Determination of plasma CRP concentrations could be used as an adjunct for risk assessment in primary and secondary prevention of cerebrovascular disease, increasing trend in Nepal and be of prognostic value. There is growing evidence that C-reactive protein (CRP), a peripheral marker of inflammation, is also a marker of generalized atherosclerosis. This relationship between inflammation and atherosclerosis make CRP a potential marker for prognosis after vascular events and a potential predictor of future vascular events like an increased risk of ischemic stroke patients. Large population-based studies show that high CRP is a risk factor for future cardiovascular events.

The recent JUPITER trial shows that the use of rosuvastatin in patients with high CRP has a significant impact both in reducing the CRP level and in lowering future vascular events. This indicates the role of inflammation in atherogenesis and suggests that CRP can be used as marker of future events.

Materials and Methods
It is a descriptive prospective exploratory research study performed in the year 2008. The study conducted among patients receiving treatment from TUTH. This institute have been in the care of Ischemic stroke patients for many

Introduction: At the time when tissue plasminogen activator and time factor is discussed in ischaemic stroke we have tried to study the level of CRP in these patients. Can it be an investigative tool for screening high-risk patients like diabetes and hypertension is still to be studied.

Methods: It is a descriptive prospective exploratory research study performed among 50 ischaemic stroke patients admitted in TUTH among other investigation CRP was also done

Results: CRP is raised among ischaemic stroke patients but its relation with altered lipid profile is not so significant.

Conclusions: The inclusion of CRP as a risk factor for ischemic stroke or TIA would have important implications. Thus, the use of CRP values may aid in identifying a potentially large number of men and women who are at risk for cerebrovascular events. This, in turn, may lead to the development of new treatment strategies for primary stroke prevention in those individuals identified as being at risk for developing cerebrovascular disease.

Key Words: atheromatous plaque, c-reactive protein (CRP), ischaemic stroke
CRP in Stroke

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50 total Nepali patients 31 are male and 19 are female patients as demonstrated in figure

years, till date and many patients have been treated from this institute. The aim of this study is to see if CRP in ischemic stroke is raised in Nepalese subjects.

The objective of this study are to study the socio demographic of the stroke, Neurological manifestation of stroke, various biological parameter in strokes, comparative & correlative study between CRP & stroke, extent of lesion & clinical manifestation.

Samples: 50 confirmed cases of stroke by ICD10, NIHST & CT admitted in TUTH Kathmandu is taken for study.

Only ischaemic stroke patients were included in this study.

Sampling method/sample size/sampling frame: Universal sample of the target population. Minimum fifty confirmed cases of stroke from TUTH.

Results

Ischemic cerebrovascular disease accounts for a substantial proportion of all strokes. CRP, one of the acute phase reactant, is an indicator of underlying systemic inflammation and a novel plasma marker of atherothrombotic disease. Among the 50 patients studied in TUTH 54% patients had left ischemic stroke, the level of CRP in ischemic stroke patients were increased in patients mostly around the age group of 61-75 years old, most of them were male (62%) patients. 28% patients were having a habit of drinking alcohol and smoking and 26% patients smoker only 40% patients were hypertensive and 22% patients with hypertension and diabetese, 30% patients did not suffer from both 4 patients were diabetic only. 20% patients had a high CRP with borderline to high triglyceride, 18% patients with borderline to high cholesterol.

Discussion

CRP, one of the acute-phase reactants, is an indicator of underlying systemic inflammation and a novel plasma marker of atherothrombotic disease. Our prospective data from Tribhuvan University Teaching Hospital of Nepal with diagnosis of acute Ischemic stroke demonstrate a strong relationship between plasma CRP and ischemic stroke.

The Rotterdam study shows that although high CRP is associated with the risk for future stroke, it is not useful for individual stroke prediction. On the other hand the

<table>
<thead>
<tr>
<th>HDL</th>
<th>CRP</th>
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<tbody>
<tr>
<td>0.95mmol/l or 1.21mmol/l or below 37 mg/dL, below 47 mg/dL, 1.55mmol/l or above</td>
<td>&lt;5mg/l</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>-------</td>
</tr>
<tr>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>2</td>
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<tr>
<td>1</td>
<td>0</td>
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<tr>
<td>Total</td>
<td>5</td>
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</tbody>
</table>

Table 1: Comparison between HDL and CRP
Framingham study shows that high CRP is associated with a greater risk for ischemic stroke or TIA. Studies in patients who already had a stroke shows an association between high CRP and stroke presentation outcomes and future vascular events. Similarly in our study the patients CRP tend to be increased in both sexes where 27 male, 14 female have CRP more than 6 mg/l. CRP is more than 6 mg/l in 52% patients with the age group of 61-75 which is similar to Arjundas D et al where the maximum stroke incidence was in the age-group of 50-79 years.24 The mean age of stroke patients was 10 years lower than that reported from studies in high-income countries.17 Only population-based incidence studies would be able to clarify whether our results reflect the actual situation in the source population or if it is due to the fact that elderly stroke patients are less likely to be admitted to health facilities.

In our study, smokers are more prone to ischemic stroke which correlates to Bonita R et al studies showing smokers both current and past, have a higher risk of developing stroke. Raised CRP are found in 56% patients with hypertension where A Malaysian study by Ong et al. that was reported in 2002, concluded that hypertension and diabetes are the most common risk factors of strokes admitted to a tertiary hospital.24 which was similar to our findings.

In our study, total cholesterol, LDL, VLDL, TGL, showed no relation to the incidence of ischemic stroke and raised CRP. Similar findings have been observed by Ross et al.26 He found that altered serum cholesterol was not linked to an increased stroke incidence. However hypercholesterolemia is related to the incidence of IHD, which is a risk factor for stroke. His study was a large, prospective observational study of middle-aged men and he found no relationship between plasma total cholesterol concentration and incidence of fatal or nonfatal stroke. Two large meta-analyses6,5 aggregated from very large cohorts failed to find a relationship between cholesterol and stroke. HDL - identified as the good cholesterol helps transport lipids out of the blood, reducing the chance of these molecules becoming involved in atherosclerosis. In Jones William et al29 cohort study performed of urban primary care patients, after correction for other common known vascular risk factors, patients with higher HDL-cholesterol concentrations and those whose HDL-cholesterol increased from first to second measurements

<table>
<thead>
<tr>
<th>LDL</th>
<th>Address</th>
<th>CRP</th>
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<tbody>
<tr>
<td>2.5mmol/l or Less than 100 mg/dL</td>
<td>&lt;5mg/l</td>
<td>1</td>
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<td></td>
<td>5-6</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>more than 6</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>33</td>
</tr>
<tr>
<td>2.5-3.33mmol/l or 100 - 129 mg/dL</td>
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<td>0</td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td>Borderline High: 3.36-4.11mmol/l or 130 - 159 mg/dL</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>High:3.36-4.88mmol/l or 160 - 189 mg/dL</td>
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<tr>
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<td>0</td>
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<td></td>
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Table 2: Comparison between LDL and CRP
had significantly lower risk of acute ischemic stroke, similarly in our study. While comparing the lipid profile, HDL with CRP, 45 patients have HDL below 47mg/dl, CRP more than 6mg/l are 37 cases with HDL below than 47mg/dl, 6 patients have CRP 5-6mg/l, 2 patients have CRP less than 5mg/l.

Among 50 patients, 43 patients have CRP level more than 6mg/l, 6 patients CRP 5-6mg/l and in 3 patients CRP is less than 5mg/l. Probably, CRP may reflect something fundamental about the patient’s inflammation system. Some patients might be predisposed to intense activation of inflammation in response to a variety of stimuli such as stroke. We speculate that stroke patients in whom the inflammation system reacts most intensely may be at greater risk for subsequent events. In this way a stroke may show the abnormal reactivity of the inflammation system. CRP levels would identify those patients whose inflammation system responds most actively to stimuli. These might be the patients at highest risk for subsequent new vascular events or death, in whom more aggressive therapy and clinical surveillance might be appropriate. Moreover, the results from some studies were negative.

In their pivotal review, Di Napoli et al concluded that there is insufficient evidence to justify the routine use of CRP for either primary or secondary risk stratification for cerebrovascular disease alone. In addition, only few studies have analyzed the relationship between elevated admission CRP levels and stroke severity or stroke etiology.

**Conclusions**

We conclude that in Nepali elderly men and women with ischemic stroke, CRP was found to be raised. If the results of the present study are confirmed in other analyses of large population-based cohorts of men and women, the inclusion of CRP as a risk factor for ischemic stroke or TIA would have important implications. Thus, the use of CRP values may aid in identifying a potentially large number of men and women who are at risk for cerebrovascular events. This, in turn, may lead to the development of new treatment strategies for primary stroke prevention in those individuals identified as being at risk for developing cerebrovascular disease.

**Recommendation**

We believe that the role of CRP after ischemic stroke is far more complicated than perhaps we realize it is therefore conceivable that CRP is a non-specific biomarker of inflammation and not only acts as a marker but also is involved in the initiation and progression of atherosclerosis. At present, there is not sufficient evidence to recommend measurement of CRP in the routine evaluation of cerebrovascular disease risk in primary prevention, because there is insufficient evidence as to whether early detection, or intervention based on detection, improves health outcomes, although shared risk of cardiovascular disease indicates this may be of value. In secondary prevention of stroke, elevated CRP adds to existing prognostic markers, but it remains to be established whether specific therapeutic options can be derived from this.

In short, there is need for more studies to clarify the exact role of CRP in cerebrovascular disease.
Acknowledgement

I would like to thank Professor Dr K.K.Oli, and the department of Neurology TUTH for providing me the ground to perform this study and Dr Praveesh Rajbhandari for helping me with this study.

Reference

8. Cholesterol, diastolic blood pressure, and stroke: 13,000 strokes in 450,000 people in 45 prospective cohorts. Prospective studies collaboration. Lancet 346: 1647-1653, 1995

<table>
<thead>
<tr>
<th>Cholesterol Address</th>
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</tr>
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<tbody>
<tr>
<td>&lt;5.17 mmol/l Less than 200 mg/dL Desirable</td>
<td>5-6</td>
</tr>
<tr>
<td>2</td>
<td>32</td>
</tr>
<tr>
<td>5.17-6.18 mmol/l 200–239 mg/dL Borderline high</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 4: Comparison between Cholesterol and CRP


