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A Prospective Study on High Sensitivity C – Reactive Protein in Acute Ischemic Stroke Patients in a Medical College Hospital

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Abstract: One of the biomarkers for the ischemic stroke is CRP, the first acute-phase protein exquisitely sensitive systemic marker of inflammation and tissue damage. The current research focused the evaluation and the predictive value of hs-CRP (high sensitivity C – Reactive Protein) in relation to the ultimate functional outcome in first ever ischemic stroke after 4 weeks and to correlate the hs-CRP levels with various risk factors. A total number of 50 subjects were included in the study. The hs-CRP levels were compared with age, gender, time of sample collection, time interval of sample collection, total serum cholesterol, smokering and alcohol consumption. Patients with elevated hs-CRP had a poorer outcome when compared to patients with lower levels of CRP, four weeks after the onset of ischemic stroke. hs-CRP levels had no significant correlation with age or gender. hs-CRP did not show a statistically significant correlation with smoking or cholesterol intake.

Key words: hs-CRP Levels · C – Reactive Protein · Ischemic Stroke and Glasgow Outcome Scale

INTRODUCTION

World Health Organization defines the clinical syndrome of stroke as rapidly developing clinical signs of focal (or global) disturbance of cerebral function with symptoms lasting 24 hrs or longer or leading to death, with no apparent cause other than vascular origin [1]. Ischemic stroke is the most common stroke type, representing about 85% of all strokes. Ischemic stroke patients will typically present with sudden onset of weakness, numbness, vision loss, diplopia, dysarthria, gait disorder, vertigo, aphasia, or disturbed level of consciousness [2]. Cerebral ischemia and infarction are due to arterial wall disorder, athero - thromboembolism, Binswanger disease, congenital arterial anomalies, dissection embolism from arterial aneurysm, embolism from the heart, fibro muscular dysplasia, hematological disorders, infection, inflammatory vascular disease, intracranial small vessel disease (lipohyalinosis, microatheroma),irradiation, Moyamoya syndrome and trauma & some unknown causes which include cancer, drug abuse, epidermal naevus syndrome, epidermal nevus syndrome, Fabry's disease, fat embolism, homocystinemia, hypercalcemia, hypoglycemia, inflammatory bowel disease, migraine, mitochondrial cytopathy, nephrotic syndrome, oral contraceptive pills, pregnancy and Susac's syndrome [3]. The biomarkers for the ischemic stroke in brief include genetic markers, inflammatory markers, lipid-associated markers, markers of endothelial dysfunction, markers of neovascularisation, markers of plaque erosion, markers of thrombosis, metabolic markers and Oxidative stress [4].

CRP the first acute-phase protein to be described and is an exquisitely sensitive systemic marker of inflammation and tissue damage [5]. It is thought to assist in complement binding to foreign and damaged cells and affect the humoral response to disease. It is believed to play an important role in innate immunity, as an early defense system against infection and thus measuring and charting CRP values can prove useful in determining disease processes or the effectiveness of treatment [6]. The current research focused the evaluation and the predictive value of hs-CRP (high sensitivity C – Reactive Protein) in relation to the ultimate functional outcome in first ever ischemic stroke after 4 weeks and to correlate the hs-CRP levels with various risk factors.

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MATERIALS AND METHODS

The study was a descriptive, prospective carried out on proven cases of stroke patients admitted in AarupadaiVeedu Medical College, Pondicherry (India) from September 2011 to September 2012.

A detailed informed consent to participate in the study was obtained from the participants. The following were the inclusion criteria; all patients who presented within 48 hrs of onset of stroke and explained the study in detailed. Patients with subarachnoid haemorrhage, subdural haemorrhage and intracerebral haemorrhage (evidence from CT scan), above 70 years of age, known active infection and neoplastic conditions, rheumatic heart disease and collagen vascular disease, actively smoking at the time of study and previous history of transient ischemic attack or reversible ischemic neurological deficit were excluded.

Study Method: A total of 50 patients who presented with acute ischemic stroke were enrolled into the study. The stroke was an ischemic one confirmed by CT scan. As soon as the patients were admitted within 48 hrs of onset of stroke, serum samples were taken for hs-CRP estimation. And further the age, time of sample (hs-CRP) collection & time interval of (hs-CRP) collection, cholesterol levels, a correlation between the hs-CRP vs Age group; sex, smoking condition and alcohol consumption were also noted. The standard guidelines for the treatment of acute ischemic stroke were followed. None of the patients received any thrombolytic treatment. They were treated only with antiedema measures and antiplatelets such as aspirin alone and with good nursing care and physiotherapy. The patients were reviewed after 4 weeks after onset of stroke and were stratified using the Glasgow Outcome Scale (GOS)[7]. The data's were statistically done by Chi- Square test using Windows-based SPSS statistical package (Version 19.0).

RESULTS

The results of the present study showed that the Mean ± SD of the age of the studied patients was 60.12 ± 7.12 and that of the time of sample collection was 21.48+10.61.

The following tables illustrates the outcome of our research from high sensitivity c – reactive protein in acute ischemic stroke patients viz., Table1, the time intervals of collection of different samples; Table 2, Detection of level of cholesterol; Table 3, CRP and S. Cholesterol levels in the studied cases; Table 4, Relation of hs-CRP with Age groups of studied cases; Table 5, Relation of hs-CRP with Sex of studied cases; Table 6, Relation of hs-CRP with Smokers and Table 7, Relation of hs-CRP with Alcoholics.

Table 1: Time intervals of collection of different samples

Time of Collection (hrs)	No. of Patients
6-12	16
13-18	7
19-24	7
25-30	9
31-36	5
37-42	6

Table 2: Detection of level of cholesterol

Cholesterol (mg/dL)	No. of Patients
121-150	1
151-180	11
181-210	22
211-240	8
241-270	5
271-300	2
Above 300	1

Table 3: CRP and S. Cholesterol levels in the studied cases

Findings	No. of Cases	Mean ± Sd
S. Cholesterol (mg/dL)	50	205.78±35.05
hs-CRP (mg/dL)		29.60±21.39

Table 4: Relation of hs-CRP with Age groups of studied cases

	hs-CRP (mg/L)		
Age interval	<10.1 (%)	>10.1(1)	Total (%)
45-50	1 (2%)	6(12%)	7(14%)
51-55	3(6%)	3(6%)	6(12%)
56-60	6(12%)	6(12%)	12(24%)
61-65	2(4%)	8(16%)	10(20%)
66-70	3(6%)	12(24%)	15(30%)
Total (%)	15(30%)	35(70%)	50(100%)

Table 5: Relation of hs-CRP with Sex of studied cases

	hs-CRP (mg/L)		
Sex	<10.1 (%)	>10.1(1)	Total (%)
Male	6 (12%)	20(40%)	26(52%)
Female	9(18%)	15(30%)	24(48%)
Total (%)	15(30%)	35(70%)	50(100%)

Table 6: Relation of hs-CRP with Smokers

	hs-CRP (mg/L)		
Smoker	<10.1 (%)	>10.1(1)	Total (%)
Yes (1)	4 (8%)	17(34%)	21(42%)
No (0)	11(22%)	18(36%)	29(58%)
Total (%)	15(30%)	35(70%)	50(100%)

Table 7: Relation of hs-CRP with Alcoholics

	hs-CRP (mg/L)		
Alcoholic	<10.1 (%)	>10.1(1)	Total (%)
Yes (1)	4 (8%)	15(30%)	19(38%)
No (0)	11(22%)	20(40%)	31(62%)
Total (%)	15(30%)	35(70%)	50(100%)

DISCUSSION

Out of 50 total number of subjects included in the study males were 52% and females 48% the mean age of the patients were 60.12 ± 7.12. The relation of hs-CRP levels with age, and gender had no significant correlation as observed by previous studies which indicates that the acute ischemic stroke was an independent association with plasma hs-CRP[8].Mean time of sample collection was 21.48+10.61 after acute ischemic stroke. The time Interval of sample collection after the acute ischemic stroke was in the range between 6 - 42 hrs in which the number of patients observed at maximum was within 6-12hrs (32%) indicates the casualty on the cases (Table: 1). The range of cholesterol level was between 121-above 300(mg/dL) and maximum was found in the range of 181-210 (mg/dL) 44% indicating the non significant results. The mean S. cholesterol was 205.78±35.05 and hs-CRP was 29.60±21.39, mg/dL respectively (Table 3). In our study, total serum cholesterol had no statistical significant correlation with hs-CRP levels. This is in contrast to a study conducted by previous research as we have not included the complete lipid profile and the numbers of samples were also less[9].

The hs-CRP (mg/L) was maximum in <10.1 (%) at 56-60 age =10.1(%) at 66-70 age groups. hs-CRP vs Sex indicated that in males it was52% and in females 48%and this variation may due to hormonal factors (Table 5). The hs-CRP profile in both smokers and non-smokers was studied; 21(42%) were smokers and 29 (58%) were non smokers (Table 6),while it was 19(38%) in alcoholics and 31(62%) in non alcoholics (Table 7). Smoking is well supposed to give chemical and oxidative stimuli to the cardiovascular system and cause inflammation. It was reported that moderate alcohol consumption reduces circulating hs-CRP[10]. Moderate alcohol consumption has anti-inflammatory effects which may decrease CRP levels which needs further investigation as coated in the literature that involves nuclear factor (NF) – êB. NF-êB is a redox sensitive transcription factor which activates gens involved in the immune, inflammatory or acute phase response, such as cytokines IL – 668 and TNF - á83 which regulates CRP production by liver[11]. The research was further driven for the relation between in hs-CRP with other disorders like hypertension, diabetes and Glasgow Outcome Scale (GOS).

CONCLUSIONS

Patients with elevated hs-CRP had a poorer outcome when compared to patients with lower levels of CRP, four weeks after the onset of ischemic stroke. hs-CRP levels had no significant correlation with age or gender. hs-CRP did not show a statistically significant correlation with smoking or cholesterol intake.

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