

Evaluation study of C-reactive protein in patients of Ischemic stroke

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Abstract:

Background & objective: Stroke is a dreadful health hazard all over the world as well as in our country and one of the leading causes of mortality & morbidity. The relationship between serum C-reactive protein (CRP) level and post stroke outcome is not well studied especially in Iraq. We were interested to study this relationship in our country.

Methods: In this finding was a cross-sectional study, done from April-November/ 2021 consisting of 80 Iraqi stroke patients whose are selected randomly from neurological ward in AL-Husseini teaching hospital. Patients (confirmed by CT scan or MRI). Serum CRP & Lipid profile was determined by standard Methods.

Results: Mean serum CRP level was 8.71 mg/L that was higher than normal subjects. Correlation analysis between serums CRP level of stroke patients with post stroke outcome was found to be positively correlated ($r = 0.452/p < 0.01$).

Conclusion: The current study identified elevation of CRP in acute stroke and a high CRP is clearly associated with more severe stroke and high mortality. The further periodic advance and follow up studies should be needed to sort out the possibility that stroke patients may be at greater risk of subsequent cardiovascular complications.

Key words: stroke. C-reactive, Patients.

Introduction:

Acute stroke may trigger an inflammatory response that leads to increased levels of CRP [1, 2]. This relationship between inflammation and atherosclerosis makes CRP a potential prognostic marker after vascular events and a potential predictor of future vascular events. High levels of CRP may be associated with poor outcome because they reflect either an inflammatory reaction or tissue damage [3]. It is not clear whether this is due to a direct effect or rather an epiphenomenon.

Elevated serum levels of CRP are found in up to three quarters of patients with ischemic stroke [4]. Increases in CRP may reflect a systemic inflammatory response following stroke, the extent of tissue injury, or concurrent infections. Moreover, in animal models of focal cerebral ischemia, CRP increases secondary brain damage through activation of the complement system [5]. Less evidence is available for hemorrhagic stroke. Plasma CRP was seen to increase shortly after admission and was related to hematoma volume at later time points in hemorrhagic stroke [6]. This was attributed to inflammatory response to the hematoma [6].

The role of CRP as a marker during and after stroke is less extensively studied in comparison to coronary artery disease. The Rotterdam study shows that although high CRP is associated with the risk for future stroke, it is not useful for individual stroke prediction [7]. On the other hand, the Framingham study shows that high CRP is associated with a greater risk for ischemic stroke or TIA [8].

Stroke is a major cerebrovascular disease threatening human health and life with high morbidity, disability and mortality [9]. According to the data from Global Burden of Disease Study [10], worldwide in 2010 there were an estimated 11,569,538 incident ischemic strokes and 5,324,997 events of incident hemorrhagic stroke; furthermore, 2,835,419 individuals died from ischemic stroke and 3,038,763 from hemorrhagic stroke. Stroke was defined as a sudden onset of loss of global or focal cerebral function persisting for more than 24 h [11]. Biomarkers that predict the occurrence and outcome from ischemic stroke are critical for prevention and treatment. Serum biomarkers are considered to be the most valuable adjunct to routine clinical examination and imaging data [12, 13]. Inflammation has an important role in the development of atherosclerosis and during the ischemic event. Inflammatory markers such as fibrinogen and hsCRP have been reported as a predictable marker for the

stroke severity and outcome [14]. It has been reported that it is possible to use the increase in the concentration of acute phase reactants especially the hsCRP to help predict cerebrovascular mortality [15].

CRP is a pentameric protein synthesized by the liver, whose level rises in response to inflammation. CRP is an acute-phase reactant protein that is primarily induced by the IL-6 action on the gene responsible for the transcription of CRP during the acute phase of an inflammatory/infectious process. There is some question about whether dysregulation of the role of CRP in the clearance of apoptotic cells and cellular debris plays a role in the pathogenesis of systemic lupus erythematosus (SLE), but this has not been definitively demonstrated. It has been demonstrated to have some protective properties in animal studies on lung tissue in alveolitis by reducing neutrophil-mediated damage to the alveoli and protein leakage into the lung.(16).

Methods:

In this finding was a cross-sectional study, done from April-November/ 2021 consisting of 80 Iraqi stroke patients whose are selected randomly from neurological ward in AL-Hussein teaching hospital. patients (confirmed by CT scan or MRI). Serum CRP & Lipid profile was determined by standard Methods. Post stroke outcome was measured by modified ranking scale (good outcome, score within 0 – 2 & bad outcome, score within 3 – 6). The subjects were divided in two groups CRP level above or below 12 mg/L.

Inclusion criteria: acute stroke patients aged (45-75) years. Exclusion criteria: out of study population age & who have acute head trauma.

We included stroke patients those confirmed diagnosis by radiological imaging and clinical feature. Patients who's involved in this study either ischemic or hemorrhagic stroke. Clinical features, physical examination & radiological imaging.

Statistical analysis

Correlations between variables were assessed using Student's t-test for numerical variables and using Chi-square test and Fisher exact test for categorical variables. P-value of < 0.05 was considered statistically significant.

Results:

During ninth months study period of 80 patients in this study, 36 were male and 44 were female. The mean (\pm SD) age of study subject was 49.9 ± 12.04 years (Table-1). The mean (\pm SD) of serum CRP concentration was 8.71 ± 11.34 mg/L and median concentration was 4.1mg/L (Table 2). Findings correlate with some other studies¹³. CT scan was performed and found 63 ischemic & 17 were hemorrhagic stroke. Study subjects were further divided into two subgroups on the basis of CRP concentration above 12 mg/L or below 12 mg/L.

Table 1: General characteristics in all patients.

No.	characteristics	Mean \pm SD
1	Age (year)	60.5 \pm 7.1
	Smoking index	83.1 \pm 135.2
3	Systolic blood pressure (mmHg)	72.49 \pm 30.6
4	Diastolic blood pressure (mmHg)	81.4 \pm 61.04
5	Mean blood pressure (mmHg)	91.37 \pm 55.12
	RBS (mg %)	79.03 \pm 68.21
7	Cholesterol (mg/L)	73.92 \pm 78.47
8	CRP (mg/L)	11.59 \pm 8.02

Table-2: Serum CRP level of study subjects

Parameter	Mean \pm SD	Median (range)
CRP (mg /L)	8.71 \pm 11.34	4.1

Table-3 showed comparison of serum CRP between groups. We found significantly ($p < 0.001$) higher level serum CRP in the groups.

Table-3: Comparison of serum CRP between groups:

Grouping	CRP(mg/L) Median (range)	Mann whitney U value	p value
Group A	4.1 (3.1-8)	0.000	<0.001
Group B	16.3 (11.2-51)		

Table-4 showed comparison of MRS and lipid profile between two groups A & B. We found in group B significantly ($p < 0.05$) higher level MRS, total cholesterol, LDL and Low level HDL than group A. But there was no significant ($p > 0.05$) difference in TG between two groups.

Table- 4: Comparison of MRS and lipid profile between two groups:

Parameter	Group- A	Group-B	t-value	p- value
MRS	2.81±1.16	4.13±1.27	-4.91	<0.002
T. Cholesterol mg/dl	209.11±38.78	242.0±31.4	-3.31	<0.01
HDL mg/dl	33.91±5.3	28.26±2.1	3.032	<0.004
LDL mg/dl	145.12±31.9	27.08±2.1	-3.71	<0.002
TG mg/dl	191.78±41.36	205.33±22	-1.28	>0.001

Discussion:

Several case-control studies with acute stroke patients have indicated that recent infections are a possible risk factor for stroke. [15-17] In particular;

there is increasing evidence that inflammatory processes are involved in cerebral ischemia. There is growing evidence that C-reactive protein (CRP), a peripheral marker of inflammation, is also a marker of generalized atherosclerosis [18]. This relationship between inflammation and atherosclerosis make CRP a potential marker for prognosis after vascular events and a potential predictor of future vascular events. The present study was conducted at tertiary care hospital although the former large population-based studies also shown that high CRP is a risk factor for future cardiovascular events [15, 17]. The recent JUPITER trial shown that the use of rosuvastatin in patients with high CRP has a significant impact both in reducing the CRP level and in lowering future vascular events [18]. This indicates the role of inflammation in atherogenesis and suggests that CRP can be used as marker of future events. The mean age in our population is 60.5 ± 7.1 while it was 69.3 in the study of Idicula [19]. Our study in stroke patients shows that a high CRP at admission is associated with more severe stroke, cardioembolic etiology, poor functional outcome and high mortality. After adjusting for the effect of confounding factors, high CRP remained to be associated with more severe stroke and high mortality (20).

Conclusion:

The current study identified elevation of CRP in acute stroke and a high CRP is clearly associated with more severe stroke and high mortality. The further periodic advance and follow up studies should be needed to sort out the possibility that stroke patients may be at greater risk of subsequent cardiovascular complications or death and severe neurological deficit.

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