

Original article

Prognostic role of C-reactive protein in acute 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 Bangladesh. We were interested to study this relationship in our country. **Materials & methods:** A cross sectional prospective study was performed on 50-stroke patients. Serum CRP & Lipid profile was determined. 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 10 mg/L. Statistical analysis was performed by using SPSS software. Chi-square test & Spearman's rho correlation test was done to see the level of significance. **Results:** Mean serum CRP level was 9.69 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 ($r = 0.598/p < 0.01$). **Conclusion:** Serum CRP level may be used as a prognostic marker in stroke patients and it helps to make necessary management plan to physician.

Introduction

The term cerebrovascular disease denotes any abnormality of brain caused by a pathologic process of blood vessels. "Stroke" is the clinical designation that applies to these conditions particularly when symptoms begin acutely.

Cerebral blood flow normally 50ml /minute for each 100 gm of tissue¹. A fall in cerebral blood flow to zero cause death of brain tissue Within 4 to 10 min; values <16 to 18ml /100gm tissue per minute cause infarction within an hour and values <20ml /100gm tissue per minute cause ischemia without infarction unless prolonged for several hour or days². Cerebrovascular disease is the 3rd leading cause of death in the United States. It is also the most prevalent neurologic disorder in terms of both morbidity & mortality. Cerebrovascular diseases cause 200000 deaths each year in the United States and are a major cause of disability. The

incidence of C.V.D. increase with age and the number of strokes is projected to increase as the elderly population grows with a doubling in strokes death in the United States by 2030². The annual incidence of acute cerebrovascular disease in the over 45 age group in the U.K. is about 180-300 per 100000. Cerebrovascular diseases can cause death & disability by ischemia, from occlusion of blood vessel (producing cerebral ischemia & infarction) or hemorrhage through their rupture³. In India the prevalence rate of stroke was 250- 350/ 100000 in last decade⁴. In Bangladesh adequate and complete data on the incidence and mortality of stroke is not available. In one study in Dhaka Medical college Hospital, stroke is found to be the second commonest cause of emergency admission in the medicine ward and constituted about 10-12% of the total patient in this ward. Two studies in Chittagong Medical college

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Hospital and BIRDEM Hospital, Dhaka revealed respectively 2.58% and 5.8% of the admitted patients diagnosed as stroke⁵.

Stroke is a dreadful health hazard all over the world as well as our country and one of the leading causes of morbidity and mortality. Health care facility in our country is far behind of western world. The number of stroke patients is gradually increasing day by day. Stroke causes disable not only by the patient himself but also the patient becomes a burden to his family both economically and socially. Treatment modality depends upon its severity. Stroke is treated by medicine, physiotherapy and other supportive treatment. Rehabilitation facilities are also limited in our country due to various regions. Types of rehabilitation necessary for a patient depend on severity of neurological disability. Neurological outcome is assessed by modified Rankin Scale (MRS) one of the modalities of neurological assessment. The association between Serum CRP and MRS level has been reported by many authors. We can use the CRP as a prognostic marker in our population that reduces the social burden. If CRP can be a prognostic marker of neurological outcome of stroke patient then prior adequate protective measure can be taken to reduce the worse outcome of stroke. In this way serum CRP level may help in stratification of patient and thus help in treating physician and other relative. With this back ground present study has been designed to evaluate the prognostic role of CRP level in acute stroke in Bangladeshi population.

Subjects and Methods

This study was carried out in the Department of Biochemistry, Bangabandhu Sheikh Mujib Medical University, Dhaka. Cross sectional prospective study was performed on 50-stroke 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 10 mg/L. Statistical analysis was performed by using SPSS software. Chi-square test & Spearman’s rho correlation test was done to see the level of significance.

Results

Out of 50 patients in this study, 27 were male and 23 were female. The mean (±SD) age of study subject was 62.9 ± 11.21 years (Table-I). The mean (±SD) of serum CRP concentration was 9.69± 10.95 mg/L and median concentration was 3.4mg/L (Table-II). Findings correlate with some other studies¹³. CT scan was performed and found 40 ischemic & 10 were hemorrhagic stroke. Study subjects were further divided into two subgroups on the basis of CRP concentration above 10mg/L or below 10 mg/L.

Table-I: Age & Sex distribution of the study subject

Parameter	Mean ± SD	Range	Sex	
			M	F
Age (years)	62.90 ± 11.21	40- 82	27	23

Table-II: Serum CRP level of study subjects

Parameter	Mean ± SD	Median (range)
CRP (mg /L)	9.69±10.95	3.4 (3-50)

Results are expressed in Mean±Std. Deviation & Median (range)

Table-III: Correlation between CRP & MRS (Modified Rankin scale) of study subject

Independent variable /Dependent variable	r value	p value
CRP/MRS	0.598	<.01

Test: Spearman’s rho correlation test was done as the test of significance

Table-III and figure-1 showed correlation between CRP & MRS (Modified Rankin scale). A significant positive correlation ($r, .598/ p<.01$) was observed between serum CRP & MRS (Modified Rankin scale).

Table-IV showed comparison of serum CRP between group A & B. We found significantly ($p< 0.001$) higher level serum CRP in the group B than group A.

Table-IV: Comparison of serum CRP between groups (Group A & B)

Grouping	CRP(mg/L) Median (range)	Mann whitney U value	P value
Group-A	3.2 (3-9.9)	0.000	<0.001
Group-B	17.6 (10.1-50)		

Mann Whitney U test was done as the level of significance.

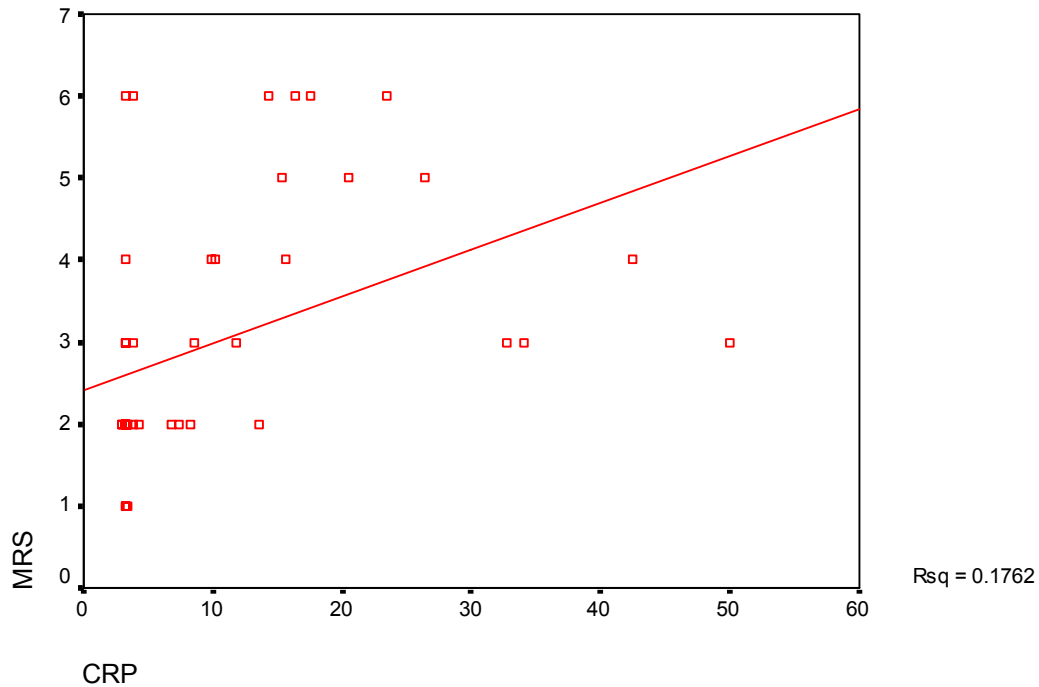


Figure -1: Correlation between serum CRP & MRS of the study subject

Table-V 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- V: Comparison of MRS and lipid profile between two groups A & B

Parameter	Group- A	Group-B	t-value	p- value
MRS	2.37±1.14	4.33±1.34	-4.94	<0.0001
T. Cholesterol mg/dl	212.46±36.12	249.0±38.8	-3.23	<0.002
HDL mg/dl	34.28±5.7	29.56±2.68	3.021	<0.004
LDL mg/dl	141.83±34.8	29.56±2.68	-3.76	<0.001
TG mg/dl	186.02±49.13	201.46±26	-1.14	>0.05

Unpaired t- test done as the level of significance

Table-VI:

Categorise of MRS	Group A <10mg/L	Group B >10mg/L	Chi square value	p value
Good Outcome (MRS 0-2)	26	1	16.701	<0.001
Bad outcome (MRS 3-6)	9	14		
Total	35	15		

Table-VI showed significant difference between two groups (Group A and Group B) in respect of MRS (Modified Rankin Scale).

Discussion

A close association has been reported between raised serum CRP level and post stroke outcome by many authors⁶⁻¹⁰. Despite improved treatment of ischemic stroke during the past decade, there remains a substantial risk of death or new vascular events during the first year after the acute episode. The identification of new risk markers could improve risk stratification and selection of individuals who might benefit from intensified therapy and the understanding of pathophysiological mechanisms¹¹. The aim of our study was to elucidate the relationship between serum CRP level of acute stroke patient and their outcome after three month by assessing MRS. In this study we measured serum CRP level within 72 hours of onset of stroke of 50 diagnosed patients. Raised serum CRP level was observed in all stroke patient of the study subject. The mean CRP concentration of study subject is 9.69 ± 10.95 mg/L (median CRP 3.4 mg/L) which is much higher than reference range. Similar findings are found by other authors¹¹.

Correlation analysis between CRP level of stroke patient with post stroke outcome assessed by modified Rankin scale (MRS) and found to be positive correlation ($r, 0.598$ / $p < .01$) which indicate that the more will be the serum CRP level the more

will be the MRS. High MRS in post stroke patient means the worse or bad outcome i.e. the patient is unable to move individually. Similar finding was reported by many authors^{6,7&9}. We also correlate serum CRP level with the component of lipid profile and found significant positive correlation between CRP with total cholesterol, LDL, and HDL. But no significant correlation found between CRP & HDL. This finding indicates strong association of total cholesterol, LDL & HDL in the development of acute stroke.

After three month of onset of stroke when outcome was assessed by MRS, significantly low MRS ($p < .0001$) was observed in patient having CRP level < 10 mg/L (Group-A) as compared to those having > 10 mg/L (Group-B). Low MRS indicate good outcome in the sense that the patient more functionally independent. Which indicate CRP level may be a prognostic marker. This finding is consistent with other study^{7,10,13&14}.

Therefore, the study revealed that serum CRP level is associated with stroke¹⁴ and its severity. It is also revealed that CRP level is correlate with post stroke outcome.

It may be concluded that we can use the CRP as a prognostic marker in stroke patient for neurological outcome and may help in stratification of patient and thus help in treating physician and other relatives for adequate protective measure or step that can reduce the worse outcome of stroke.

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