ORIGINAL ARTICLE

Serum Homocysteine In Acute Ischaemic Cerebrovascular Stroke

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KEY WORDS : Homocysteine, Acute ischaemic cerebrovascular stroke, NIHSS Score

ABSTRACT

Background: There is evidence that high serum homocysteine is a poor prognostic factor in patients with acute ischaemic cerebrovascular stroke. Our study showed a close correlation of serum homocysteine and National Institutes Of Health Stroke Scale Score (NIHSS score) in patients of acute ischaemic cerebrovascular stroke.

M**aterial** and Methods: 50 indoor cases of acute ischemic cerebrovascular accidents were studied. All patients underwent serum homocysteine determination and the NIHSS score of all the patients at admission were calculated.

Results: Most patients with a better prognosis as determined by their lower NIHSS score had a lower serum homocysteine level, and most with a worse prognosis as per their higher NIHSS score and a higher serum homocysteine level.

Conclusion: Higher level of serum homocysteine is associated with a poorer short term prognosis. Thus, it may act as an indicator of short term prognosis in acute ischaemic cerebrovascular stroke.

INTRODUCTION

Homocysteine is a sulfhydryl-containing amino acid derived from the essential amino acid Methionine, which is abundant in animal sources of protein. The metabolic pathway that converts methionine to homocysteine is essential for the proper functioning of many biomolecules, including DNA, proteins, phospholipids, and neurotransmitter.

However, homocysteine also plays a major role in the causation of acute ischaemic cerebrovascular stroke.

EFFECTS OF HOMOCYSTEINE THAT MAY BE RELEVANT TO ATHEROGENESIS AND THROMBOGENESIS LEADING TO STROKE: 1-5

ATHEROGENESIS :

1. Induces DNA hypomethylation and expression of genes known to mediate cell growth and differentiation.
2. Induces oxidative stress.
3. Induces vascular inflammation by altering expression of tumor Necrosis factor – a and inducible Nitric Oxide (NO) synthase.
4. Induces endothelial dysfunction as a result of increased oxidative stress, decreased bioavailability of Nitric Oxide (due to increased oxidative stress) and increased inflammation.
5. Alters hepatic and macrophage lipoprotein metabolism, in part by enhancing uptake of modified low density lipoprotein.
6. Induces hypertrophy and altered mechanics in the micro-circulation and increased intima media thicknes

THROMBOGENESIS:

1. Induced tissue factor expression in monocytes.
2. Modulates leukocyte endothelium interactions.
3. Increases platelets aggregation.
4. Enhance binding of lipoprotein (a) to fibrin.
5. Interferes with several clotting factors.

Thus, there seems to be a correlation between serum homocysteine level with the prognosis of acute ischemic stroke, as higher level is associated with a poorer prognosis in animal studies.

We did this study to note if there is any relationship between serum homocysteine level and the NIHSS score in patients of acute ischaemic cerebrovascular stroke.

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MATERIAL AND METHODS

In the present study, 50 indoor cases of ages more than 35 were studied who had acute ischemic cerebrovascular stroke within previous 72 hours as diagnosed by clinical examination and confirmed by either a CT Scan or by an MRI Scan.

Patients presenting with hemorrhagic stroke/ subarachnoid hemorrhage/ cerebral venous sinus thrombosis or presenting with ischemic stroke after 72 hours of onset were excluded.Also, Patients with other predisposing illnesses, other than classical risk factors for stroke (e.g. HT, DM, hyperlipidemia, IHD, previous TIA/ stroke) which may alter results of the study were excluded.

Detailed history of the patient included in the study was taken. They were asked in details about their symptoms, the onset, duration and progress of the same, as also associated other symptoms. They were specifically asked for symptoms of headache/ vomiting/ vertigo/ gait imbalance/ speech disturbances/ sensory symptoms/ visual complains among the other symptoms.

Past history regarding any illnesses was elicited. Especially history for risk factors for stroke, i.e. hypertension, diabetes, ischemic heart disease and previous TIA/stroke was asked as also about treatment of the same.

Complete nervous system examination was done systematically along with examination of the other systems like respiratory, cardiovascular, gastrointestinal and musculoskeletal systems. After that, clinical diagnosis was made.

The NIHSS score of all the patients at admission were calculated.

All patients underwent serum Homocysteine determination. In our study, a serum homocysteine level above 15µmol/L was considered as significant.

Patients also underwent the following investigations : Hb, TC, DC, Urine examination, RBS, FBS, PP2BS, S. Cholesterol, blood urea, serum creatinine, serum electrolytes, Liver function test, E.C.G., Fundus examination, C.T./ M.R.I. Scan examination, Lipid profile, X-ray chest PA view, 2D- ECHO, USG- KUB in certain cases.

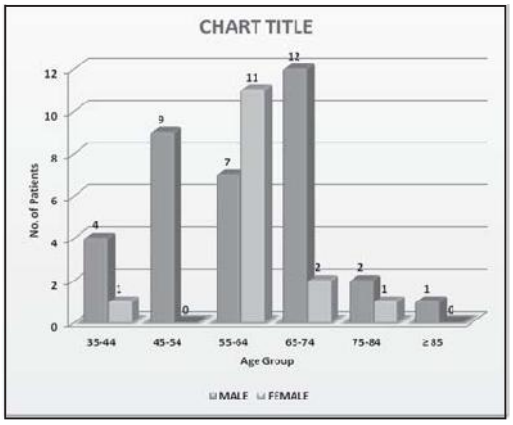
RESULTS AND DATA ANALYSIS [6-12]

In the current study, most of the patients 36% were belonging to the age group 55-64 years, followed by 28% in 65-74 years, 18% in 45-54 years, 10% in 35-44 years, 6% in 75%84 years and 2% aged ⩾ 85 years.The youngest patient was 35 years old, and the oldest patient was 85 years old. The mean age of the patients was 59.4 years.In the present study 70% of the patients were males and 30% were females. Males are more frequently affected than females. In the present series, the ratio is 2.3 : 1 in favour of males, which confirms to that of other workers.(Table I, and Chart I)

Table I : Age and Sex distribution in the study.

AGE GROUP	MALE No. of Patients	FEMALE No. of Patients	TOTAL
35-44	4	1	5
45-54	9	0	9
55-64	7	11	18
65-74	12	2	14
75-84	2	1	
≥85	1	0	1
TOTAL	35	15	50

Chart I : Age and Sex chart in the study



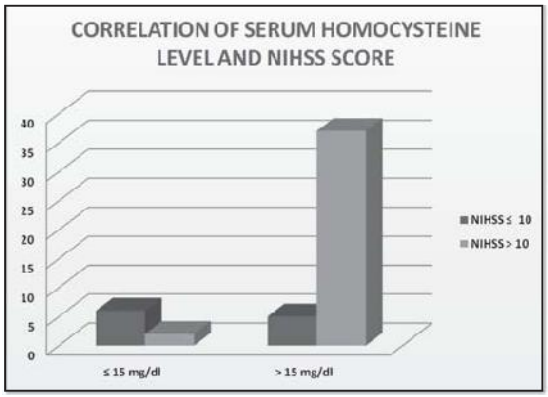
2 patients with NIHSS score more than 10 had their serum homocysteine less than or equal to 15.0 mg/dl, while 37 patients had it at serum homocysteine levels more than 15.0 mg/dl.

Likewise, 6 patients with NIHSS score less than 10 had their serum homocysteine less than 15.0 mg/dl, while only 5 patients had it at serum homocysteine levels more than 15.0 mg/dl.(Table II, and ChartII).

Table-II : Correlation of serum homocysteine and NIHSS score

Serum Total Homocysteine	NIHSS ⩽ 10	NIHSS > 10	TOTAL
⩽ 15 mg/dl	6	2	8
> 15 mg/dl	5	37	42

ChartII : Correlation chart of serum homocysteine and NIHSS score



Thus, most patients with a better prognosis as determined by their lower NIHSS score had a lower serum homocysteine level, and most with a worse prognosis as per their higher NIHSS score and a higher serum homocysteine level.

The p value was < 0.001. Thus, there was a highly significant correlation between serum uric acid level and a better prognosis at the time of admission.This correlates with most of the previous studies. (Tables III and IV)

Table III : Mean homocysteine level in various other studies and current study.

STUDY	No. of Patients	Mean Total Homocysteine
Crudrun Boysen et al	1039	13.4
Narang et al	117	16.8
Kay sin TAN et al	83	13.5
Present study	50	32.9

Table IV: P values of various other studies and current study.

STUDY	P Valve	Significance
Cudrun Boysen et al	< 0.001	Highly Significant
Narang et al	< 0.01	Highly Significant
KAY- SIN TAN et al	< 0.001	Highly Significant
James F took et al	= 0.05	Significant
Present Study	<0.001	Highly Significant

Although no patient had died due to cerebrovascular stroke in this study, the patients with lower serum homocysteine levels were discharged earlier from the hospital as compared to the patients with higher serum homocysteine levels who were admitted for longer period.

CONCLUSION

Patients with a lower NIHSS score on admission, and thus a better prognosis, had lower levels of serum homocysteine and those with a higher NIHSS score had higher homocysteine levels.

P value < 0.001 (Highly Significant)

Our results thus indicate that higher levels of serum Homocysteine is associated with a poorer short term prognosis. Thus, it may act as an indicator of short term prognosis.

These results reinforce the available evidence, and point towards a potential therapeutic approach for patients presenting with acute ischemic cerebrovascular stroke, in the form of therapeutic correction of the Homocysteine and other interventions in a bid to improve the outcome for the patients. However, further studies are needed to confirm these findings on a larger scale, and a longer duration of follow-up.

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