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An Evaluated Study of Serum C - reactive protein (CRP) and Erythrocyte Sedimentation Rate (ESR) in a Tertiary Care Hospital.

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ABSTRACT

Background: The aim of the study is to evaluate instead serum C – reactive protein level and Erythrocyte sedimentation rate as a monitoring tool for all patients to determine severity of infection, attending the OPD in a tertiary care hospital. **Methods:** This study was conducted in Department of Microbiology & Pathology in Heritage Institute of Medical Sciences, Varanasi. Serum CRP level was measured by CRP analyzer & ESR by Wintrobe's method. **Results:** In above study, A total numbers of 240 cases were included, out of which 43.4% were male and 56.7% were females. Among the total number of patients, 76.7% were CRP positive & rest were CRP negative. While, in case of ESR it was elevated in 63.4% cases & rest were normal before starting the treatment. **Conclusion:** This study conclude that both CRP and ESR aid in analysis and monitoring of the disease but assessment of serum CRP level is much more sensitive in infections.

Keywords: Erythrocyte sedimentation rate, C-reactive protein, Inflammation

INTRODUCTION

Erythrocyte sedimentation rate (ESR) is a simple, cheap and minimally invasive test for assessing the acute and chronic inflammatory response. Though, this useful test was discovered in 1897 by a Polish Physician Edmund Biernacki, but this discovery was not known. Robert fahraeus, Swedish hematologist and pathologist, was credited for rediscovering and presenting this test to the scientific world in 1918. He used this test as a pregnancy test.[1] The ESR test is one of the most commonly used laboratory tests in clinical practice and is still a useful tool for monitoring inflammatory diseases, e.g. rheumatoid arthritis.[1]

ESR values have been found to increase with age in normal individuals and a formula has been devised for calculating the maximal normal ESR at any age.[2] For each 5-year increase in age, the values of ESR increase by 0.85 mm/h. This may be associated with high levels of fibrinogen or the prevalence of higher occult disease in elders.[3] Though, the highest normal ESR values have been found among people aged 65-74 years.[4] The high values of ESR increase the likelihood of disease at any age.[2] But there are many cases where no reason will be found for an elevated ESR. The International Committee for Standardization in Hematology (ICSH) recommends that the best method to measure the ESR is the Westergren method.[5]

The erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP) are two frequently used laboratory tests that may assist clinicians to diagnose many complex disease states. Though these tests have a low index of specificity and are influenced by several disease factors. Still the clinicians receive the valuable information when these tests are used with other clinical and diagnostic data. In the intensive care unit, ESR and CRP are important as a component of the rapid, yet complex decision making that is required in individuals with multiple comorbidities.

In acute inflammatory conditions, both CRP and ESR are generally increased. However, both the test differs in the patterns of response. CRP rises with onset of an infection or inflammatory condition within hours and if the acute process is resolved, it returns to normal within three to seven days. On the other hand, ESR increases in a slower manner and remains high for a longer period of time.[6] Apart from this, ESR is a non-specific measure, it can be affected by various factors other than inflammation, such as the size, shape, and number of red blood cells, levels of serum fibrinogen and immunoglobulin's, renal function, age and sex, pregnancy and use of medications.[6,7] Due to all

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these differences, CRP testing is often used by clinicians in the assessment of early inflammation.[6,8-10] Though, there is no consensus on which single test is preferred. As a result,[7,11] physicians often request for both the tests. It has been reported by Alberta Health Services that they had received the 6,50,000 requests (45%) for ESR and CRP tests in 2013.[12]

MATERIALS AND METHODS

Study Population

A total numbers of 240 cases were included in this study who attended the hospital OPD for different types of medical purposes .Out of these 240 cases, 104 were males and 136 were females.

Study Area

This cross sectional study was conducted in Department of Microbiology &Pathology in Heritage Institute of Medical Sciences, Varanasi.

Duration of Study

The duration of study was over a period of six month.

Sample Collection

Serum CRP and ESR test was conducted in patients before starting the treatment & around after one week during the treatment at the interval of 1st – 2nd week in all cases. For every patient blood sample were collected in plain as well as in EDTA vial. Initial samples were collected, before starting the treatment, while the 2nd samples collected around after one week during the treatment. Serum CRP was measured by CRP analyzer by quantitative method and ESR was measured by Wintrobe's tube method. Then results were analyzed.

Normal values

CRP: Less than 0.6mg/dl

ESR: males: 3 to 7 mm in one hour Females: 5 to 9 mm in one hour

Data Analysis

Data were analyzed by using Microsoft excel.

RESULTS

Table 1: Distribution of cases according to gender

Gender	No. of Patients	Percentage
Male	104	43.4%
Female	136	56.7%
Total	240	100%

In our study, 240 total numbers of patients were included, out of which 43.4% were male and 56.7% were female. Before starting the treatment, 76.7% were positive and 23.4% were negative for CRP. But during treatment at the interval of 1st-2nd week, only 53.3% were positive out of all CRP positive case. In this study, 63.4% elevated cases were seen and 36.7% normal for ESR result before starting the treatment. While during treatment at the interval of 1st-2nd week, 76.4% were elevated out of all elevated ESR cases.

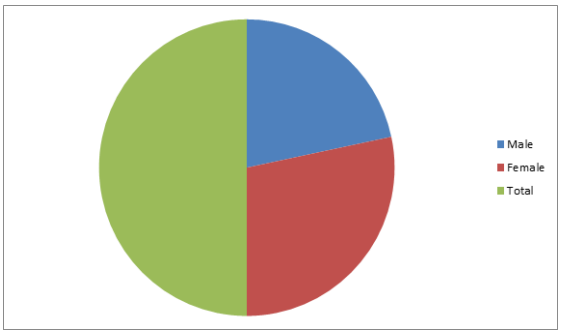

Figure 1: This chart showed distribution of cases according to gender

Table 2: Distribution according to level of CRP in all cases before starting the treatment

CRP	No. of Patients	Percentage
Positive	184	76.7%
Negative	56	23.4%
Total	240	100%

Table 3: Evaluation of CRP level around after one week during the treatment in all CRP positive cases at the interval of 1st -2nd week

CRP	No. of Patients	Percentage
Positive	98	53.3%
Negative	86	46.7%
Total	184	100%

Table 4: Distribution according to level of ESR in all cases before starting the treatment

ESR	No. of Patients	Percentage
Normal	88	36.7%
Elevated	152	63.4%
Total	240	100%

Table 5: Evaluation of ESR around after one week during the treatment in all ESR positive cases at the interval of 1st -2nd week

ESR	No. of Patients	Percentage
Normal	36	23.6%
Elevated	116	76.4%
Total	152	100%

DISCUSSION

Testing for CRP is available in almost every hospital set¬tings. It is an economical, consistent and reproducible test. Age and gender have no significant effect on CRP. The rate, at which CRP is produced and released into the blood, is determined by its serum concentration.[13] The CRP level is determined by its rate of synthesis, which in turn depend on the intensity of inflammation.[14]

Peltola et al,[15] Ellitsgaard et al,[16] observed in their studies that CRP got increased during preoperative period and decreased post operatively in comparison to ESR. In the present study, the evaluation between serum CRP and ESR was carried out in patients

before & after starting the treatment and same findings were obtained. Similar to CRP, rise in ESR was significantly found but it remained high and after one week also. At the interval of 1st – 2nd week fall in ESR is comparatively slower than serum CRP.[17] In the level of ESR, there was an insignificant change observed before and after treatment. The concentration of serum CRP level is directly proportional to amount of tissue injury occurs. In case of trauma, infection, inflammation and malignancy, it got increased. Similar results were obtained in present study. It has been found in the present study that the level of serum CRP was comparatively higher in more severe infections.

In the present study, some patient had been diagnosed with negative CRP, but it got increased. The reason behind this rise in CRP could be related to microorganisms which lead to infection.

To detect infection, assessment of serum CRP level is not a completely accurate test.[11] In present study before starting of treatment 23.4 % patients did not respond to infection and there was no increase in CRP. The reason could be that CRP rises significantly after acute infection (24 to 48 hours) and tissue injury occurs.[13]

In case of bacterial infection, there is significant increase in CRP level. It helps to differentiate from viral infection. Though; CRP does not differentiate between inflammation and infection.

CONCLUSION

This study suggested that, both CRP and ESR are helpful in diagnosis and monitoring of the disease and also helpful in assessing the prognosis of disease by correlating with clinical conditions. The level of serum CRP is much more sensitive in infections in comparison to ESR. CRP is not 100 % accurate test, it should always been monitored along with thorough clinical examination.

REFERENCES

1. Wolfe F, Pincus T. Th e level of inflammation in rheumatoid arthritis isdetermined early and remains stable over the longterm course of theillness. J Rheumatol 2001;28:1817-1824.
2. Smith EM, Samadian S. Use of the erythrocyte sedimentation rate inthe elderly. Br J Hosp Med 1994;51:394-397.
3. Olshaker JS, Jerrard DA. Th e erythrocyte sedimentation rate. J EmMed 1997;15(6):869-874.
4. Caswell M, Pike LA, Bull BS. Effect of patient age on tests of the acutephaseresponse. Arch Pathol Lab Med 1993;117:906-910.
5. International Council for Standardization in Haematology (ExpertPanel on Blood Rheology): ICSH recommendations for measurementof erythrocyte sedimentation rate. J ClinPathol 1993;46:198-208.
6. Kermani TA, Schmidt J, Crowson CS, Ytterberg SR, Hunder GG, Matteson EL, et al. Utility of erythrocyte sedimentation rate and C-reactive protein for the diagnosis of giant cell arteritis. Semin Arthritis Rheum. 2012 Jun;41(6):866-71.
7. Robinson S, Leonard P. C reactive protein, erythrocyte sedimentation rate, or both, in the diagnosis of atraumaticpaediatric limb pain? Emerg Med J. 2012 Dec;29(12):969-71.
8. Grzesk E, Koltan S, Grzesk G, et al. Value of erythrocyte sedimentation rate, c-reactive protein and procalcitonin concentration versus multimarker strategy in management of bronchiolitis in pediatric emergency. Med Biol Sci. 2012;26.2:11-7.
9. Johnson AJ, Zywiel MG, Stroh A, Marker DR, Mont MA. Serological markers can lead to false negative diagnoses of periprosthetic infections following total knee arthroplasty. IntOrthop. 2011 Nov;35(11):1621-6.
10. Paakkonen M, Kallio MJ, Kallio PE, Peltola H. Sensitivity of erythrocyte sedimentation rate and C-reactive protein in childhood bone and joint infections. ClinOrthopRelat Res. 2010 Mar;468(3):861-6.
11. Ghanem E, Antoci V, Jr., Pulido L, Joshi A, Hozack W, Parvizi J. The use of receiver operating characteristics analysis in determining erythrocyte sedimentation rate and C-reactive protein levels in diagnosing periprosthetic infection prior to revision total hip arthroplasty. Int J Infect Dis. 2009 Nov;13(6):e444-e449.
12. Austin MS, Ghanem E, Joshi A, Lindsay A, Parvizi J. A simple, cost-effective screening protocol to rule out periprosthetic infection. J Arthroplasty. 2008 Jan;23(1):65-8.
13. Yan-Fang Ren, Hans S. Malmstrom. Rapid quantitative determination of C-reactive protein at chair side in dental emergency patients. Oral Surg Oral Med Oral Pathol Oral RadiolEndod 2007;104:49- 55.
14. Pedro Povoa C-reactive protein: a valuable marker of sepsis. Intensive Care Med (2002) 28:235–243. 10. Peltola H, Vahvanen V, Aalto K. Fever C-reactive protein, and erythrocyte sedimentation rate in monitoring recovery from septic arthritis: a preliminary study. J PediatrOrthopSurg 1984;4:170–174.
15. Ellitsgaard N, Andersson AP, Jensen KV, et al. Changes in C-reactive protein and erythrocyte sedimentation rate after hip fractures. IntOrthopedics.1991;15: 311– 314.
16. Gabay C, Kushner I. Acute-phase proteins and other systemic responses to inflammation. N Engl J Med 1999; 340(6):448-54.
17. M Korppi,T. Heiskanen – kosma, M. Leinonen . White bllod cell, C reactive protein, and erythrocyte sedemtation rate in pneumococcal pneumonia in children. European respiratory journal.1997:10:1125-1129.

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