**C-REACTIVE PROTEIN – A MARKER TO PREDICT THE OUTCOME OF PATIENTS WITH ACUTE ISCHEMIC STROKE**

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**ABSTRACT**

**BACKGROUND**

C-reactive protein is an inflammatory marker. The inflammation plays an important role in the atherogenesis. There is an evidence of the prognostic importance of C-reactive protein (CRP) in ischemic stroke. In this study, we assessed the prognostic values of CRP in ischemic stroke and predicting outcomes.

Aims and Objectives- To evaluate the role of CRP in acute ischemic stroke. To assess the levels of CRP in acute ischemic stroke and in follow-up and CRP as a risk factor in acute ischemic stroke

**MATERIALS AND METHODS**

We studied 71 patients admitted in department of general medicine, Karnataka Institute of Medical Sciences (KIMS), Hubli, with either hypertension or diabetes or both or none without thrombolysis. Patients with first ever acute ischemic stroke, were examined considering all inclusion and exclusion criteria. CT scan of brain is done in all patients to confirm ischemic stroke and plasma CRP level was measured in all CT confirmed patients, and patients were followed-up for a period of three months and reassessed by NIHSS scale and plasma CRP level.

**RESULTS**

In the ischemic stroke, we found that serum CRP level on admission was predictive of stroke severity (positively correlated with NIHSS). CRP was elevated >6 mg/dl in 50 patients out of 71 patients at the time of admission which was statistically significant. High CRP was associated with high NIHSS and high long-term mortality.

**CONCLUSION**

The CRP level is significantly higher in ischemic stroke and its elevation between 12-72 hours of symptom onset is a bad prognostic indicator. Elevated CRP level was a risk factor in association with other risk factors like diabetes hypertension.

**KEYWORDS**
C-Reactive Protein, Ischemic Stroke.

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**BACKGROUND**

Stroke is the second common cause of death and fourth leading cause of adult disability in world.¹ Disability is a significant problem in long-term survivors. In previous studies 15–30% are permanently disabled among stroke survivors, and 20% of stroke survivors require hospital care 3 months after stroke.²,³

CRP is a systemic inflammatory marker that is produced in large amounts by hepatocytes in response to IL-1, IL-6 and TNF factor.³,⁴ Rapid induction of CRP, its long half-life (19 hours) and a lack of alteration during day and night in comparison with other acute phase reactants has introduced CRP as an important factor for evaluation of inflammatory and infectious diseases.⁴

C-reactive protein (CRP) is a prognostic marker of ischemic stroke is used for evaluating pathological inflammation and has been studied in relationship to the progression of atherosclerosis.⁵

Patients with ischemic stroke an increased circulatory CRP on hospital admission have greater mortality.⁶,⁷ The prospective study showed that CRP is clinically helpful in predicting the risk of the future cardiovascular diseases.⁸

**MATERIALS AND METHODS**

71 patients were included in the study and the sample population was collected from admitted patients in KIMS, Hubballi. Clinical history was taken from either patient or
his/her attender. Personal history regarding dietary habits, smoking, alcohol consumption and tobacco chewing were noted. NIH Stroke Scale was assessed in all patients to assess the neurological disability and its prognosis.

**Sampling Method**
Convenient sampling method was used. All the cases of ischaemic stroke presented to KIMS, Hubballi were included in the study period of 6 months duration. The study period was from July 2018 – December 2018.

**Inclusion Criteria**
All the cases of acute ischemic stroke presented to the KIMS Hospital, Hubballi during the study period and aged >18 years were included in the study.

**Exclusion Criteria**
All cases with significant history of-
1. Autoimmune diseases
2. Rheumatoid arthritis
3. Chronic infectious diseases like HIV, tuberculosis etc.,
4. Acute on chronic systemic illness like inflammatory bowel diseases etc., were excluded from the study and also patients who were found to have newly detected illness which would significantly contribute to changes in acute phase reactants like CRP and ESR were excluded from the study.

Detailed investigations including complete blood count, ESR, fasting blood sugar, serum electrolytes, lipid profile, chest X-Ray, electrocardiography, transthoracic echocardiography, prothrombin time, INR, CRP level, CT brain/MRI brain were done in all patients.

Patients were followed up for a period of three months and all patients were reassessed by using NIH stroke scale to know the clinical improvement or deterioration. Venous blood sample was taken to estimate CRP level at the end of three months follow-up and compared with admission value of CRP and NIH stroke scale.

**RESULTS**
The maximum ischemic stroke patients are in the age group of 40-60 years constituting 45.1% of total study population. Mean (SD) age of the study participants: 58.01 (13.24).

54.9% were males and 45.1% were females. Among 71 patients, 20 patients were smokers constituting 28.2% of study group. 30 patients had past history of hypertension constituting 42.3% of study and 14 patients had a past history of diabetes mellitus constituting 20% of group.
CRP Level at Admission | NIHSS at Admission Mean (SD) | p-Value (t test) 
---|---|---
<6 | 9.0 (4.69) | 0.003
>6 | 14.1 (6.9) |  

**Table 6. Association of CRP at Admission with NIHSS Score at Admission**

CRP Level at 3rd Month | NIHSS at 3rd Month Mean (SD) | P Value (t test) 
---|---|---
<6 | 2.98 (1.97) | <0.001
>6 | 6.32 (4.04) |  

**Table 7. Association of CRP and NIHSS at the End of Third Month**

There is a positive correlation between CRP level and NIH score with a "p" value of 0.03 at admission time which is significant. At the end of three months of follow-up, this also showed a positive correlation with a "p" value of <0.001 which is significant.

**DISCUSSION**

In the present study ischemic stroke in patients less than 40 years of age constituted 11.3% of all strokes and highest incidence was seen in the age group of 40-60 years, that is 45.1% and followed by age more than 60 years constituting 43.6% and an increased incidence of stroke in both male and females after the age of 60 years with a slight predominance in males. Incidence of stroke in males was 54.9% and that of females was 45.1%.

Acute stroke may trigger an inflammatory response that leads to increased levels of CRP. High levels of CRP may be associated with poor outcome because they reflect either an inflammatory reaction or tissue damage. Elevated serum levels of CRP are found in up-to three quarters of patients with ischemic stroke.

ESR, CRP, Haptoglobin, Fibrinogen etc are many acute phase reactants which are elevated in many conditions like autoimmune diseases, rheumatoid arthritis, connective tissue diseases, inflammatory bowel diseases, acute on chronic infectious diseases like HIV and tuberculosis, Acute on chronic systemic illness. The CRP is the only acute phase reactant studied in association with stroke after ruling out all the above-mentioned causes. Detailed history and relevant investigations were done to rule out the underlying causes which would bias the study.

Increases in CRP may reflect a systemic inflammatory response following stroke, the extent of tissue injury, or concurrent infections. Several studies have assessed the value of CRP in the very early phase of stroke as a prognostic factor of functional outcome. Verification of the role of CRP as an early prognostic factor of functional outcome after ischemic stroke may be of clinical importance, because it is an easily-measured and readily available inflammatory marker.

**REFERENCES**


