

Role of C-Reactive Protein in Diagnosis of Acute Tonsillitis : A Study Done at Western Regional Hospital, Nepal

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ABSTRACT

Introduction: Acute tonsillitis, defined as an inflammation of the tonsils is a part of the spectrum of sore throat. It is a common diagnosis of patients in Ear, Nose, Throat out-patient department with a sore throat. It equally affects both gender and all age groups. There has been an alarming increase in the use of antibiotics in acute tonsillitis. Thus our study aims to establish the rational use of antibiotics in acute tonsillitis by differentiating between bacterial from tonsillitis due to other etiologies. Thus, we have used the C-Reactive protein as a tool to support the diagnosis of bacterial tonsillitis.

Materials and Methods: This is an observational study conducted from January 2018 to January 2019 in the Department of ENT, Pokhara Academy of Health Sciences. The objective of this study is to establish the role of C-reactive protein for the diagnosis of acute bacterial tonsillitis. Patients of all age groups presented with sore throat and fever and diagnosed with acute tonsillitis were enrolled in the study. Complete blood count with throat swab culture sensitivity and C-reactive protein were sent and reports were studied. SPSS was used to analyse the data. Association between variables was examined using independent sample T-test, Chi square test and binary logistic regression OR with 95% CI was reported.

Results: There were 35 patients ie. 37.2% labeled as a bacterial group who had bacterial growth in their throat swab culture examination and 59 ie 62.8% had no growth and labeled as a viral group. Bacterial group showed significantly higher odds of having positive CRP value compared to viral/non-bacterial group (OR: 3.737, 95% CI: 1.547 – 9.028, p = 0.003).

Conclusion: C-reactive protein can be a diagnostic tool for differentiating bacterial from viral tonsillitis.

Keywords: Acute tonsillitis, bacterial tonsillitis, C-reactive protein, sore throat.

INTRODUCTION

Acute tonsillitis may be defined as inflammation of the tonsils, predominantly due to infection. It is part of the spectrum of pharyngitis that ranges from localised tonsillar infection to generalized infection of the pharynx. This affects both sexes and all age groups, but is more common in younger people, especially in autumn and winter.¹ In 50-80% of cases, the causative pathogen is a virus, for example, Epstein-Barr virus, herpes simplex, influenza and rhinovirus. Bacteria, the commonest being Group A beta-haemolytic Streptococci, cause 5-36% of cases. Other bacteria that can infect the tonsils and pharynx include *Hemophilus influenzae*, *Streptococcus pneumoniae* and *Neisseria gonorrhoea*.² The differentiation of streptococcal from viral tonsillitis based on the appearance of the tonsils alone is impossible.³ A nonspecific inflammatory reaction is assessed by measuring changes in the leukocyte count and changes in the differential leukocyte count, and or by measuring the changes in serum concentration of C-reactive protein (CRP).⁴ In some cases, however, these methods do not provide a rapid answer to the clinically crucial question of whether the etiology of the inflammation is bacterial or viral.⁵ C-reactive protein is synthesized by hepatocytes. It is a pentameric protein consisting of five noncovalently bonded identical subunits with an overall molecular weight of approximately 118,00 daltons. Upon infection or tissue inflammation, CRP production is stimulated by cytokines, particularly IL-6, IL-1, and tumor necrosis factor.⁶ CRP rises more rapidly and peaks earlier in response to inflammatory stimuli. It also returns to normal levels more quickly upon resolution of stimuli.⁷

The main aim of this study is to establish a correlation between CRP and acute bacterial tonsillitis which shall be confirmed by Culture and Sensitivity reports.

MATERIALS AND METHODS

This is an observational study conducted from January 2018 to January 2019 in the Department of ENT, Pokhara Academy of Health Sciences. Patients of all age groups presented with sore throat and fever and diagnosed with acute tonsillitis were enrolled in the study. Complete blood count with throat swab culture sensitivity and C reactive protein was sent and reports were studied. Patients were divided into

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two groups: Viral tonsillitis and Bacterial tonsillitis based on the culture sensitivity report. Data was analysed using SPSS version 24. Frequencies and proportion was reported for categorical variables whereas mean and standard deviation (SD) was reported for continuous variables. Chi-square test and binary logistic regression was used to examine the relationship between two categorical variables. Similarly, independent sample t-test was used to examine the association between continuous and dichotomous categorical variables. p-value less than 0.05 was considered as statistically significant results. ODDS Ratio (OR) with 95% Confidence Interval (CI) was reported for binary logistic regression.

RESULTS

In this study, among 94 patients 60 (63.8%) were females and 34 (36.2%) were males. The minimum age of the patient was 11 years and the maximum age was 84 years. The mean age group was 28.24±11.65 years. The age group of 20-29 years had a maximum number of patients 40 (42.55%) and minimum patients 6 (6.38%) were in the group of > 50years. In the study, 35 patients ie. 37.2% had bacterial growth in their throat swab culture examination so labeled as a bacterial group and 59 ie 62.8% had no growth and labeled as a viral group (Table 1).

Table 1: Age-wise distribution of patients with acute tonsillitis (n = 94)

Age group (years)	Viral (No bacterial growth)	Bacterial growth	Total
10-19	13 (72.2%)	5 (27.8%)	18(100.0%)
20-29	20 (50.0%)	20 (50.0%)	40 (100.0%)
30-39	16 (72.7%)	6 (27.3%)	22 (100.0%)
40-49	6 (75.0%)	2 (25.0%)	8 (100.0%)
50-59	4 (66.7%)	2 (33.3%)	6 (100.0%)
Total	59(62.8%)	35 (37.2%)	n = 94 (100.0%)

In this study, no growth of organism was seen in maximum number of cases ie. 59(62.8%) and thus labeled as viral group. In the bacterial group, Group B haemolytic Streptococcus was the most common

organism present in 22 cases(23.4%) whereas E.coli, Klebsiella and Pseudomonas was seen in least number of patients ie. 1(1.1%) as shown in Table 2.

Table 2: Distribution of causative agents in patients with acute tonsillitis (n=94)

Organism	Frequency	Percentage (%)
E. coli	1	1.1
Klebsiella	1	1.1
No growth(viral)	59	62.8
Pseudomonas	1	1.1
Staphylococcus aureus	7	7.4
B hemolytic streptococcus	22	23.4
Streptococcus pneumonia	3	3.2
Total	94	100.0

In bivariate binary logistic regression, bacterial group showed significantly higher odds of having positive CRP value compared to viral/non-bacterial group (OR: 3.737, 95% CI: 1.547 – 9.028, p = 0.003). Among the viral group, 39 (66.1%) had negative CRP values whereas 20 (33.9%) had positive CRP values. Whereas in the bacterial group 23 (65.7%) had positive CRP values and 12(34.3%) had negative CRP values. Among both the groups, 51(54.3%) had negative CRP values and 43 (45.7%) had positive CRP values (Table 3 and Fig. 1).

Table 3: Association between CRP and organism categories (n=94)

Organism	CRP categories		OR (95% CI)	p-value
	Positive	Negative		
Viral/Non-bacterial	20 (33.9%)	39 (66.1%)	3.737 (1.547 – 9.028)	0.003
Bacterial	23 (65.7%)	12 (34.3%)		

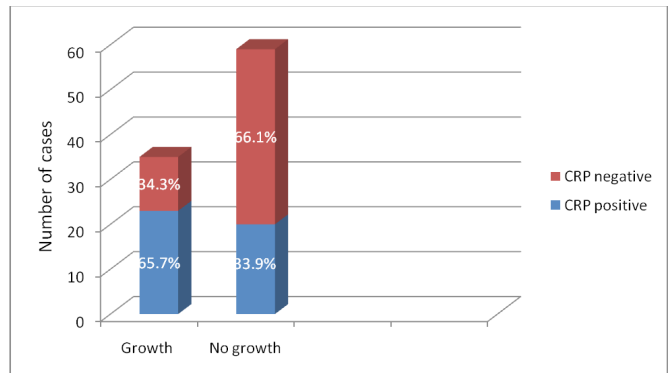


Fig.1: Bacterial growth/CRP in culture

DISCUSSION

Tonsillitis is an infection which affects mainly children and adolescents. The most common cause of acute tonsillitis is viral and around one third is bacterial in origin in contrast to a study done by Suzumoto M et al^{2,8} where the bacterial infection was more prevalent than viral. Many studies have been done to differentiate bacterial and viral infection with the use of acute phase reactants such as CRP, ESR, 2-5-oligoadenylate synthetase, etc. Though various inflammatory markers are available for measurement in acute infective and chronic infective stage, they may not be available in all health centers especially in a country like ours where the resources are limited. To limit the number of investigations, simple and easily available tool such as CRP can be used. Many types of research have been conducted in the past regarding the use of CRP in differentiating bacterial from viral etiology. They showed mixed results some showing a strong correlation between bacterial infection and CRP. In this study, the patients whose throat swab showed bacterial growth were about four times (OR: 3.73, 95%CI: 1.54-9.02) more likely to have CRP positive results as compared to those which showed no growth. Thus, positive CRP co-relates with acute bacterial tonsillitis and negative value with the viral cause in this study. Similar reports were observed by Kaya Z et al.⁹, Ylikoski J et al.¹⁰, Stjernquist-Desatnik A et al.¹¹. In contrast to this study, Bakashi P et al.¹² led to the conclusion that the measurement of acute phase reactants cannot differentiate between viral or bacterial tonsillitis but age can be a factor. In their study, they have concluded that bacterial cause is more dominant in children whereas bacterial in adult. In contrast to this study in the age group 20-29 years, there is an equal number of bacterial and viral cases and the viral group is predominant in the rest of the age

groups. Various studies have been done regarding CRP in differentiating viral and bacterial etiology in other febrile illnesses besides tonsillitis. Toikka P et al.¹³ in their study of children with pneumonia observed that CRP is of little value in differentiating bacterial and viral etiology however, very high level CRP is suggestive of bacterial etiology. Similarly Nooruddin R et al¹⁴ also observed that high level of serum CRP is useful in detecting bacterial cause of acute otitis media in children. Although various other markers along with CRP have been used in other studies, because of limited resources only CRP is used here, also the value of CRP is not measured. In this study, the cases without bacterial growth in culture were considered to be of viral etiology by diagnosis of exclusion although ideally viral culture or other viral detection tests should have been performed.

CONCLUSION:

In this study, CRP was positive more in bacterial tonsillitis as compared to the viral group. showing that there is a strong association between acute phase reactant CRP and bacterial tonsillitis. Thus it can be concluded that CRP can be a diagnostic tool for the differentiation of bacterial from viral tonsillitis. Thus, in a setting like ours, the study can create guidance for the rational use of antibiotics in acute bacterial tonsillitis.

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