



STUDY ON ELEVATED C- REACTIVE PROTEIN (CRP) LEVEL IN PATIENTS OF DIFFERENT SPECIALTY WARDS OF A TERTIARY HEALTH CARE CENTER.

Microbiology

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ABSTRACT

Objective- To understand the importance of CRP test in diagnosis of neonatal sepsis, Rheumatoid arthritis and other inflammatory presentation brought to Medical college hospital.

Introduction- One hundred samples of patients were screened for CRP those who are having various ailments in the Medical college hospital, we have screened the serum samples by latex agglutination test. CRP appears and disappears more quickly than changes in ESR. Therefore the CRP is considered the useful nonspecific biochemical marker of inflammation measurement. CRP contributes importantly to various disease diagnosis.

Results & Observation- The study is based on 100 samples collected from different specialty in duration of three months. Neonatal sepsis is confirmed in two cases out of four. The study was useful in finding out indication of arthritis in 20% cases of orthopedic dept. The study was also useful in ascertaining the impact of drugs used in post -surgery cases and also in cases of general medicine.

KEYWORDS

CRP (C- reactive protein)

INTRODUCTION

CRP was discovered by Tillet and Francis in 1930¹ in patients with pneumococcal pneumonia, where it was found to interact with the C-polysaccharide of streptococcus pneumoniae cell wall, hence the term C-reactive protein. CRP is produced and synthesized in the liver in response to inflammatory cytokines and assists in complement binding and phagocytosis by macrophages.²

CRP can aide the physician in the diagnostic algorithm and clinical monitoring of various infectious or inflammatory conditions. Clinicians should be aware of the limitations of these tests and the conditions that may account for discordant results and utilize them within the clinical context in which they are obtained³. A high level of CRP in the blood is a marker of inflammation. It can be caused by a wide variety of conditions, from infection to cancer. The C-reactive protein (CRP) test is used to detect inflammation.^{3,4}

Overview of C-reactive protein structure-

C-reactive protein (CRP) is an annular (ring-shaped), pentameric protein found in blood plasma, whose circulating concentrations rise in response to inflammation. It is an acute-phase protein of hepatic origin that increases interleukin-6 secretion by macrophages and T cells. Its physiological role is to bind to lyso phosphatidylcholine expressed on the surface of dead or dying cells (and some types of bacteria) in order to activate the complement system via C1q.⁵

The circulating value of CRP reflects ongoing inflammation and/or tissue damage much more accurately than do other laboratory parameters of the acute-phase response, such as plasma viscosity and the erythrocyte sedimentation rate. Normal concentration in healthy human serum is usually lower than 4.9 mg/L, slightly increasing with aging. Higher levels are found in late pregnant women, active inflammation, bacterial infection, severe bacterial infections, tissue injury (post operation), trauma and burns. CRP is a more sensitive and accurate reflection of the acute phase response than the ESR. (en.wikipedia.org)⁶

CRP appears and disappears more quickly than changes in ESR. Therefore, CRP level may drop to normal following successful treatment (boneandspine.com), whereas ESR may remain elevated for a longer period.⁷

The half-life of CRP is constant. Therefore, CRP level is mainly determined by the rate of production (and hence the severity of the precipitating cause). In the first 24h, ESR may be normal and CRP elevated (en.wikipedia.org). Increased CRP values during the first 5 postoperative days do not indicate that an infection is ongoing. An infection should be considered with prolonged CRP elevation (more than 5 days)⁸

The CRP concentration is thus a very useful nonspecific biochemical marker of inflammation, measurement of which contributes importantly to (a) screening for organic disease, (b) monitoring of the response to treatment of inflammation and infection, and (c) detection

of intercurrent infection in immunocompromised individuals, and in the few specific diseases characterized by modest or absent acute-phase responses⁹.

Diagnostic use of CRP test-

- 1- The CRP test is widely used to detect sepsis in newborn babies⁹.
- 2- The CRP test may be used to monitor patients after surgery. Generally, CRP levels increase after surgery and drop down to normal unless post-surgery infection is present¹⁰.
- 3- CRP can be a good predictor of rejection in kidney transplant recipients¹¹.
- 4- It may also be used on a regular basis to monitor conditions such as rheumatoid arthritis and lupus and is often repeated at intervals to determine whether treatment is effective¹².
- 5- High CRP levels predict ultrasound progression of disease in patients with carotid artery stenosis. In addition, CRP levels may provide additional information to help guide ultimate therapy for evaluation and follow-up of patients with borderline lesions identified by duplex exam^{13,14}.
- 6- CRP could be a useful marker of arterial stiffness in treated hypertension patients and a possible target for arterial inflammation in hypertension¹⁵.
- 7- increased levels of C-reactive protein (CRP), a marker of immune system activation, are predictive of diabetes, independent of adiposity¹⁶.
- 8- C-reactive protein (CRP) and amyloid P (AP) are pentraxins which are associated with many pathological lesions, including the amyloid deposits and neurofibrillary tangles (NFTs) of Alzheimer disease (AD)¹⁷.

CRP value in serum-

1-Normal value-In healthy adults, the normal concentrations of CRP varies between 0.8 mg/L to 5.0 mg/L. concentrations^{8,18}.

2-Acute inflammation- In acute inflammation, CRP can increase as much as 50 to 100 mg/L within 4 to 6 hours in mild to moderate inflammation or in infection such as skin infection, cystitis, or bronchitis. It can double every 8 hours and reaches its peak at 36 to 50 hours following injury or inflammation.

CRP between 100 and 500 mg/L is considered highly predictive of inflammation due to bacterial infection. Once inflammation subsides, CRP level falls quickly because of its relatively short half-life¹⁹.

3-Chronic inflammation-CRP concentrations between 2 and 10 mg/L are considered as metabolic inflammation: metabolic pathways that cause arteriosclerosis and type II diabetes mellitus²⁰.

Principle of CRP Test (Effoe, et. al., 2015), (Mazdi, et. al., 2017)

The C-Reactive Protein test is based on the principle of the latex agglutination. When latex particles complexed human anti-CRP are mixed with a patient's serum containing C reactive proteins, an visible agglutination reaction will take place within 2 minutes²¹.

Procedure of CRP Test ((Effoe, et. al., 2015), (Mazdi, et. al., 2017)**Qualitative Test²²**

1. Bring all reagents and serum sample to Room Temperature and mix latex reagent gently prior to use. Do not dilute the controls and serum.
2. Place 1 drop of Serum, Positive control and Negative control on separate reaction circle on glass slide.
3. Then add 1 drop of CRP latex reagent to each of the circles.
4. Mix with separate mixing sticks and spread the fluid over the entire area of the cell.
5. Tilt the slide back and forth slowly for 2 minutes observing preferably under artificial light.
6. Observe for visible agglutination.

Semi-Quantitative Test²²

1. Prepare dilution of the specimen with physiological saline 0.9%, as indicated in this table

Dilution	CRP (ug/ml) in undiluted sample
1:2	14
1:4	28
1:8	56
1:16	112
1:32	224
1:64	448

2. Then proceed for each dilution as in qualitative test.

Result Interpretation of CRP Test²²

Positive: Agglutination of latex particles, indicating the presence of C-reactive protein at a significant and detectable level.

Negative: No Agglutination.

For Semi-Quantitative Test Results, the last dilution of serum with visible agglutination is the CRP titre of the serum.

CALCULATION OF TITRE²²

CRP ug/ml = 7 x D, where D is the highest dilution of serum showing agglutination and 7 is the sensitivity in ug/ml.

RESULTS-**1-CRP positive sample-**

Total sample	Positive sample (No.)	Positive sample (%)	Negative sample (NO.)	Negative sample (%)
100	15	15%	85	85%

Total 15% samples were found with positive CRP and 85% were recorded Negative.

2-Genderwise CRP Testing-

Total sample	Male (No.)	Male (%)	Female(No.)	Female(%)
100	39	39%	61	61%

Out of 100 samples 39% samples pertains to male patients and remaining 61% of female.

3-CRP positive sample Gender wise-

Gender	Total sample	Positive (No.)	Positive (%)
Male	39	08	20.51%
Female	61	07	11.47%

Out of 39 samples of male patients, 08(20.51%) were found positive CRP and out of 61 female samples 07(11.47%) were positive CRP.

4-Age wise CRP positive sample-

Age group(yrs)	Sample tested(No.)	Positive sample (No.)	Positive sample (%)
0-20	07	02	28.57%
21-40	47	05	10.64%
41-60	32	05	15.64%
> 60	14	03	21.43%
Total	100	15	15%

Out of 4 samples collected from neonatal children, 02 (50%) were positive CRP shown in 0-20 years age bracket. Samples collected from > 60 years patients had highest (21.43%) CRP positive and

lowest (10.64%) belong to age group between 21-40 yrs.

5-Departmentwise/ward wise CRP positive sample-

Dept/ward	Sample tested (No.)	Positive CRP (No.)	Positive CRP(%)
Medicine	37	02	5.40%
G.Surgery	22	04	18.18%
OBG	06	01	16.6%
ENT	01	00	00
Ortho	30	06	20.00%
Pedia	04	02	50%
Total	100	15	15%

Highest (50%) CRP positive sample belong to pediatrics followed by ortho (20%) then G.Surgery (18.18%) then OBG (16.6%). ENT samples were found negative for CRP. Out of 4 samples collected from neonatal children, 02 (50%) were positive CRP.

DISCUSSION AND OBSERVATIONS-

- 1- Neonatal patients confirms Sepsis. 2 out of 4 neonatal samples confirms positive CRP (Refer Table 5 pediatrics dept.)
- 2- 21.43% samples of > 60 yrs age patients were indicative of arthritis subject to further confirmatory tests. 20% of samples collected from ortho ward were CRP positive. (Refer table 4)
- 3- The samples collected from Surgery dept. shows 18.18% positive CRP, indicative for inflammatory persistence in the body .
- 4- CRP test carried out were also indicative to examine the effect of medicine for further line of treatment by clinicians.
- 5- In this study we could not find any correlation of the raised CRP level with age and sex specifically.
- 6- Study is indicative that Arthritis cases are more (21.43%) in samples collected from > 60 years age group subject to further confirmatory diagnosis of Rheumatoid arthritis.

CONCLUSION-

We may draw the conclusion from the study that sepsis in neonatal children can be confirmed by C-reactive protein test . The inflammatory conditions in the body can early be detected for further probe in the matter. The action of applied drugs in different ailment can also be monitored quickly for further management .The differential diagnosis amongst certain diseases is also possible to the extent outlining to form a preliminary opinion of the clinicians. Increased levels of CRP generally are reflective of underlying inflammation, resulting from trauma or infection. The study could not establish any relationship of elevated CRP with that of age and sex.

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