

Importance of High C-Reactive Protein (CRP) And Total Leukocyte Count (TLC) In Odontogenic Space Infections

SADIA RASHID¹, MUHAMMAD ADNAN IQBAL², MUHAMMAD ADEEL³, SANA ZAFAR⁴, SHAHIDA MAQBOOL⁵, DANISH JAVED⁶, MUHAMMAD RIZWAN⁷

¹Professor of Physiology, Frontier Medical and Dental College Abbottabad.

²Assistant Professor Medicine, Gujranwala Medical College, Gujranwala.

³Assistant Professor, Department of Oral Medicine, Islam dental college, Sialkot.

⁴Associate professor Oral Biology, Islam Dental College Sialkot

⁵Assistant Professor Oral Medicine, HBS Medical & Dental College Islamabad.

⁶Associate Prof Oral Pathology, Islam Dental College Sialkot

⁷Professor Oral Pathology, HBS Dental College Islamabad.

Correspondence to Dr Sadia Rashid, Email: drsadiarizwan@gmail.com Mobile: 0333-5435866

ABSTRACT

Background: An acute inflammatory homo-pentameric plasma protein, C-reactive Protein, discovered in 1930, is found in small amounts in healthy persons and plays an important role in natural immune system, activation of complement system and phagocytosis and antigen clearance.

Aim: To determine high C - reactive protein (CRP) and Total Leukocyte Count (TLC) in patients suffering from odontogenic space infections.

Methods: Present study was carried out in the department of Oral Surgery at Islam Dental College, Sialkot from Sept. 2020 to Oct 2021. A total of 151 male and female patients of 22-65 years age range with odontogenic space infection were included. Patients suffering from chronic disease like diabetes, chronic renal failure, and pregnant women were excluded. Sample of patient's blood was sent to the hospital laboratory for measurement of serum C - reactive protein (CRP) and Total Leukocyte Count (TLC) levels.

Results: Patient's age range in our study was 22 to 65 years with mean age of 54.5±14.68 years. Out of 151 patients, 93 (61.58%) were male and females were 58 (38.42%) showing male to female ratio of 1.6:1. Mean CRP levels were 3.52±1.23 mg/L and Mean TLC levels were 13670 ± 1890 cells/mm³. In our study, frequency of raised CRP levels was found in 100% and TLC in 71.82% of patients with odontogenic space infections.

Conclusion: This study concluded that frequency of raised C-Reactive Protein (CRP) levels are found in 100% patients, indicating CRP to be an effective biomarker in infected patients.

Keywords: Odontogenic Infections, C-Reactive Protein (CRP), Total Leukocyte Count (TLC).

INTRODUCTION

Most of orofacial infections in human beings are odontogenic in origin.¹ Patients presenting odontogenic space infections of the head and neck region are at more risk for life threatening situations due to minimal resistance, anatomical location, vital organ's presence in the area and fast spread mode of these infections.² Several Serious complications of Respiratory and cardiovascular system may become inevitable; therefore, careful scrutiny and monitoring of these patients is necessary. Such serious complications usually occur at a rate of 10-20%^{3,4}. A serum inflammatory biomarker like high sensitivity C-reactive protein (hs-CRP), has been advocated to highlight the risk of adverse cardiovascular (CV) events effectively⁵⁻¹¹.

White Blood Count (WBC) count and Erythrocyte Sedimentation Rate (ESR) values are important at testing time, however their predictability is limited.¹² Due to importance of serum-derived surrogate predictor behavior and outcome, several inflammatory markers are discovered functioning as prospective indicator of disease process.¹³ In 1930, Tillet and Francis discovered C-reactive protein (CRP) during the investigation of sera of *Pneumococcus* infectious patients and named it due to its reaction with the capsular (C)-polysaccharide of *Pneumococcus*^{14,17, 22} C-reactive Protein is found in small amounts in healthy persons and plays an important role in natural immune system, activation of complement system and phagocytosis and thus antigen clearance.^{15,16} Marked increase up to 1000 fold of serum CRP levels, is noted within a few hours of clinical symptoms in severe inflammatory reactions.¹⁶ In a study conducted by Bali R and colleagues in 2017, raised CRP levels were found in 100% and TLC in 64% of patients with Odontogenic space infections^{17,18}.

Received on 11-09-2021

Accepted on 22-03-2022

Total Leukocyte Count (TLC) test is commonly used for diagnosing Odontogenic space infections, adding the estimation of CRP as a new diagnostic tool.

This study was conducted to determine raised CRP and TLC in odontogenic space infection patients. Literature search revealed no local study on this topic.

MATERIALS AND METHODS

This descriptive, cross-sectional study was done after IRB permission in Oral Surgery Department at Islam Dental College Sialkot. Total of 151 patients of 22-65 years age range, were diagnosed with odontogenic space infections by taking patient's history, thorough clinical examination and radiographic Examination indicating periapical changes. We excluded patients suffering from chronic disease like diabetes mellitus, chronic renal failure and pregnant women from the study. The study was approved by the ethical review committee of Islam Dental College, Sialkot

An informed patient's consent and college ethical committee permission was taken. Collected Samples of patient's blood for serum C - reactive protein (CRP) and Total Leukocyte Count (TLC) level measurements were sent to hospital laboratory. The results were analyzed by SPSS version 20.0 and Mean and standard deviation for age, duration of symptoms and raised serum C-Reactive Protein (CRP) and Total Leukocyte Count (TLC) levels, their raised frequency and percentages were calculated for gender.

RESULTS

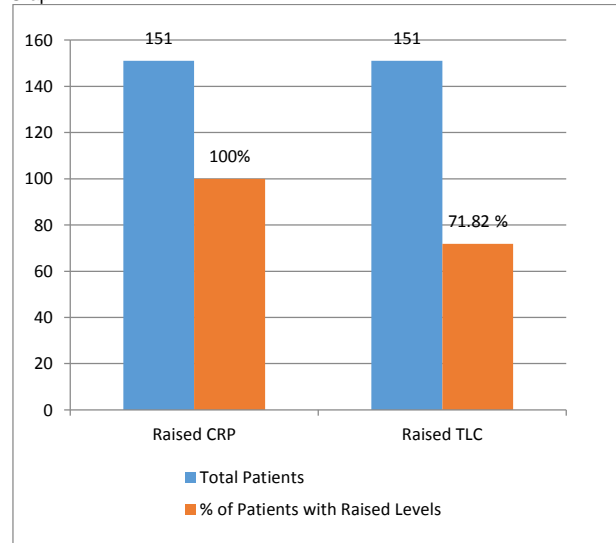
Age range of patients in our study was 22-65 years with mean of 54.5 ± 14.68 years. Out of 151 patients, 93(61.58%) were male and 58 (38.42%) were females and male to female ratio was 1.6:1. Mean duration of symptoms in our study was 29.24±7.61 hours. Mean BMI was 30.02±2.05kg/m². Mean CRP levels were 3.52±1.23 mg/L. Mean TLC levels were 13670±1890 cells/mm³. In

our study, frequency of raised CRP levels was found in 100% and TLC in 71.82% patients with Odontogenic space infections. The results are shown in Table 1 and Graph 1.

Table 1: Raised C-Reactive Protein (CRP) and Total Leukocyte Count (TLC) in patients with odontogenic space infections

Laboratory Test	Frequency (%)	
	Yes	No
Raised CRP in Patients	151(100%)	0
Raised TLC in patients	108 (71.82%)	43 (28.18%)

Graph : 1



DISCUSSION

According to many authors, Inflammatory serum markers are very useful and quantitatively can be helpful for finding therapeutic efficacy of various treatment modalities for investigating the severity of infection, dealing with pre and post-operative infections and appropriate use of prophylactic antibiotic.^{20,21} Thus many authors advised use of CRP in infection assessment due to their multiple advantages^{20,18}.

This study was conducted to find the frequency of raised C-reactive protein and Total Leukocyte Count (TLC) in odontogenic space infections. Age of patients in this study ranged between 22 to 65 years with mean of 54.5 ± 14.68 years. Out of 151 patients, male were 93(61.58%) and females were 58(38.42%) with 1.6:1 male to female ratio. In our study, frequency of raised CRP levels was found in 100% and TLC in 71.82% patients with Odontogenic space infections. In a study conducted by Bali R and colleagues in 2017, raised CRP levels were found in 100% and TLC in 64.0% patients with Odontogenic space infections¹⁷.

Tillet and Francis identified CRP in 1930 as an acute-phase protein²². It has been studied as a screening device for inflammation, a non-specific marker for disease activity and as a diagnostic adjunct. Physiologically, it increases cell-mediated immunity by phagocytosis promotion, chemotaxis acceleration and platelets activation. CRP is a reliable early indicator of inflammation or injury^{22,23}. According to Mustard et al. CRP post-op levels could indicate septic complications prior to their clinical appearance²⁴.

In similar studies by Pinilla et al., and Malve I found statistically significant correlation between pre-albumin and CRP at 2nd day ($r = 0.45$, $p < 0.01$) and 5th day ($r = 0.53$, $p < 0.01$) and mean serum levels of pre-albumin decreased ($p < 0.001$) and significantly increased levels of CRP ($p < 0.01$) respectively in patients compared to healthy controls^{25,17} according to studies by Pinilla et al²⁷, use of Pre-albumin and CRP inflammatory markers is an easy and inexpensive method of assessment of illness

severity in critical patients²⁷. CRP can be a useful infection indicator along higher body temperature above 38.2°C also stated by Pova et al in a study where healthy individual's CRP raised from 0.08 mg/dl to more than 8.7mg/dl when infected by *S aureus*⁴⁰.

Importance of WBCs is more in the assessment of patient's response to treatment but has minor role in the diagnosis and judgement of severity of head and neck infections which is well supported by studies of Boucher et al²⁹ and Heimdahl and Nord³⁰. When Compared in odontogenic infections, CRP is better marker in an infection process due to faster increase in level of CRP than WBC^{31,32}. In a study of comparative assessment, Ebersole in 1997³³ also found significant raised CRP and hepatoglobin in periodontitis patients and normal person's characteristics. With this finding Manelli in 1998 and others came to conclusion that localized infection and inflammation, resulting in stimulating systemic host changes are manifested by raised CRP^{34,35}.

Similarly CRP, IL-6 and α -1 antitrypsin concentration levels were found raised in the serum in a study by Gunnell et al. and Haupt et al^{36,37,38}. Flores et al. in 2001 also concluded higher CRP levels suggesting underlying infectious complication while studying several patients with severe infection due to trauma.³⁹ Therefore, raised CRP levels show an infectious condition of the body, which in case of our study are the odontogenic spaces.

The limitation of this study was that a relatively smaller sample size was used and there was no long term follow up. Further studies with longer follow ups and a larger sample size are recommended so that the results can be generalized to the local population.

CONCLUSION

This study concluded that frequency of raised CRP concentration was found in 100% patients, and CRP was found to be an effective biomarker in patients with odontogenic space infections as compared to TLC. So, we recommend that CRP should be used in assessment and management of odontogenic space infections routinely to reduce the morbidity of such patients.

Disclaimer: None

Conflict of interest: None

Source of funding: None

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