A Prospective Study of Evaluation of C - Reactive Protein in Patients of Ischemic Stroke

Narayan Prasad Majhi[1], Sushma Trikha[2], Dinesh Udeniya[3], O P Jatav[4], Neelima Singh[5], Rahul T Sarode[6]

ABSTRACT

Introduction: Evidences suggest that inflammation plays an important role in atherogenesis. Large numbers of studies have shown that C-reactive protein (CRP), an inflammatory marker, is associated with stroke severity and outcome. Data is limited which estimated the relationship of CRP in new patients of ischemic stroke. Study aimed to record C-reactive protein levels in patients with ischemic stroke and compare with different risk factor.

Material and methods: Thirty new patients of ischemic stroke were compared with 30 patients without ischemic stroke in Department of Medicine and Neurology, G.R. Medical College, Gwalior from January 2016 to September 2017. Detailed history, clinical examination and investigation including C-reactive protein, blood glucose, CT scan and lipid profile were done in all the patients.

Results: CRP was increased among cases compared to control group. CRP was significantly increased in patients with hypertension (75% and 33.33%; p=0.003), diabetes (60% and 54.54%; p<0.005), smoking (68.75% and 50%; p=0.049) in Cases compared to Control group respectively. CRP was increased more in patients with abnormal TC (61.53% and 44.44%; p=0.034), TG, (61.90% and 44.44%; p=0.021)), HDL (68.18% and 37.50%; p=0.012)) and LDL (28.57% and 35.29%; p=0.018)) in Cases compared to Control group.

Conclusion: CRP was increased in new patients of ischemic stroke. CRP level on admission can be used to predict severity and early outcome. CRP was higher in patients with hypertension, smokers and patients with abnormal lipid levels.

Keywords: C Reactive Protein, Hypertension, Diabetes, Stroke, Lipid Profile

INTRODUCTION

C-reactive protein (CRP) is an inflammatory biomarker of inflammation and may reflect progression of vascular disease. CRP is the sensitive marker for predicting both new-onset and recurrent ischemic events. CRP levels are also linked with different stroke outcomes and further vascular events.[1-3] After a vascular event CRP is a potential prognostic marker and a potential predictor of future vascular events. Several reports have shown that recent infection can increase the possible risk for ischemic stroke in patients who had survived the event.[4,5]

Many studies have also shown increased levels of CRP in subjects who are at greater risk of ischemic heart disease.[6-8] Increased CRP is considered as more reliable marker for predicting ischemic stroke compared to creatinine kinase in MI patients. Indian data is limited on CRP level in new patients of ischemic stroke. Hence present study was performed to study C-reactive protein levels in patients with ischemic stroke and compare with different risk factor.

MATERIAL AND METHODS

Present prospective hospital based study was conducted on new patients of ischemic stroke in Department of Medicine and Neurology, G.R. Medical College, Gwalior from January 2016 to September 2017. Sixty patients were divided into cases (n=30; new patients of ischemic stroke) and control (n=30; patients other than stroke patients admitted in ward). All new patients presenting with ischemic stroke having age between 30-60 years were included. Patients with history of infection, rheumatoid arthritis, inflammatory bowel disease, previous cardiovascular diseases, liver failure, burn, sepsis, BMI >30, and age <30/ >60 years were excluded from the study.

Detailed history, clinical examination and investigation including haemoglobin, TLC, DLC, platelet count, ESR, C-reactive protein, LFT, RFT, blood glucose, USG Abdomen, CT scan – Head (If necessary MRI brain/Carotid Doppler study) and Lipid profile were done in all the patients.

STATISTICAL ANALYSIS

All the data was analyzed using IBM SPSS ver. 20. Frequency distribution and cross tabulation was used to analyze the data. Data is expressed as numbers and percentage. Chi square test was used to establish the significance level between groups. P value of <0.05 was considered as significant.

RESULTS

Most common age group among cases (50%) and control (33.33%) was of 51-60 years. Most of the stroke patients were males in both the groups [18 (46.15%) in cases and 21 (53.84%) in control].

In cases and control, 1 (25%) and 3 (75%) subjects had family history, 10 (55.56%) and 8 (44.44) patients had

[1]PG 3rd Year Student, Department of Medicine, [2]Professor, Department of Medicine, [3]Professor and HOD, Department of Neurology, [4]Professor and HOD, Department of Medicine, [5]Associate Professor, Department of Medicine, [6]PG 3rd Year Student, Department of Medicine, GRMC Gwalior, India

Corresponding author: Dr Sushma Trikha, Professor, Department of Medicine, GRMC, Gwalior, India

Section: Medicine

| Parameters		Cases		Control		P value
		Normal	Increased	Normal	Increased	
Hypertension	Yes	4 (25)	12 (75)	4 (66.67)	2 (33.33)	0.003
	No	8 (57.14)	6 (42.85)	14 (58.33)	10 (41.66)	
Diabetes	Yes	4 (40)	6 (60)	6 (75)	12 (54.54)	NS
	No	6 (30)	14 (70)	2 (25)	10 (45.45)	
Smoking	Yes	5 (31.25)	11 (68.75)	5 (50)	5 (50)	0.049
	No	5 (35.71)	9 (64.28)	13 (65)	7(35)	
Data is expressed as no of patients (percentage), NS; not significant, P value of <0.05 is significant						

Table-1: Comparing C reactive protein with risk factors between groups

Parameters		Cases		Control		P value
		Normal	Increased	Normal	Increased	
TC	≤200	0 (0)	4 (100)	13 (61.90)	8 (39.09)	0.034
	>200	10 (38.46)	16 (61.53)	5 (55.56)	4 (44.44)	
TG	≤150	2 (22.22)	7 (77.78)	7 (33.33)	14 (66.67)	0.021
	>150	8 (38.09)	13 (61.90)	5 (55.56)	4 (44.44)	
HDL	<40	7 (31.81)	15 (68.18)	5 (62.5)	3 (37.5)	0.012
	≥40	3 (37.5)	5 (62.5)	13 (59.09)	9 (40.90)	
LDL	≤100	0 (0)	2 (100)	7 (53.84)	6 (46.15)	0.018
	>100	10 (35.71)	18 (28.57)	11 (64.70)	6 (35.29)	
Data is expressed as no of patients (percentage), TC; total cholesterol, TG; triglyceride, HDL; high density lipoprotein, LDL; low density lipoprotein, P value of <0.05 is considered as significant						

Table-2: Comparing C reactive protein with lipid parameters between groups
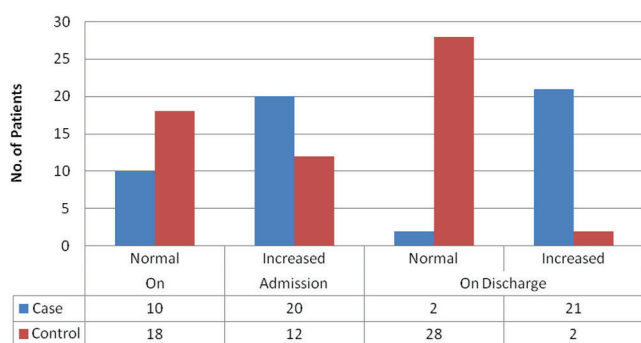
Data is expressed as no of patients, CRP; C reactive protein

Graph-1: Distribution of CRP on admission and discharge

diabetes mellitus, 16 (72.72%) and 6 (27.28%) patients had hypertension, 16 (61.54%) and 10 (38.46%) patients were smokers and 6 (60%) and 4 (40%) patients were alcoholic (table-1).

Most of the patients had BMI between 18.5 to 24.9 kg/m^2 [22 (46.80%) in Cases and 25 (53.20%) in control] were presented within 12 hours [12 (24%) in cases and 13 (26%) in control] and had atheromatous plaque [18 (81.81%) in cases and 4 (18.18) in control] (graph-1).

Most of the patients in cases had FBS >126 mg/dl [30 (81.08)] whereas in control group only [7 (18.91)] patients had FBS >126 mg/dl. Most of the patients in cases had PPBS >200 mg/dl [30 (81.08)] whereas in control group only [7 (18.91)] patients had PPBS >200 mg/dl (table-2).

DISCUSSION

C-reactive protein is a glycoprotein produced by the liver, and is normally absent in blood. The presence of acute inflammation with tissue destruction within the body stimulates its production. The CRP typically rises within 6

h of the start of inflammation, allowing the inflammation to be confirmed.[9]

In present study CRP level was significantly increased in stroke patients compared to control group. Several previous studies have reported elevated CRP values in patients with ischemic stroke.[6-8,10]

In present study most common age group in both the groups was 51-60 years with male preponderance. Konin et al studied 60 patients of first ever acute ischemic stroke and reported male preponderance (61.6%) and maximum stroke patients were in the age group of 61 – 70 (30%).[11] Contrary to present study Hamidon et al reported female preponderance (59.5%).[12] Di Napoli et al studied CRP level which was determined within 24 hours after stroke and related to 1-year outcome in 128 patients with first-ever ischemic stroke and reported female preponderance (n=75).[13]

Increase in CRP is not only associated with immediate consequences but also remains elevated in ischemic stroke survivors. At discharge CRP was elevated in 91.30% patients which proves the above statement. Di Napoli et al in a study of 128 patients reported that the CRP values within 24 hours were 13 mg/L.[13] which is in agreement with the present study whereas on admission, 62.50% and 37.50% patients and on discharge 91.30% and 8.69% patients had increased CRP level in cases and control respectively. Singh et al also showed that at discharge, higher CRP levels were also associated with larger infarcts (P = 0.0041).[14]

In an Egyptian study by Shoaeb et al on 50 patients with a first-ever acute stroke admitted within 24 h of onset reported that serum CRP level on admission was predictive of stroke severity (r = 0.54, P = 0.006) as well as outcome (r = 0.56, P= 0.004).[15] Similar to Shoaeb et al in present study CRP

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International Journal of Contemporary Medical Research
Volume 5 | Issue 4 | April 2018 | ICV: 77.83 | ISSN (Online): 2393-915X; (Print): 2454-7379

was significantly high in patients with stroke compared to normal. Di Napoli et al studied, the rise of CRP in 72% of patients (P<0.0001) and suggested the CRP as an independent marker of underlying chronic inflammatory process in atherosclerosis. Author also observed an increase in CRP within 3 hours after stroke compared with the pre stroke value.[13] Singh et al studied 48 patients and reported that CRP values, within 24 hours, between 48 to 72 hours, and at hospital discharge were 1.4, 1.0 and 0.7 mg/dl, respectively, which indicate that CRP was higher during first 24 hours of the event.[14] Similar results were revealed in present study.

In present study, CRP was significantly higher in cases with abnormal lipid levels compared to control group. Everett et al studied CRP levels and lipid levels in stroke patients and reported that CRP was closely associated with ischemic stroke than with CHD. Everett et al also suggested concomitant evaluation of lipid levels and hs-CRP may improve risk assessment for stroke as well as CHD.[16]

Idicula et al in their study showed high prevalence of an elevated CRP according to various potential predictors, such as age and sex, pre-existing illnesses, such as diabetes mellitus and coronary artery disease, stroke severity and time to hospital. In univariate analysis, only stroke severity and preexisting diabetes were significant. In a multivariate model including one measure of stroke severity and preexisting diabetes, an elevated CRP was independently predicted both by stroke severity and pre-existing diabetes (p = 0.03; p = 0.04).[17]

Our study has few limitations. Although the use of high sensitivity CRP would have been more sensitive than the regular CRP, however, we thought to evaluate the commonly present, readily available marker in most ICUs in our country as a prognostic marker for cerebrovascular accidents. The small number of patients and the short study period limit the conclusion that can be drawn from this study.

CONCLUSION

Stroke was significantly high in old patients (>50 years) male population, patients with diabetes, hypertension and smokers. Increased CRP level was obtained in patients with hypertension and smokers. Patients with abnormal TC, TG, LDL and HDL were having significantly high CRP. CRP levels at admission plays an important role in establishing decision for further intervention. CRP is a marker of increased 1-year risk in ischemic stroke. CRP at discharge is better related to later outcome and could be of greater utility for risk stratification.

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