses cause similar symptoms and signs, it is difficult to differentiate the causative virus solely based on clinical features.<sup>[2]</sup>

However recent developments in molecular biology-based diagnostic techniques for identification of types of viruses, such as sequencing or multiplex reverse transcription polymerase chain reaction, have facilitated the tenuous examination of a number of respiratory viruses. Among them, c-reactive protein (CRP), which is an acute phase reactant and one of the indicators of acute inflammation, has been linked to bacterial or viral co-infections like bacterial pneumonia.<sup>[3]</sup> However, it was shown that patients with respiratory virus (RSV) bronchitis, bronchopneumonia, and RSV pneumonia had elevated levels of CRP along with a higher white blood count (WC) and erythrocyte sedimentation rate (ESR), which all indicate bacterial

co-infection.<sup>[4]</sup> Accordingly, the identification of CRP levels can be an important indirect marker for viral infections and an indicator for the progression of infections and the effectiveness of treatment. In patients with RSV bronchiolitis, it is worth mentioning that elevated CRP levels were associated with prolonged hospital stays. Hence, an attempt is made to evaluate the CRP levels in respiratory tract-infected children.

## MATERIALS AND METHODS

90 children 1–5 years of age who regularly visit ESIC medical college and hospital in Gulbarga, Karnataka, 585102, were studied.

### Inclusive Criteria

Children aged between 1 to 5 years of age suffering from acute respiratory tract infections who have not taken any antimicrobial drugs for at least seven days for any reason. Parents or guardians of patients who gave written consent for treatment were selected for the study.

### Exclusion Criteria

Patients with chronic liver disease, congenital anomalies of the cardio-vascular system, auto-

immune disease, or any other inflammatory diseases were excluded from the study.

**Method**

The history of every patient was recorded, and blood examinations included CBC. The serum samples were tested for CRP by a semiquantitative method. The reagent used was "RHELAX-CRP". Testing was based on the principle of agglutination; a chest x-ray (if needed) was studied.

The duration of the study was from March 2022 to April 2023.

Statistical analysis: Various clinical manifestations of respiratory tract infection (RTI) and the correlation of CPR positive patients with WBC count were classified by percentage day of illness, and the CRP range was noted in every patient. The statistical analysis was carried out in SPSS software. The ratio of males to females was 2:1.

**RESULTS**

Table-1: Clinical manifestations of CRP positive patients with respiratory tract infections in children –

88 (97.6%) had a fever, 90 (100%) had a cough, 73 (81.1%) had rhinitis, 9 (10%) had throat pain, 2 (2.22%) had an earache, and 17 (18.8%) had breathlessness.

Table-2: Study of CRP levels and days of illness in RT-infected children

4 patients à 0.6 – 18.8 on first day  
 48 patients à 0.6 – 4.8 mg/dl second day  
 38 patients à 0.6 – 6.8 mg/dl third day  
 Total 90 patients

Table-3: Correlation between leucocyte count in CRP positive children with RT infection

12 (13.3%) had <6000, 62 (68.8%) had 6000–15000, and 16 (17.7%) had >15000 WBC/mm<sup>3</sup>

**Table 1: Study of different clinical manifestation CRP positive patients of respiratory tract infections**

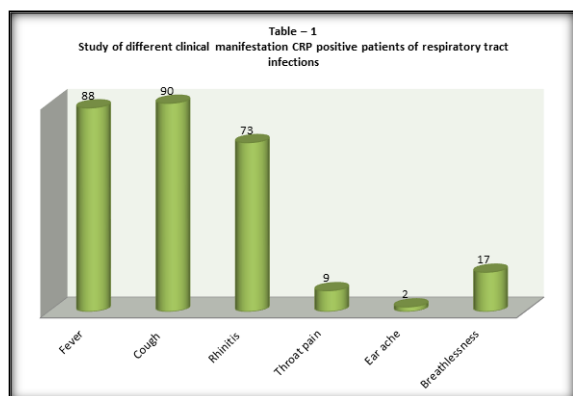
Clinical manifestations	No. of patients (90)	Percentage (%)
Fever	88	97.6
Cough	90	100
Rhinitis	73	81
Throat pain	9	10
Ear ache	2	2.2
Breathlessness	17	18.8

**Table 2: Study of day of illness and CRP levels**

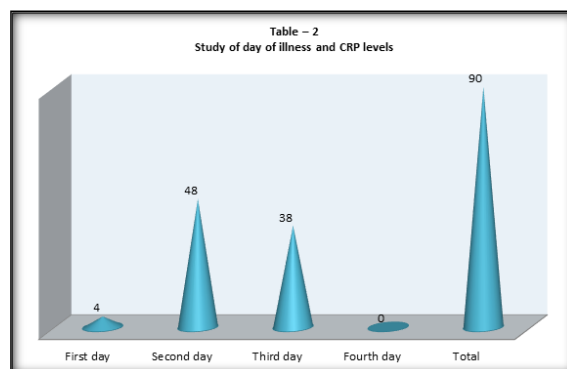
Day of illness on presentation	Total No. of patients	CRP Range
First day	4	0.6-18.8 mg/dl
Second day	48	0.6-4.8 mg/dl
Third day	38	0.6-6.8 mg/dl
Fourth day	--	CRP Not raised
Total	90	

**Table 3: Correlation between leucocytes count and CRP positive patients**

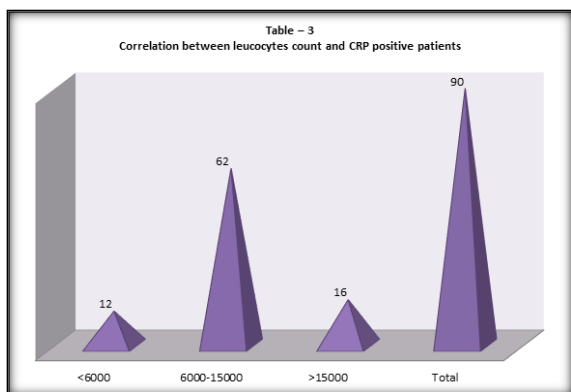
Leucocytes count WBC/mm <sup>3</sup>	CRP positive patients	Percentage
<6000	12	13.3
6000-15000	62	68.8
>15000	16	17.7
Total	90	99.8



**Figure 1: Study of different clinical manifestation CRP positive patients of respiratory tract infections**



**Figure 2: Study of day of illness and CRP levels**



**Figure 3: Correlation between leucocytes count and CRP positive patients**

## DISCUSSION

Present study of CRP in acute respiratory tract infection (ARTS) in children of north Karnataka. The clinical manifestations were 88 (97.6%) fever, 90 (100%) cough, 73 (81%) rhinitis, 9 (10%) throat pain, 2 (2.22%) earache, and 17 (18.8%) breathlessness (Table-1). In the study of day of illness and CRP level studies – 4 patients had 0.6–18.8 mg/dl on the first day, 48 patients had 9.6–4.8 mg/dl on the second day, and 38 patients had 0.6–6.8 mg/dl on the third day (Table-2). In a correlative study of CRP level and leucocytes – 12 (13.3%) patients had <6000 WBC/mm<sup>3</sup>, 62 (68.8%) patients had 6000–15000 WBC/mm<sup>3</sup>, and 16 (17.7%) patients had >15000 WBC / mm<sup>3</sup> (Table-3). These findings are more or less in agreement with previous studies.<sup>[5,6,7]</sup>

Differentiating between serious and non-serious infections is important factor for the clinician. It is observed that serious infections tended to have higher CRP values; however, serious infections with CRP<5 mg/L were also found. The highest number of patients with pneumonia was also found in the CRP range of 20 to 50 gm/L. A serious infection with low CRP can be explained by the fact that in the early stages of disease, the inflammatory response is still developing and CRP is still low (8). Raised CRP values were found in the majority of the patients with viral infections, and the highest values were found in those with influenza A and B infections. Usually, CRP levels reach their peak during the first 2-4 days of infection. The CRP responses followed the presence of pain in muscles and joints, soreness of the throat, fatigue, clamminess, coughing, and expectoration, which, on the other hand, tended to persist while the CRP values approached normal. A minor elevation of CRP was observed in hypersensitivity to infection, and CRP values decreased continuously after the 10th day of illness. The persistence of cough after the CRP value had become lower than 10 mg/dl is in accordance with previous findings in patients with acute bronchitis.<sup>[9]</sup> The persistence of cough and expectoration may, in many cases, not reflect the

seriousness of the infection but rather a post-infectious host response.

It is reported that in febrile children, the CRP value was less than 20 mg/L and the duration of disease was more than 12 hours. With no identifiable focus of bacterial infection, all children could be classified as having a viral infection. CRP values of 20–40 mg/L were recorded in both viral and bacterial infections.<sup>[10,11]</sup> and most febrile children with CRP ≥ 40 mg/dl had a bacterial infection.

## CONCLUSION

In the present study, cough, rhinitis, and fever were the most common symptoms of acute respiratory tract infections. Mean CRP levels were higher in patients presented on the first day and decreased gradually in patients presented on the second and third days without receiving antimicrobials. Leucocytosis could not be correlated with raised CRP levels. Hence, it can be concluded that raised CRP levels will not be an indicator for starting antimicrobial drug therapy. Such clinical trials must be conducted with a large number of patients in a high-tech specialty hospital to confirm these findings.

### Limitation of Study

Owing to the tertiary location of the research centre, the small number of patients, and the lack of the latest technologies, we have limited findings and results.

- This research was approved by Ethical committee of ESIC Medical College and Hospital, Gulbarga, Karnataka, 585102.
- There is no conflict of interest.
- Self-Funding

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