



MORBIDITY PREDICTIVE ROLE OF C-REACTIVE PROTEIN IN ISCHEMIC STROKE

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ABSTRACT **INTRODUCTION:** Ischemic stroke is a significant cause of illness and mortality worldwide. C-reactive protein has been used in all of the human diseases as an important diagnostic method. Level of C-reactive protein increases in various conditions like infection, renal disorders, cardiovascular diseases, tumours and inflammations.

AIM: To evaluate the function of C-reactive protein as a morbidity predictor in ischemic stroke.

METHODS: This retrospective observational research was performed in the Department of Medicine at the tertiary hospital. Cases admitted in the diagnosis of Ischemic stroke were included. C-reactive protein level had measured for all the patients involved in the research, and written consent form had obtained from the patients. The results were statistically analyzed and discussed.

RESULTS: Out of 100 patients, 72 patients were males and 28 patients were females. 67 patients had CRP < 7mg/l, 33 patients had CRP ≥ 7mg/l. The mean age of 69.2 patients had CRP < 7mg/l and 74.8 patients had CRP ≥ 7mg/l. Mean systolic and diastolic blood pressure in patients with CRP < 7mg/l is 166 ± 29/86 ± 12, CRP ≥ 7 mg/l is 170 ± 31/89 ± 16. In CRP < 7mg/l, 19 patients had poor outcomes and 6 patients died, in CRP ≥ 7 mg/l, 29 patients had poor outcomes, and 12 patients died.

CONCLUSION: Patients with a higher level of C-reactive protein had a poor prognosis and increased death rate.

KEYWORDS : Ischemic stroke, C-reactive protein, Inflammation, Morbidity.

INTRODUCTION

Stroke is the primary cause of disability and death globally with ischemic stroke accounting for about 80% of all types of stroke, and the remaining 20% are hemorrhagic.^{1,2} Ischemic stroke, usually involves cerebral artery blockage by atherosclerotic plaque or emboli WHO defines stroke as a rapidly developed sign of focal disturbances of cerebral function lasting longer than 24 hours with no apparent non-vascular causes. The non-modifiable risk factor associated with stroke is age, gender, ethnicity and genetics. The modifiable risk factor associated with stroke includes high blood pressure, diabetes, myocardial infarction, atrial fibrillation, cigarette smoking, alcohol, obesity and high cholesterol.³ Other risk factors associated with ischemic stroke are infection, inflammation, hypercoagulable state, oral contraceptives and socioeconomic status.^{4,5} The treatment of ischemic stroke includes lowering of blood pressure and BMI, antiplatelet therapy, antithrombotic therapy, anti-diabetic therapy, stop smoking and alcohol and anti-cholesterol drug.⁶ Invasive management, such as endovascular or surgical, is based on the types and severity of stroke.

C-reactive protein is the essential markers of inflammation, and the four stages involved in the wound healing process are hemostasis, remodelling, proliferation and inflammation. This protein had produced in the liver after infection or inflammation and had considered as an acute-phase protein. This belongs to the family of pentraxins and calcium-dependent ligand-binding plasma proteins. This protein can precipitate the streptococcal somatic C-polysaccharide. This was suspected to play a key role in innate immunity as an early defense mechanism against infection. The mean concentration of CRP in healthy individuals is 0.8mg / l, and its half-life is 19 hours. Some factors, such as interleukin-6 and other cytokines, cause the release of CRP, raising its level by 500 times or more during an acute inflammatory response to tissue injury or infection. Low CRP concentrations mediate LDL absorption by endothelial macrophages, which cause monocyte recruitment through blood vessel walls. These factors lead to and can also intensify the development of fatty streaks in early atherosclerosis. Elevated rates of CRP are associated with adverse coronary and cerebrovascular injuries, including increased risk of fatal and non-fatal coronary accidents in ischemic stroke patients. High CRP raises the risk of carotid stenosis; stroke first, and death following a stroke.

AIM

To evaluate the function of C-reactive protein as a morbidity predictor in ischemic stroke.

MATERIALS AND METHODS

This prospective observational study was conducted in the department of medicine at a tertiary care hospital. Cases admitted in the diagnosis of Ischemic stroke were included. C-reactive protein level had measured for all the patients involved in the research, and written consent form had obtained from the patients. On admission, blood samples were taken for evaluation of CRP and white blood cell count. For all patients, the time of calculation of CRP relative to the onset of stroke was reported. As extraordinarily high levels of CRP are likely to represent an infection at the time of blood collection, patients with a CRP level above the mean of 2 SD were removed from further study. CRP levels at 7 mg / L have been dichotomized. This cut-off point was chosen because it was the highest cut-off point at which values were considered normal. To check a possible level-risk relation, all CRP values were recorded as the below 7 mg/L. Data as frequency, percentage, mean and standard deviations were provided.

RESULTS

This study consisted of 100 patients with an ischemic stroke, of which 7 were males, and 28 were females. CRP < 7mg / l had been observed in 67 patients and 33 patients had been reported with CRP < 7mg / l. There was a mean age of 69.2 years in patients with CRP level < 7mg / l and a mean age of 74.8 years in patients with CRP level over 7 mg / l. 34 patients had a risk factor for atrial hypertension in patients with CRP level < 7mg / l, 12 patients had a risk of atrial fibrillation, 16 patients had a risk of asthma, 24 patients had a risk of smoking cigarettes and 21 patients had a risk of hypercholesterolemia. Patients with CRP had a risk factor of atrial hypertension, 9 patients were at risk of atrial fibrillation, 11 patients were at risk of diabetes, 16 patients were at risk of tobacco smoking, and 10 patients were at risk of hypercholesterolemia. 8 patients with CRP < 7mg / l give stroke history, 9 patients with myocardial infarction and 6 patients with peripheral vascular diseases. 8 patients give a history of stroke, 6 patients with myocardial infarction, and 4 patients with peripheral vascular disorders in patients with CRP level of about 7 mg / l. For patients with CRP < 7mg / l, the mean systolic and diastolic blood pressure are 166 ± 29/86 ± 12, CRP around 7mg / l is 170 ± 31/89 ± 16. 19

patients had poor results in CRP < 7mg / l and 6 patients died, 29 patients had poor outcomes in CRP < 7mg / l, and 12 patients died.

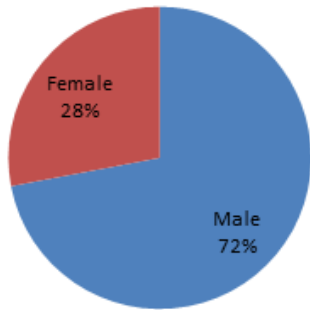


Figure 1: Gender distribution.

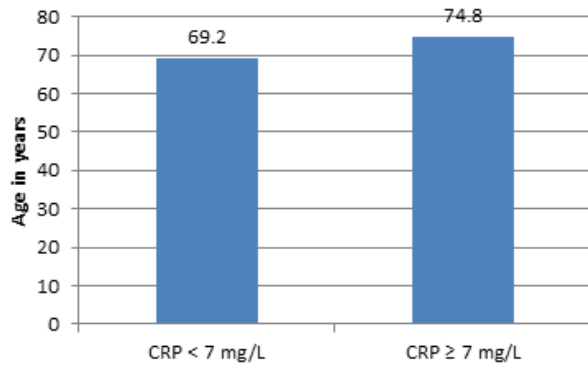


Figure 2: Age distribution.

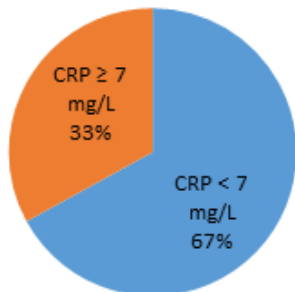


Figure 3: CRP level.

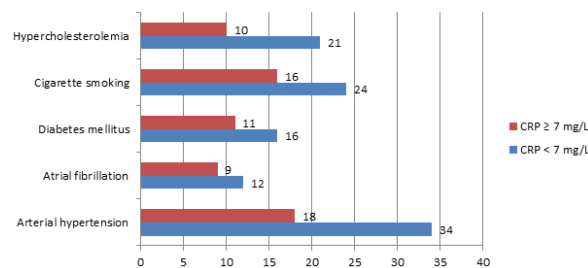


Figure 4: Cross relation between a risk factor and the level of CRP.

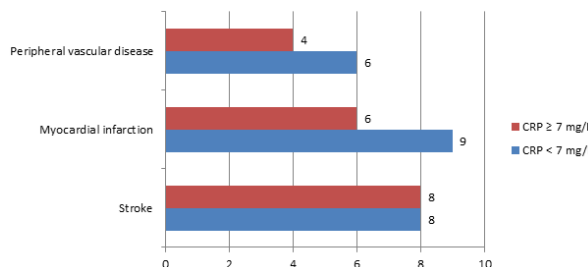


Figure 5: Cross relation between the level of CRP and past illness.

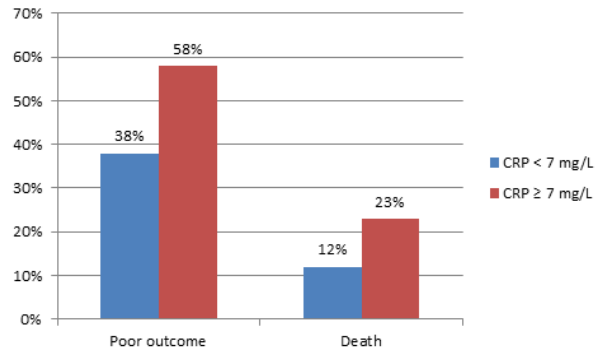


Figure 6: Cross relation between the level of CRP and prognosis.

DISCUSSION

Stroke is the first leading cause of morbidity in developing countries and the third most frequent cause of death. CRP is a predictor of cerebrovascular disease and peripheral vascular disease as well as of sudden death. Thus, CRP, as an inflammatory marker, has attracted clinical attention as a predictive marker of ischemic stroke.

In our present research males had a higher frequency than females of ischemic stroke. A study performed in the Western European region, the occurrence of male strokes was 33 per cent higher, and the prevalence of strokes was 41 per cent higher than that of women, with significant differences between age groups and population worldwide, strokes are more frequent among males, but women are more severely ill.⁸

In our study, the majority of the patients were in the age group between 6th-7th decade. Sikka et al. in their study of ischemic cerebrovascular disease (cerebral thrombosis) found the maximum number of cases fell in 5-6th decades with mean age 61.8 years.⁹ Muir K. W. et al., 1999 in his study stated that the higher CRP concentration was an independent indicator of mortality along with age and severity of stroke on the National Institute of Health Stroke Scale.¹⁰

Patients with higher serum CRP have weak prognosis in our present study, and the survival rate is lower relative to patients with lower serum CRP level. Framingham research found a graded rise in the occurrence of ischemic stroke and TIA with elevated rates of CRP.¹¹ Another analysis performed by Rotterdam reported that while high CRP is correlated with the likelihood of potential stroke, it is not useful for prediction of specific strokes.¹²

A research conducted by Winbeck K and his colleagues explored the effect on the long-term outcome of early serial CRP measures in hyperacute ischemic stroke.¹³ The research performed by Bergen stroke showed that there is a direct link between the elevated CRP and the short-term functional result that could be due to the severity of the stroke. CRP is an independent predictor of long-term mortality following an ischemic stroke.¹⁴ Ufuk Emry and his colleagues found that fibrinogen and CRP are strongly linked as inflammatory factors in the acute process of ischemic stroke.¹⁵ Another research performed by Mitchell SV Elkind et al. also revealed that CRP rates are higher in patients with stroke than in patients without stroke.¹⁶

CONCLUSION

Patients with a higher level of C-reactive protein had had a poor prognosis and increased death rate. In the very early stages of an acute ischemic stroke, elevated CRP rates are independent prognostic factors for the bad outcome

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