Original Research Article

Study of prognostic importance of hs-CRP levels in acute stroke patients coming to Theerthanker Mahaveer Medical College, Moradabad, Uttar Pradesh, India

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ABSTRACT

Background: Stroke has been found to be the fourth most fatal cause of death around the globe. Decreased activity and physical work are the major causes of increased incidences of stoke worldwide. It has also been studied that elevated levels of high-sensitivity C-reactive protein (hs-CRP) have been related to vascular inflammation whereas CRP is an important biomarker of systemic inflammation. Aim of this study to measure serum high-sensitivity C-reactive protein (hs-CRP) levels in the patients presenting with stroke, and evaluating its correlation as a prognostic marker in stroke patients.

Methods: It was an observational prospective hospital-based case study carried out at Teerthanker Mahaveer Medical College and Research Centre, a tertiary care hospital situated in Moradabad, India for 5 months period from 1st November 2018 to 31st March 2019. 100 patients of new-onset stroke were included in the study.

Results: According to the Scandinavian score, the majority of the patients who had ischemic stroke depicted a score range from 2-8. On the other hand, the majority the patients with hemorrhagic score had a Scandinavian score >14. The mean hs-CRP, when observed between different ranges of the Scandinavian score, showed that in 2-8 range the mean hs-CRP was 31.49±15.00, the mean hs-CRP for 9-14 range was 7.99±6.32 and the mean hs-CRP for >14 range was 7.10±0.32.

Conclusions: It can be identified that levels of hs-CRP can be used as a marker to predict the long term prognosis of patients with stroke. In addition to this, it can also be identified that patients with higher levels of hs-CRP have lower Scandinavian score and the patients with lower hs-CRP levels have a higher Scandinavian score. Also, the results show that patients with ischaemic stroke have higher hs-CRP levels as compared to hemorrhagic stroke.

Keywords: hs-CRP, Stroke, Hemorrhagic stroke, Ischemic stroke, Scandinavian score

INTRODUCTION

Stroke has been found to be the fourth most fatal cause of death around the globe. The changing lifestyle and altered routines have increased the incidence of strokes for the younger generation as well. Decreased activity and physical work are the major causes of increased incidence worldwide.[1] It has been seen that not all patients with stroke die. Through various studies, it has been found that nearly 30% of the patients with stroke are disabled for a lifetime.[2] Apart from lifestyle, unhealthy eating habits are also one of the major issues resulting in an increased rate of stroke in the younger population.[3] It has been identified that higher levels of serum cholesterol

act as a major threat of ischemic stroke. Furthermore, dietary saturated fatty acid (SFA) has been found to be positively related to a stroke. It means that if the levels of SFA are high, then the chances of stroke are also high.[4] It can thus be implied that excessive intake of nutrient-dense forms of foods has become compelling, and the population has difficulty in following a low-calorie diet to promote weight loss over time. Sugar-sweetened beverages are contributors to add sugar intake and weight gain and can lead to increased risk of stroke.[5] A diet rich in whole grains, fruits, and vegetables may help reduce body weight and provide adequate amounts of flavonoids, carotenoids, minerals, and trace elements, which can help to reduce chronic disease risk and stroke.[6]

Furthermore, it has also been studied that 20% of the patients suffering from stroke need hospital care for more than 3 months post-stroke.[7] Ischemic stroke accounts for 80% of the patients suffering from stroke and the remaining 20% of the patients experience haemorrhage.[8,9] Ischemic brain trauma is identified by acute local inflammation and changes in levels of inflammatory cytokines, notably C reactive protein (CRP).[10,11] Therefore elevated levels of CRP do not serve as a marker of any particular disease but are sensitive markers produced depicting tissue injury, infectious agents, and inflammation.[12] It has also been studied that elevated levels of high-sensitivity protein (hs-CRP) have been related to vascular inflammation, whereas CRP is an important biomarker of systemic inflammation.[13,14] Therefore, it is necessary to identify the signs of stroke at an early stage in order to eliminate the chances of mortality and morbidity. Thus, measuring the hs-CRP levels prior to an ischemic stroke can serve to be an important and independent predictor of the first ischemic stroke.[15,16] The study was aimed to evaluate the hs-CRP levels in the stroke patients, presenting at TMMRCH both in emergency and IPD patients.

Aim of this study to measure serum hs-CRP levels in the patients presenting with stroke, and evaluating its correlation as a prognostic marker in stroke patients.

Objectives

- Patients of new-onset stroke shall be recruited after diagnosis is confirmed by CT/MRI Brain
- Their clinical status shall be recorded as per the Scandinavian Stroke Scale
- Their hs-CRP levels shall be measured first at presentation and then at follow up after 3 months
- The hs-CRP levels and the Stroke Scale-grade shall then be Compared, to establish a correlation

METHODS

It was an observational prospective hospital-based case study. The study place was carried out at Teerthanker Mahaveer Medical College and Research Centre, a tertiary care hospital situated in Moradabad, India.

All patients with new-onset Stroke during the study period were evaluated for the scope of the study. The period of study was 5 months from 1st November 2018 to 31st Mach 2019. A hundred patients of new-onset stroke were included in the study during the above mentioned period.

Inclusion criteria

All cases of OPD/IPD presenting with H/O new-onset focal neurological deficits in the form of hemiparesis, hemi-anaesthesia, aphasia or defect in higher mental function or cranial nerves palsy evidenced by the presence of stroke (Ischemic/haemorrhage) in CT/MRI of brain.

Exclusion criteria

The following groups of patients shall be excluded from the study,

- H/O recent Myocardial Ischemia and/or Arthritis
- Known cases of Cancer, hepatic failure, renal failure, Venous thrombosis
- Those taking steroids, anti-platelets agents, fibrinolytic agents or oral contraceptive pills
- Patients of major trauma (within 6months) and/or recent surgery (<6 months before the presentation).

Study plan

All the patients with new-onset Stroke admitted during the study phase.

- Details about each patient's medical history, family history, neurological findings, and treatment if any, were recorded.
- The clinical data of these patients were consecutively, systematically and prospectively recorded in a database.
- Serum hs-CRP levels were measured and then correlated with the Scandinavian Stroke Scale Score
- All the patients and controls that fulfil the inclusion criteria were subjected to RBS, lipid profile, LFT, RFT, CBC and Viral markers, besides Brain CT/MRI and Serum hs-CRP levels (using ELISA).
- These patients were followed up with repeat hs-CRP levels after three months of presentation and correlated with the progress/deterioration of their neurological deficit.

RESULTS

Out of 100 patients, 68 patients had an ischemic stroke, and the remaining 32 of the patients had a hemorrhagic stroke.

Table 1: Scandinavian Score and type of stroke.

Scandinavian score	Type of stroke	
	Ischemic stroke	Hemorrhagic score
2-8	52	10
9-14	8	7
>14	8	15

Form the above table, it has been identified that according to the Scandinavian score, the majority of the patients who had ischemic stroke depicted a score range from 2-8. On the other hand, the majority, the patients with hemorrhagic score had a Scandinavian score >14.

Table 2: Mean hs-CRP and scandinavian Score.

	Scandinavian score		
	2-8	9-14	>14
hs-CRP	31.49±15.00	7.99±6.32	7.10±0.32

The mean hs-CRP, when observed between different ranges of the Scandinavian score, showed that in 2-8 range the mean hs-CRP was 31.49±15.00, the mean hs-CRP for 9-14 range was 7.99±6.32 and the mean hs-CRP for >14 range was 7.10±0.32. The result showed that hs-CRP was highest in patients with low Scandinavian score and low in patients with a high Scandinavian score. There was a statistically significant difference between the three groups.

Table 3: Mean hs-CRP level in ischemic stroke.

hs-CRP levels	Prognostic Score
0-20	18.50±1.23
21-30	7.89±1.89
31-40	6.10±2.59
41-50	3.99±0.98
>50	1.59±0.03

Table 4: hs-CRP level in hemorrhagic stroke.

hs-CRP levels	Prognostic Score
0-5	18.98±0.23
6-10	12.01±4.89
>10	1.99±0.56

In patients of ischaemic stroke, it was observed that patients with a hs-CRP value of 0-20 had a mean prognostic score of 18.50±1.23, patients with hs-CRP value of 21-30 had a prognostic score of 7.89±1.89, patients with hs-CRP value of 31-40 had a score of 6.10±2.59, patients with hs-CRP level of 41-50 had a score of 3.99±0.98 and patients with hs-CRP levels of >51 had the lowest prognostic score of 1.59±0.03. This data was statistically significant as the p-value was <0.05. In patients of hemorrhagic stroke, it was observed that patients with a hs-CRP value of 0-5 had a mean

prognostic score of 18.98±0.23, patients with the hs-CRP value of 6-10 had a men prognostic score of 12.01±4.89, patients with the hs-CRP value of >10 had a mean prognostic score of 1.99±0.56.

Table 5: Functional outcome.

Functional outcome	Ischemic stroke	Hemorrhagic Stroke
Good outcome	26	20
Poor outcome	40	8
Mortality	2	4

From the above table, it was identified that among the ischemic patients, the majority of the patients had poor functional outcome, and mortality was observed in 2 cases. Furthermore, it was identified that among the hemorrhagic patients, the majority of them had good functional outcome with mortality in 4 patients.

DISCUSSION

The study was designed to identify the role of hs-CRP as being a prognostic marker among the patients suffering from a stroke. In the current study, it was found that majority of the patients had an ischemic stroke as compared to the hemorrhagic patients. Similar results were found in the study of Lal R et al, where the patients with ischemic stroke were comparatively high than the hemorrhagic score. Similarly, according to the study of Di Napoli M et al, it was found that 95 patients had an acute ischemic stroke.[17]

The current study found that the mean hs-CRP level was a significant biomarker in identifying ischemic as well as a hemorrhagic stroke. Also, there was a statistically significant difference between the mean hs-CRP levels of both groups. It also showed that ischemic stroke patients had higher mean hs-CRP as compared to the hemorrhagic stroke. Similar results were found in the study of Lal R et al. In the current study, it was observed that higher the hs-CRP level lower is the Scandinavian score. This implies that in a stroke, the elevated levels of hs-CRP proved to be a better marker. According to the study of Rost NS et al, it was identified that participants with higher levels of hs-CRP showed higher relative risk ratios.[18]

Furthermore, in the current study, it was identified that the mean prognostic score was higher in patients who had their hs-CRP range between 0-20. Similar results were obtained in the study of Lal R et al. Thus, in the current study, it was found that hs-CRP levels were helpful in identifying the risk of stroke. Similarly, Eikelboom JW et al, found that hs-CRP levels were most markedly elevated in patients with stroke caused by large artery disease, which tends to cause larger infarct and greater disability and they were significantly lower in patients with stroke caused by small artery disease which cause small infarcts.[19]

CONCLUSION

In light of the above findings, it can be identified that levels of hs-CRP can be used as a marker to predict the long term prognosis of patients with stroke. In addition to this, it can also be identified that patients with higher levels of hs-CRP have lower Scandinavian score and the patients with lower hs-CRP levels have a higher Scandinavian score. Also, the results show that patients with ischaemic stroke have higher hs-CRP levels as compared to hemorrhagic stroke.

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