IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 21, Issue 7 Ser.6 (July. 2022), PP 53-56
www.iosrjournals.org

Association of C- Reactive Protein in Acute Stroke

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Abstract

Background:*Stroke is an important health issue for individuals and society. C-reactive protein is a marker of acute inflammation. CRP level is elevated in patients who suffer from acute stroke.*

Aim of the study:*To study the level of CRP in patients with acute stroke.To compare the level of CRP in ischemic and hemorrhagic stroke with the healthy population.*

Methods:*This observational study was undertaken in the department of Neuromedicine, Rajshahi Medical College Hospital, from July 2010 to June 2011. A total of 130 patients were included in the study group who met the inclusion and exclusion criteria. Out of 130 patients, 63 were ischemic strokes and 67 were hemorrhagic strokes.*

Results: *In our study, the estimated mean CRP level in acute hemorrhagic stroke was 8.6 mg/L. and in acute ischemic stroke was 21.6mg/L. The estimatedCRP level in the normal Bangladeshi population was 4.30 (SD 0.72). Comparing the estimated mean CRP level of hemorrhagic stroke(8.6 mg/L) andischemic stroke (21.6 mg/L) with the mean CRP levelof thehealthy Bangladeshi population (4.30 mg/L), it was found that there was a statistically significant increase in CRP level in patients of acute stroke. Also,there was a significant increase in CRP levels in patients with ischemic stroke compared to hemorrhagic stroke.*

Conclusion:*CRP increases in acute stroke.The increase is significantly more in ischemic than hemorrhagic strokes.*

Date of Submission: 18-07-2022 Date of Acceptance: 02-08-2022

I. Introduction

World health organization (WHO) defined stroke as a clinical syndrome occurring due to sudden cerebral dysfunction, producing focal or global neurological deficit, persisting for more than 24 hours, or the patient dies within 24 hours, vascular in origin, non-epileptic, non-traumatic [1].Stroke is one of the leading causes of death and disability in the elderly[2]. It is estimated to be responsible for 9.5% of all death. About two-thirds or more stroke deaths occur in the developing world[3]. Of the total number of prevalent stokes, more than 80% are ischemic[4].C-Reactive Protein (CRP) is a trace protein in the circulation of healthy subjects, with a median concentration of about 1 mg/ L[5].The normal concentration of CRP is less than 6mg/L in serum[6]. Most of the studies were in Europe and America with the majority ofthe non- Asian population. It has been shown that Asians tend to have higher concentrations of CRP than European whites[7]. In a study on the Bangladeshi population, it was found that the mean CRP level was 4.30 (SD 0.72)[8].Acute stroke may trigger an inflammatory response that leads to increased levels of CRP[9]. Elevated serum levels of CRP are found in up to three-quarters of patients with ischemic stroke[10]. Plasma CRP was seen to increase shortly after admission and was related to hematoma volume at later time points in hemorrhagic stroke [11].Increases in CRP may reflect a systemic inflammatory response following ischemic stroke, the extent of tissue injury, or concurrent infections[12].

II. Methods And Materials

This observational study was undertaken in the department of Neuromedicine, Rajshahi Medical College Hospital, from July 2010 to June 2011. Patients who were admitted in wards with features of acute stroke between 40 to 70 years were selected primarily. After taking a detailed history and physical examination 167 patients were included. A CT scan was done on all the patients. Patients with recurrent stroke, presenting

after 24 hours of stroke, after acute MI, suffering from acute infectious disease orrheumatologic orconnective tissue diseases, major renal, hepatic or cancerous diseases, recent surgery or major trauma (in which CRP usually increases) were excluded. Finally, 130 patients were selectedfor the study group.CRP level was measured within 24 hours of stroke by quantitative method. CRP level of the patients suffering from an acute stroke was compared with that of normal population. Also, the difference in CRP was compared between the patients with hemorrhagic stroke and ischemic stroke.

III. Result

Among 130 patients 68 were male and 62 were female. 63 patients had ischemic and 67 hadhemorrhagic stroke.In haemorrhagic stroke mean age of the patients was 57 years (±8.11) and in ischemic stroke mean age of the patients was 56 years (±10.04). There was no significant difference in age between the two groups (p=0.585) (Table-2). Out of 67 hemorrhagic patients, 36 (53.7%) were male and 31(46.3%) were female. In ischemic stroke patients, 32(50.8%) were male and 31(49.2%) were female respectively (Figure-1). The mean value of C-reactive protein in hemorrhagic stroke and in normal Bangladeshi population was 8.6 mg/L and 4.3 mg/L respectively. The significance of the difference in mean CRP between the two groups was statistically significant (<0.046) (Table-2). The mean value of C-reactive protein in ischemic stroke and the mean value of C-reactive protein in a normal Bangladeshi population were 21.6 mg/L and 4.3 mg/L respectively. The significance of the difference in mean CRP between the two groups was statistically significant (<0.001) (Table-3). The meanvalues of C-reactive protein in hemorrhagic and ischemic stroke patients were 8.6 mg/L (SD ±11.65) and 21.6 mg/L (SD±23.97) respectively. The significant difference in mean CRP between the two groups was statistically significant (<0.001) (Table-4).

Table-1: Distribution of study populations by age and types of stroke.

Age (years)	Type of stroke					
	Haemorrhagic (n=67)		Ischaemic (n=63)		Total	
	No.	(%)	No.	(%)	No.	(%)
40-50	20	45.8	24	54.5	44	100
51-60	28	56	22	44	50	100
61-70	19	52.8	17	47.2	36	100

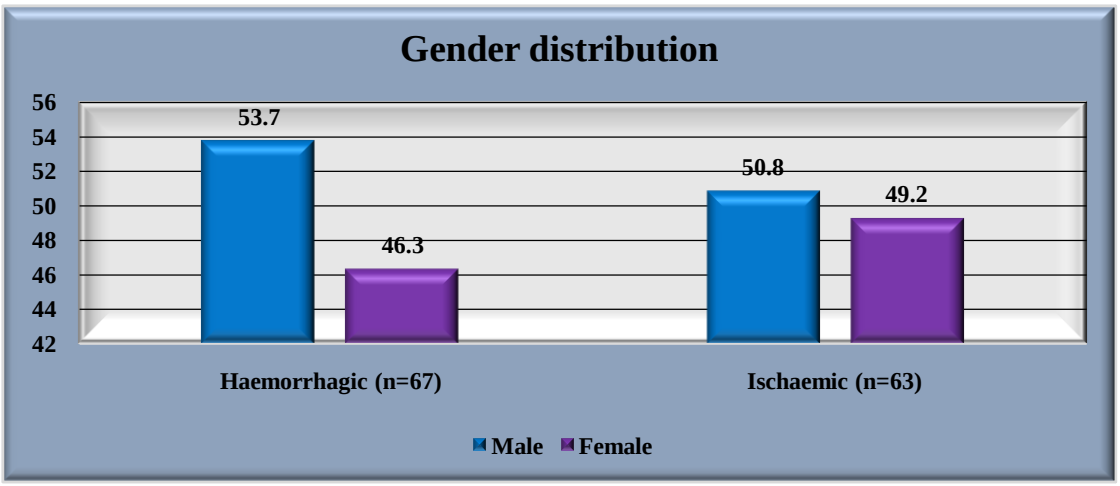

Figure-1: Gender distribution of study populations by types of stroke.

Table-2: Relationship of CRP in acute Hemorrhagic stroke with that of Normal population.

Type of stroke	Number	CRP Level (mg/L)		df	t-value	p-value
		Mean±SD	Mean diff.			
Hemorrhagic	67	8.6±11.65	43	95	2.01	0.04
Normal	30	4.30±0.72				

Table-3: Relationship of CRP level in patients of acute ischemic stroke with that of the normal population.

Type of stroke	Number	CRP Level (mg/L)		df	t-value	p-value
		Mean±SD	Mean diff.			
Ischemic	63	21.6±23.97	17.3	91	3.94	<0.001
Normal	30	4.30±0.72				

Table 4: Comparison of CRP levels between hemorrhagic and ischemic stroke.

Type of stroke	Number	CRP Level (mg/L)		df	t-value	p-value
		Mean±SD	Mean diff.			
Hemorrhagic	67	8.6±11.65	12.9	128	3.8	<0.001
Ischemic	63	21.6±23.97				

IV. Discussion

In this study, CRP level was measured in acute hemorrhagic and ischemic strokes.The mean CRP level in the normal Bangladeshi population wastaken from another study in our country[8].The reason for an increased number of hemorrhagic stroke patients than ischemic stroke may be; that many ischemic stroke patients have a mild deficit. So they are usually treated on an outdoor basis. On the other hand, hemorrhagic stroke patients present with co-morbid conditions with complications early. Also in our context, both general people and physicians treat hemorrhagic stroke as a more serious condition. So they are usually admitted early. In this study, the estimated level of mean CRP level in acute hemorrhagic stroke was 8.6 mg/L which in a normal Bangladeshi population is 4.30. After comparing it was found that there was a statistically significant increase in CRP levels in patients with hemorrhagic stroke. Modrego PJ et al (2008) also reported higher CRP values in patients with hemorrhagic stroke[13]. CRP levels rose significantly during the first 24 hours in most of the patients with intracerebralhemorrhage(Dziedzic et al) [14]. M.A.Shoaeb et alalso found higher CRP in hemorrhagic stroke[15]. So CRP levels may be increased in patients with hemorrhagic stroke.The mean value of CRP in ischemic stroke was 21.6 mg/L. The significance of the difference in mean CRP between ischemic stroke and the normal population was found at 17.30 which is statistically significant (<0.001).CRP level was estimated within 24 hours of the onset of acute stroke in all the patients. In patients of hemorrhagic stroke, the mean CRP level was 8.6 mg/L, while in patients of ischemic stroke it was 21.6 mg/L, indicating that there was a statistically significant increase in CRP level in patients of ischemic stroke, in comparison to hemorrhagic stroke.A significant increase in CRP levels in ischemic stroke has been documented in several studies elsewhere (Landvell et al 2006; Napoli MD 2001, Hertog et al 2009, M.A.Shoaeb et al 2014;)[16]. Ahmed (2009)also studied 30 patients withischaemic stroke and compared the CRP values of the cases with 30 age and sex-matched controls[8]. The mean value of CRP was 42.06 mg/L in the cases and 4.30 mg/L in the control group which was highly significant. M.A.Shoaeb et al 2014 found that CRP was significantly higher in ischemic stroke than in hemorrhagic stroke[15]. So the findings of our study correlate well with other studies done in Bangladesh and abroad.

Limitations of the study:

The number of cases in this study was small. The cases were collected from indoor unit of Medicine and the Neuromedicine department of Rajshahi Medical College Hospital. So there is some selection bias regarding the severity of stroke (most patients were moderate to severe in severity) and socioeconomic condition (mostly middle class and poor socioeconomic background). Only a single blood level was checked. Single CRP measurement can be influenced by many factors such as infection, stress, the timing of measurement, and lab error. Another limitation of this study was substantial heterogeneity in stroke. Unavailability of case-specific survival data.

V. Conclusion

From this study, two main points come to front. First, the elevation of CRP is common in stroke. Second, significant higher CRP levels are seen in ischemic stroke. But in this study, the number of hemorrhagic strokepatients is more than ischemic strokes which do not match with worldwide stroke data. A large-scale study to see stroke incidence and its type should be done to find out the actual scenario in our country.Further study is also required to find out a cut of the value of CRP level to determine stroke and its type which will help our physicians to apply it in resource-poorsituations.

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