

Serum C-Reactive Protein in Enteric Fever in Children: A Hospital Based Study

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ABSTRACT

Background: Enteric fever is endemic in various developing nations. Although the common test for diagnosis is determination of Salmonella typhi cultures. Despite of good specificity and sensitivity, the results of serological may not be immediately available and can be difficult to interpret in borderline cases, especially in endemic area. Levels of serum C- reactive protein, are robust, widely available and can be performed inexpensively. The present study was conducted with the aim to evaluate the levels of C reactive protein amongst subjects with enteric fever.

Materials and Methods: The study was conducted in the pediatric department for a period of one year. A complete history of all the subjects was obtained along with complete physical evaluation and serological testing. Blood and stool were tested for S. typhi. All the subjects were educated about good hygiene practices and regular use of antimicrobial drugs. All the data was arranged in a tabulated form and analyzed using SPSS software.

Results: The mean age of group I subjects was 7.2+/- 1.8 years, group II subjects had mean age of 7.1+/- 1.9 and mean

age of group III subjects was 6.0+/- 2.8 years. The rate of widal H+ in group I, group II and group III was 86% (n=43), 73.3% (n=22) and 14.3% (n=4).

Conclusion: The study concluded that combination of clinical and laboratory tests can help best diagnose cases of enteric fever.

Keywords: Enteric, Salmonella, Serological, Widal.


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INTRODUCTION

Majority of young febrile children that present in primary Healthcare are suffering from self-limiting infectious disorders. Few amongst them develop serious infections that require an antibiotic prescription or hospital readmission.^{1,2} Alarming signs are frequently seen in febrile children, and commonest of them are difficult to discriminate between children at high or low risk for serious infections. Therefore, these children are accountable for a large portion of the workload of general practitioners. A simple care test with good discriminative skills might make the triage at the level of general practitioner more efficient and prevent unnecessary antibiotic prescriptions.³

C-reactive protein is an acute-phase protein That increases in concentrations in the blood with infections.⁴ A high CRP concentration has prognostic value in pneumonia amongst adults presenting to primary care centers⁵⁻⁷ and it has significance amongst febrile children visiting emergency department.^{5,6}

Enteric fever is endemic in various developing nations. Although the common test for diagnosis is determination of Salmonella typhi cultures. These cultures are time-consuming, influenced by

antibiotic treatment and may provide clueless results for several days. The diagnosis of enteric fever depends on clinical presentation and other laboratory investigations like the Widal, and the more recently used Typhidot serological tests.^{8,9} Despite of good specificity and sensitivity, the results of serological may not be immediately available and can be difficult to interpret in borderline cases, especially in endemic area. Levels of serum C- reactive protein, are robust, widely available and can be performed inexpensively. The present study was conducted with the aim to evaluate the levels of C reactive protein amongst subjects with enteric fever.

MATERIALS AND METHODS

The study was conducted in the pediatric department for a period of one year . A written consent was obtained from all. The subjects were divided into three groups. In group I, subjects with blood culture positive for S. typhi were included, in group II subjects with blood culture negative for S. typhi but showing other features of enteric fever were included. Group III included subjects

with features of infection but not enteric fever. A complete history of all the subjects was obtained along with complete physical evaluation and serological testing. Blood and stool were tested for *S. typhi*. Every subject was appropriately rehydrated either intravenously or orally depending on the condition. Chloramphenicol was advised as first line of therapy. Freshly separated serum was used to estimate the level of CRP using

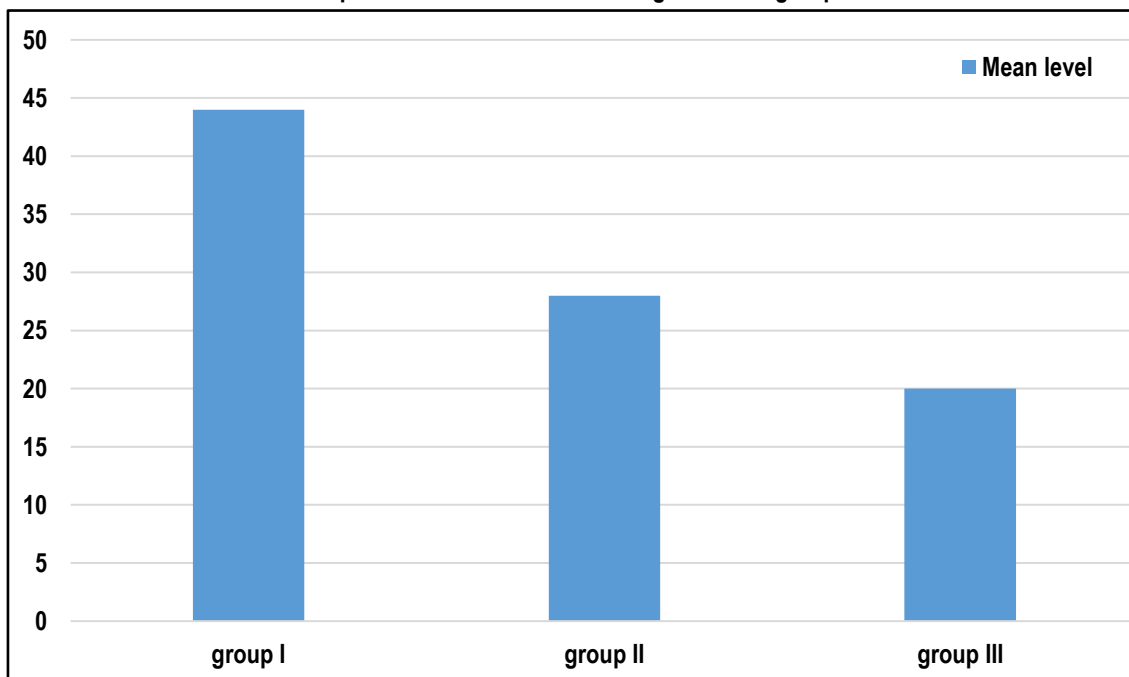
fluorescence polarization immunoassay. All the subjects were educated about good hygiene practices and regular use of antimicrobial drugs.

All the data was arranged in a tabulated form and analyzed using SPSS software. Student t test was used to determine the difference between three groups. Probability value of less than 0.05 was considered as significant.

Table 1: Baseline characteristics of children

Variable	Group I	Group II	Group III	P value
Number	50	30	28	
Age	7.2+/- 1.8	7.1+/- 1.9	6.0+/- 2.8	<0.05
M (%)	50%(n=25)	60%(n=18)	50%(n=14)	
Serum CRP (mg/dl)	13-180	9-90	5-100	<0.05
Duration of fever	4.8-13.9	6.7-16.5	2.1-9.8	<0.05
Widal O+	90%(n=45)	86.7%(n=26)	17.8%(n=5)	
Widal H+	86%(n=43)	73.3%(n=22)	14.3%(n=4)	

Graph 1: Mean level of CRP amongst various groups



RESULTS

The study was divided into three groups. Group I included 50 subjects, Group II had 30 and Group III had 20 subjects. The mean age of group I subjects was 7.2+/- 1.8 years, group II subjects had mean age of 7.1+/- 1.9 and mean age of group III subjects was 6.0+/- 2.8 years. There was a significant difference in the age group between the groups. The range of CRP in group I, group II and group III was 13-180mg/dl, 9-90 mg/dl and 5-100 mg/dl respectively. There was a significant difference between the groups. The mean duration of fever was 4.8-13.9 days in group I, 6.7-16.5 days in group II and 2.1-9.8 days. There was a significant difference in the duration of fever between the groups. The rate of widal O+ in group I, group II and group III was 90% (n=45), 86.7% (n=26) and 17.8% (n=5). The rate of widal H+ in group I, group II and group III was 86%(n=43), 73.3%(n=22) and 14.3%(n=4). (table 1, graph 1)

DISCUSSION

Fever is an indicator of various diseases that can be viral, bacterial, and immune mediated. Recent studies have shown that endogenous pyrogen, that is indirectly responsible for causing fever, is a byproduct of monocytes.¹⁰ This substance has different functional properties and has recently been named as interleukin-1 (IL-1).¹¹ Studies have proven that induction of Macrophages can be done to produce IL-1 by various stimuli, like endotoxins, lymphokines, and particulate ingestions.^{12,13} Interleukin also causes hepatic synthesis of various serum proteins. The most common is acute phase reactant i.e. C-reactive protein (CRP).¹⁴ Although fever is a common occurrence of viral infections and raised CRP occurs rarely but it is used to differentiate between viral and bacterial infections.¹⁵ The present study was done determining the level of CRP in enteric fever subjects. As per the present study, the mean age of group I subjects was 7.2+/- 1.8

years, group II subjects had mean age of 7.1+/- 1.9 and mean age of group III subjects was 6.0+/- 2.8 years. There was a significant difference in the age group between the groups. The range of CRP in group I, group II and group III was 13-180mg/dl, 9-90 mg/dl and 5-100 mg/dl respectively. There was a significant difference between the groups. The mean duration of fever was 4.8-13.9 days in group I, 6.7-16.5 days in group II and 2.1-9.8 days. There was a significant difference in the duration of fever between the groups. The rate of widal O+ in group I, group II and group III was 90% (n=45), 86.7% (n=26) and 17.8% (n=5). The rate of widal H+ in group I, group II and group III was 86% (n=43), 73.3% (n=22) and 14.3% (n=4). The clinician should rely on the clinical presentation of the disease and should promptly ask for the laboratory tests to make an appropriate diagnosis at the time of admission to hospital in enteric fever prone area. As per a study involving children with gastroenteritis the investigators used ROC analysis, and they found that the serum CRP is a useful tool in predicting whether the infection was a viral or bacterial infection.¹⁶ CRP is regularly measured amongst the pediatrics but it doesn't influence the decision strategy.¹⁷ There are different cutoff levels for CRP amongst febrile children for different diseases.⁶ A recent study has shown that the level of C reactive protein are higher amongst the subjects infected with multi drug strains compared to single strain of S typhi.¹⁸

CONCLUSION

The study concluded that combination of clinical and laboratory tests can help best diagnose cases of enteric fever. Amongst the laboratory tests CRP acts as a reliable indicator for enteric fever diagnosis. CRP can be useful indicator for the diagnosis and the response to treatment.

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