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Role of HsCRP in Predicting the Severity in Acute Ischemic Stroke Patients Attending the Tertiary Care Centre in Puducherry.

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Abstract: Background: *Ischemic stroke is one of the major cause of disability worldwide. High sensitive C-reactive protein plays a major role in acute stroke as a marker of inflammation.*

Aims: *1) To evaluate high sensitive C reactive protein as a prognostic tool in acute ischemic stroke. 2) The role of high sensitive C reactive protein in predicting the severity of acute ischemic stroke.*

Methods: *A cross-sectional study was conducted among 100 acute ischaemic stroke patients admitted in SVMCH&RC, puducherry against their hs CRP levels for stroke prognosis. Hs CRP estimation was done within 24 to 48 hours.*

Result: *22% of the patients belonging to glasgow outcome score group(GOS) 4 & 5 have CRP detected by high sensitive method (i.e.<10.1mg/L). In this group 90.9% have Glasgow outcome score 5, while 41% of CRP >=10.1mg/L level of the patients have score 2. Since p value of 0.00 which is less than 0.05, hence there is an association between GOS and hsCRP.*

Conclusion*: The study concludes that high sensitive CRP level predicts the severity of acute ischaemic stroke and guides us in the prognosis.*

Key words: *Ischemic stroke, high sensitivite C-reactive protein, Glasgow outcome score*

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I. Introduction

Stroke being a serious neurological disease is one of the major causes of disability throughout the world. Of all cases of stroke, ischaemic strokes constitute 85-87 per cent. In the pathophysiology of atherosclerosis, infections and inflammation plays a crucial role. High sensitive C-Reactive Protein (hsCRP) has been found to be a sensitive marker of inflammation and tissue injury in the arterial wall[1]. HsCRP has been found to be associated with acute stroke as a marker of infection and inflammation. Medical report highlighting the role of hs CRP as a prognostic factor in ischaemic stroke is not substantial[2].This calls for investigation of hsCRP in patients with ischaemic stroke and to correlate hsCRP levels with possible risk factors of ischaemic stroke and to assess the prognostic value of hs-CRP in ischaemic stroke[3].

II. Material And Methods

Aims: 1) To evaluate high sensitive C reactive protein as a prognostic tool in acute ischemic stroke.
2) The role of high sensitive C reactive protein in predicting the severity of acute ischemic stroke.

A cross-sectional study was conducted to examine the acute ischaemic stroke patients admitted in sri venkateshwara medical college hospital and research centre, puducherry against their high sensitive CRP levels for stroke prognosis. The sample size for the study was 100 patients with acute ischaemic stroke admitted in our institute. IBM SPSS software (version 20.0) was used for data analysis. The study conducted a detailed examination of clinical profile for neurological defects such as aphasia, cranial nerve palsies, limb weakness, sensory impairment, cerebellar dysfunction, conjugate gaze, and hemianopia. Risk factors for cardiovascular

events like smoking, hyperlipidaemia, hypertension, diabetes, oral contraceptive usage shall be recorded. Complete haemogram, urine analysis, ECG, blood sugar, blood urea and serum creatinine were recorded. Fasting blood sample for cholesterol, LDL, VDL, Triglycerides and HDL were recorded. Blood for C-reactive protein was collected within 24 to 48 hours of admission.

Statistical analysis:
The data collected were analysed using SPSS 20.0 version. Variables are expressed as the mean ± standard deviation (mean ± SD). The analysis carried out was percentage analysis to find out the demographical information of respondents. Descriptive statistical measures were carried out in each variable. Chi-square analysis was used to find the association between categorical variables. Logistic regression models the relationship between a dependent and one or more independent variables. $p< 0.05$ was considered statistically significant**.**

III. Result

The results of the study are summarized as follows
Among patients with acute ischemic stroke 60 of them are male and 40 of them are female. This shows the incidence of ischemic stroke is more in males.

Table 1: Frequency of gender

	Frequency (n)	**Percentage (%)**
Male	60	60.0
Female	40	40.0
Total	**100**	**100.0**

In the study population 21% of patients with stroke are in the age group of <38, 55-64 and 65-76. Above 77 age only 18% is the incidence of stroke. It may due to decreased survival from other causes.

Table 2: Frequency of age

	Frequency (n)	**Percentage (%)**
<= 38	21	21.0
39 - 54	19	19.0
55 - 64	21	21.0
65 - 76	21	21.0
77+	18	18.0
Total	**100**	**100.0**

By high sensitivity CRP measurement we are able to detect CRP level in 22% of the population. In remaining 78 % of people it is easily detectable by routine assay

Table 3: Frequency of hs_CRP

	Frequency (n)	**Percentage (%)**
<=10.1mg/L	22	22.0
>10.1mg/L	78	78.0
Total	**100**	**100.0**

Table 4: Frequency of group

	Frequency (n)	**Percentage (%)**
Control	78	78.0
Stroke	22	22.0
Total	**100**	**100.0**

Table 4 shows the frequency of control and stroke group of patients. Majority 78% of the patients who have detectable CRP by routine assay are taken as control group while 22% of the patients with detectability by high sensitive method (hsCRP) are taken as stroke group.

Table 3: Association between gender and hs CRP

	hs-CRP		**Total**	**p value**
	<10.1mg/L (n=22)	**>=10.1mg/L (n=78)**		
	n(%)			
Male	8 (36.4)	52 (66.7)	60 (60.0)	**0.010***
Female	14 (63.6)	26 (33.3)	40 (40.0)	
Total	**22 (100.0)**	**78 (100.0)**	**100 (100.0)**	

Chi-Square: 6.566, *p<0.05

Among patients with hs CRP, 8 of them i.e.36.4% are male and 14 (63.6%) are female. In female patients with acute ischemic stroke the hs CRP level is frequently raised when compared to male. . Since p value of 0.010 which is less than 0.05, hence there is an association between gender and hsCRP.

In the following table we could note that p value for hsCRP when compared with age is 0.573 which is more than 0.05. Hence, there is no association between age and hsCRP.

Table 4: Association between age group and hs CRP

	hs-CRP		**Total**	**p value**
	<10.1mg/L (n=22)	**>=10.1mg/L (n=78)**		
<= 38	3 (13.6)	18 (23.1)	21 (21.0)	0.573 (N.S)
39 - 54	5 (22.7)	14 (17.9)	19 (19.0)	
55 - 64	7 (31.8)	14 (17.9)	21 (21.0)	
65 - 76	4 (18.2)	17 (21.8)	21 (21.0)	
77+	3 (13.6)	15 (19.2)	18 (18.0)	
Total	**22 (100.0)**	**78 (100.0)**	**100 (100.0)**	

Chi-Square: 2.911

In patients with Glasgow outcome (GOS) scoring 4 and 5, only hs CRP level is elevated. 20 patients (90.9%) with elevated hsCRP are with the score of 5. Thus, hsCRP is a predictor of severity of ischemic stroke.

Table 7: Association between GOS and hs CRP

GOS	**hs-CRP**		**Total**	**p value**
	<10.1mg/L (n=22)	**>=10.1mg/L (n=78)**		
	n(%)			
1	0 (0.0)	21 (26.9)	21 (21.0)	**0.000****
2	0 (0.0)	32 (41.0)	32 (32.0)	
3	0 (0.0)	22 (28.2)	22 (22.0)	
4	2 (9.1)	3 (3.8)	5 (5.0)	
5	20 (90.9)	0 (0.0)	20 (20.0)	
Total	**22 (100.0)**	**78 (100.0)**	**100 (100.0)**	

Figure 1: Association between GOS and hs CRP

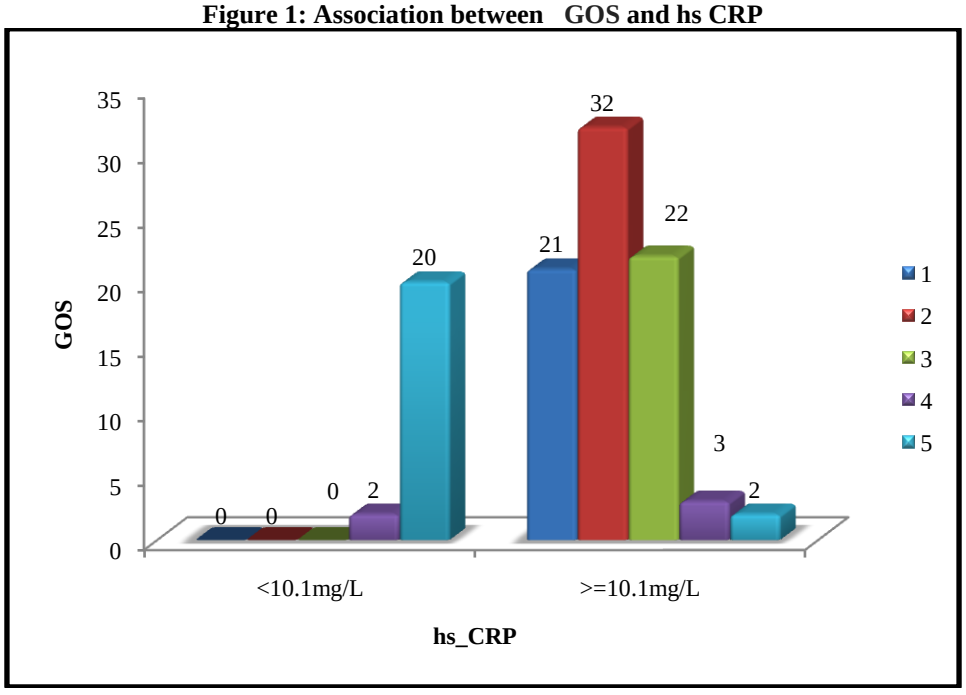

Table 8: Association between gender and control and stroke group

	Beta	**S.E.**	**p value**	**Exp(B)**	**95% C.I.for EXP(B)**	
					Lower	**Upper**
gender	0.000	0.445	1.000	1.000	0.418	2.394
Constant	-.847	0.661	0.200	0.429		

Dependent Variable: Group

The table 8 presents the logistic regression in which the study variables are entered into independent and dependent variable. In logistic regression gender considered as independent variable and control and stroke group considered as dependent variable. If the significance level of the Wald statistic is small (less than 0.05) then the parameter is useful to the model. Gender is significant (beta=0.000, p>0.001) which is greater than 0.05. The meaning of a logistic regression coefficient is not as straightforward as that of a linear regression coefficient. While B is convenient for testing the usefulness of predictors, Exp (B) is easier to interpret. Exp (B) represents the ratio-change in the odds of the event of interest for a one-unit change in the predictor. Hence there is no association in mean gender between control and stroke group.

Table 9: Association between GOS and the groups

	Beta	**S.E.**	**p value**	**Exp(B)**	**95% C.I.for EXP(B)**	
					Lower	**Upper**
GOS	0.261	0.157	0.096	1.298	0.955	1.765
Constant	-1.579	0.505	0.002	0.206		

Dependent Variable: Group, p<0.01

The table 9 presents the logistic regression in which the study variables are entered into independent and dependent variable. In logistics regression GOS considered as independent variable and control and stroke group considered as dependent variable. If the significance level of the Wald statistic is small (less than 0.05) then the parameter is useful to the model. GOS is significant (beta=0.261, p<0.001) which is greater than 0.05. The meaning of a logistic regression coefficient is not as straightforward as that of a linear regression coefficient. While B is convenient for testing the usefulness of predictors, Exp (B) is easier to interpret. Exp (B) represents the ratio-change in the odds of the event of interest for a one-unit change in the predictor. Hence there is no association in mean GOS between control and stroke group.

IV. Discussion

CRP, an acute phase protein, increases during systemic inflammation. New evidence suggests that CRP could have a direct influence on inflammatory effects. Level of CRP measured at discharge in patients after acute stroke indicates future risk of adverse outcome and recurrence[4]. Further, CRP meets the requirement of a new risk and prognostic predictor[9]. Research has shown association between increased plasma CRP concentration and increased efficacy of established therapies especially lipid lowering therapy with statins[8].

C-reactive protein was measured qualitatively by semiqualitative latex agglutination test with spectrometry. CRP levels were classified into three groups: CRP levels is < 1mg/l, person has a low risk of developing cardiovascular disease. CRP levels are between 1 – 3 mg/l, person has an average risk. CRP levels > 3mg/l, person is at a risk. To acquire more presice result the present study measured the CRP level with standard 10.1 mg/ mL.

The present study showed that majority patients (78%) had CRP level greater than 10.1mg/L while only 22 percent of the patients are <=10.1mg/L. Previous studies have indicated varying results. Muir et al. had found out increased CRP (> 10 mg/L) levels in 96 out of the 228 (42.1%) patients with acute ischemic stroke in the UK and this result in contrary with the present result because in the present study majority of the people showed greater than 10.1mg/L. Furthermore, Chaudhuri et al. performed a prospective study, more than three fifths of Indian patients with acute ischemic stroke had high hsCRP (> 3 mg/l) levels[5] and, 95 patients (74.2%) with acute ischemic stroke had high CRP levels (> 0.5 mg/dl) at admission[10]. However, these studies had taken different standard value compared to the present study. Furthermore, the present study showed no significant relation between gender and CRP.

Several studies Rost et al., Bos et al. showed an association between high CRP and severity of stroke[6],[7]; however the association was not strong enough to use CRP for individual stroke prediction. The present study indicates a significant relation between high hsCRP and severity of stroke.

The present study involved majority of female respondents and all chosen respondents come under almost all type of age groups approximately equally. The respondents divided as control and stroke group where the majority was the control group. The significant p value showed there is an relationship present between the considered factors. Association between age group and hsCRP level has not shown any significant relation. However, GOS (glasgow outcome score) has showed a significant relationship with hsCRP.
Control and stroke group has not shown any significant relationship with GOS group.

V. Conclusion

The findings of the present study indicate that regulating the level of CRP will help to decrease the risk of acute schematic stroke. The study concludes that high hs CRP level predicting the chance of greater level of acute ischaemic stroke. For the future recommendation the study suggesting for in- depth study in CRP levels and its regulation.

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