

Profile of C-reactive protein, leucocyte and neutrophil populations as predictors of bacterial infections in febrile children

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Abstract

Objective: C-reactive protein, total White Blood Cell count and Absolute Neutrophil counts are important inflammatory markers. These tests are highly significant as predictor of bacterial infection in febrile children.

Materials and Methods: We have collected data of 149 samples from pediatric indoor and outdoor patients. Samples were collected in both plain and EDTA vacuette. From plain vacuette CRP test was done and from EDTA vacuette total WBC count and absolute neutrophil count were done.

Results: In present study we have collected data of 149 pediatric patient. Total number of patient having bacterial infection were 101. Out of which CRP positive samples were 91(90%), 56(55.4%) samples show leucocytosis and 36(35.6%) samples show neutrophilia.

Conclusion: CRP test along with total WBC count and Absolute Neutrophil Count will be helpful for early prediction of bacterial infection and this test will guide clinician for better outcome of febrile children.

Keywords: C-reactive protein, Total WBC count, Absolute Neutrophil count, Bacterial infection, Children.

Introduction

C-reactive protein, total White Blood Cell count and Absolute neutrophil count are important inflammatory markers. C-reactive protein (CRP) is an acute-phase protein that rise in acute inflammatory conditions including bacterial infections.¹ C-reactive protein along with total leucocyte count and absolute neutrophil count will be helpful as predictors of bacterial infections in febrile children. These rapid tests are routinely done in laboratory. So, these tests will be used in developing countries to guide the clinician to differentiate between viral and bacterial infections as well as response to antimicrobial agents. Blood culture and other molecular study are not available in primary health centre and other remote area. Hence our study will be helpful in early prognosis of infection.

CRP has been shown to be a rapid useful predictor of bacterial infection and has guided clinicians in reducing antimicrobial use.^{2,3} However, there are considerably varying data regarding the sensitivity and specificity of CRP as a marker in predicting bacterial infections.⁴ Despite these reports, understanding serum levels of CRP in febrile children presenting at different health care settings is crucial towards improved rational use of antimicrobial drugs. WBC and ANC have been used alongside clinical symptoms to predict severe bacterial infection and to discriminate between viral and bacterial causes of pneumonia in children.^{5,6}

Nowadays there is rapid development of antimicrobial resistance due to overuse or misuse of antibiotic drugs. So,

we can decrease the use of antimicrobial drugs. These rapid tests are very cost effective for human and for country also.

Materials and Methods

This retrospective study was done in Central Laboratory of Dr. M. K. Shah Medical College & Research Centre, Ahmedabad from January-2019 to June-2019. In this study venous blood was collected for evaluation of serum CRP, WBC and ANC. The inclusion criteria are: 1). age between 1 and 13 years. 2). fever was defined as an axillary temperature above 38°C, as used for the diagnostic criteria of febrile episodes in the past 24 hours. We have excluded Infant patient <1 year.

We have collected data of 149 samples from pediatric indoor and outdoor patients. Samples were collected in both plain and EDTA vacuette. From plain vacuette CRP test was done and from EDTA vacuette total WBC count and absolute neutrophil count was done. C-reactive protein test was done by using rapid latex agglutination test with semi quantitative technique. Normal value is 0-6 mg/l and >6 mg/l value indicates CRP test is positive. Total WBC count and differential count test done by using MINDRAY 5-part hematology analyzer. Total WBC count, the normal range is usually between 4000 – 11000 / μ l of blood. Total WBC count, > 11000 / μ l suggest leucocytosis. Absolute Neutrophil count (ANC), the normal range is usually between 1500-8000 / mm^3 . Absolute Neutrophil count (ANC), >8000/ mm^3 shows increase in neutrophil count.

Common infection found in pediatric age group were fever with upper respiratory tract infection, pneumonia,

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<http://doi.org/10.18231/ijmmttd.2019.031>

pharyngitis, tonsillitis, typhoid, urinary tract infection, measles, mumps, influenza, non-infective gastroenteritis in our study. According to their clinical profile and laboratory tests we have differentiated them in bacterial and viral infection. Data were collected from Hospital Management Information System and Central Laboratory of Dr. M. K. Shah Medical College & Research Centre, Ahmedabad. Statistical analysis was done manually.

Ethical clearance

Consent of the Institutional Ethical Committee was taken for the study.

Results

We have collected data of 149 samples of pediatric patient with fever. Out of which 101 sample shows bacterial infection and 48 samples shows viral infection.

Table 1: Total number of sample showing CRP – positive and negative in bacterial and viral infection

	Patient having Bacterial infection (no.)	Patient having Viral infection (no.)
CRP – Positive	91(90%)	22(45%)
CRP – Negative	10(10%)	26(55%)
	101	48

Chisquare value- 34.794; p value <0.05

Total numbers of patient having bacterial infection were 101. Out of which CRP positive samples were 91(90%) and CRP negative samples were 10(10%). Total numbers of patient having viral infection were 48. Out of which CRP positive samples were 22(45%) and CRP negative samples were 26(55%).

Table 2: Total number of sample showing WBC count (normal and increased) in bacterial and viral infection

	Patient having Bacterial infection (no.)	Patient having Viral infection (no.)
WBC Count (>11000/ μ l)	56(55.4%)	14(29.2%)
WBC Count – normal	45(44.6%)	34(70.8%)
	101	48

Chisquare value- 9.021; p value <0.05

Total numbers of patient having bacterial infection were 101. Out of which 45(44.6%) samples show total WBC count within normal range (4000 – 11000 / μ l) and 56(55.4%) samples show leucocytosis. Total numbers of patient having viral infection were 48. Out of which 34(70.8%) samples show total WBC count within normal range and 14(29.2%) samples show leucocytosis.

Table 3: Total number of sample showing Absolute Neutrophil count (normal and increased) in bacterial and viral infection

	Patient having Bacterial infection (no.)	Patient having Viral infection (no.)
ANC- >8000/ mm^3	36(35.6%)	3(6.2%)
ANC -1500-8000/ mm^3	65(64.4%)	45(93.8%)
	101	48

Chisquare value- 14.548; p value <0.05

Total numbers of patient having bacterial infection were 101. Out of which 65(64.4%) samples show Absolute Neutrophil count within normal range (1500-8000/ mm^3) and 36(35.6%) samples show neutrophilia. Total numbers of patient having viral infection were 48. Out of which 45(93.8%) samples show Absolute Neutrophil count within normal range and 3(6.2%) samples show neutrophilia.

Discussion

In present study we have collected data of 149 pediatric patients. Out of which 101 had bacterial infection and 48 had viral infection. In patient having bacterial infection 1) 91 samples show CRP value >6 mg/l, 2) 56 samples show WBC count (>11000/ μ l) and 3) 36 samples show ANC count >8000/ mm^3 . In patient having viral infection 1) 22 samples show CRP value >6 mg/l, 2) 14 samples show WBC count (>11000/ μ l) and 3) 3 samples show ANC count >8000/ mm^3 . CRP levels were increased in 91 samples of bacterial infection and 22 samples of viral infection. C-reactive protein levels are not generally associated with viral infections.⁷ Increased level of CRP in viral infection may be associated with bacterial infection in some cases. This results are correlated with other author's study of S Srilakshmi et al, Coline Mahende et al & Kaya Z et al.^{8,9,10}

C-reactive protein usually increased in case of bacterial infection. Total WBC counts are also increased in most of bacterial infection with increase in neutrophil count. CRP testing had been reported by a number of researchers to be significantly helpful in reducing the prescription of antimicrobial drugs especially among patients with respiratory tract infections.^{11,12} Although alone total WBC count and ANC has low specificity, it can be used in correlation with CRP to identify the cases of bacterial infection.

Febrile illness in pediatric patient is a major global health problem. Blood culture and other culture technique are time consuming and costly. Molecular analysis for bacterial and viral organism is usually unavailable. So, there is need of inflammatory markers for early detection of infection. CRP, WBC count are usually available in all laboratory and it is economical and rapid. By using CRP test with total WBC count and Absolute neutrophil count as screening test we can treat the patient as early as possible

and decrease the use of antimicrobial drugs in case of viral infection.

Conclusion

CRP test may be helpful for early prediction of bacterial infection and this test will guide clinician for better outcome of febrile children. Along with CRP test we can correlate with total WBC count and Absolute Neutrophil Count which tests are performed routinely. These tests are highly significant as predictor of bacterial infection in febrile children. By using these less time consuming tests as routine analysis of infection we can decrease use of antimicrobial drugs and treat children as early as possible.

Acknowledgement

We are thankful to our Professor & head of department, all technical staff and management for their support.

Source of Funding

None.

Conflict of Interest

None.

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How to cite this article: Bhavsar RA, Shah K, Shrivastava J, Shah N. Profile of C-reactive protein, leucocyte and neutrophil populations as predictors of bacterial infections in febrile children. *Int J Med Microbiol Trop Dis* 2019;5(3):142-4.