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Research Article

Study of Homocysteine, Lipoprotein (a) and Lipid Profile in Ischemic Stroke

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Abstract: Homocysteine, lipoprotein (a) and lipid profile were assesed in patients with ischemic stroke. The study was carried out in the departments of Biochemistry and General Medicine, Mamata General Hospital, Khammam. 68 clinically diagnosed cases (by CT/MRI) of ischemic stroke and 70 age and sex matched controls were selected. Diabetics, Hypertensives, smokers and alcohol abusers were excluded. Blood samples were collected and homocysteine, lipoprotein (a) and lipid profile were measured. Statistical analysis was done by student "t' test. Mean plasma homocysteine levels were significantly increased in cases when compared to controls.This study showed an association between increased plasma homocysteine and ischemic stroke. Lipoprotein (a) levels were also higher in cases than in controls. Mean serum cholesterol and triglycerides were significantly increased in cases.
Keywords: Homocysteine, Lipoprotein (a), Ischemic stroke

INTRODUCTION

Stroke is a major cause of death and disability worldwide. Each year, about 4.4 million people die of stroke globally, of whom almost three million are from developing countries [1]. In India the estimated prevalence rate of stroke range is 84-262/100,000 in rural and 334-424/100,000 in urban areas. The incidence rate is 119-145/100,000 based on the recent population based studies [2]. Stroke accounts for two percent of hospital registrations and 9 to 30 percent of neurological admissions [3-4].

Stroke can be defined as a clinical syndrome characterized by rapidly developing clinical symptoms and/or signs focal and at times global loss of brain function, with symptoms lasting >24 hours or leading to earlier death, and with no apparent cause other than that of vascular origin [5].

Smith S. Wade *et al*. (2001) classified stroke into broad two groups [6]. Ischemic stroke (85%) and Hemorrhagic stroke (15%).

Common causes for ischemic stroke are atherosclerosis with thromboembolism while less common causes include hypercoagulable disorders, homocysteinemia, collagen vascular diseases, fibromuscular dysplasia, oral contraceptives, eclampsia.

Traditional risk factors for stroke include advanced age, male sex, hypertension, diabetes mellitus, cardiovascular diseases, hyperlipidemia, obesity, cigarette smoking, alcohol, oral contraceptives, fibrinogen, physical inactivity and psychological factors [7-8].

However, recent studies indicate that a moderately elevated plasma level of the amino acid homocysteine constitutes an additional risk factor for ischaemic stroke, coronary heart disease and deep venous thrombosis [9-10].

Homocysteine is a sulphur containing amino acid that is formed as an intermediary product during the conversion of the essential amino acid methionine to cysteine, homocysteine causes endothelial cell injury and thereby initiates the process of premature atherosclerosis [11, 12].

Lp (a) is a plasma Lipoprotein (a)nd exhibits high structural similarity with low density lipoprotein (LDL) cholesterol [13]. Both lipoproteins are characterized by the same lipid composition and the presence apolipoprotein (apo) B-100 [13]. There is evidence that Lp (a) is a predictor of many forms of vascular disease, including premature coronary, peripheral and cerebral artery disease [15].

Hypercholesterolemia and Hypertriglyceridemia are known risk factors for ischemic cerebrovascular disease [16].

MATERIAL AND METHODS

In the present study 68 (CT/MRI) cases of ischemic stroke and 70 age and sex matched controls were recruited. Diabetics, Hypertensives, smokers, alcohol abusers, patients with radioimaging showing intracerebral hemorrhage and tumor, sepsis, malignancy, hepatic/renal failure and active collagen vascular diseases were excluded from the study. Ethical clearance was obtained from the institutional ethical committee. Fasting samples were collected and following parameters were analysed. Homocysteine was estimated by Enzymatic cycling assay using Diazyme kit(USA) and Lipoprotein (a) by Turbidimetric method using Daiichi (Japan). Total cholesterol, (cholesterol oxidase/ peroxidase/ ACCUREX) Triglycerides (Glycerol phosphate Oxidase/ peroxidase/ ACCUREX), High density lipoprotein Cholesterol (HDL-C) (Phosphotungstate precipitation method/ ACCUREX), Low Density Lipoprotein Cholesterol (LDL - C) was calculated by Friedwald's formula.

Statistical Analysis: Statistical analysis was done by "t' test. <0.05 was considered significant.

RESULTS

Table 1: Mean values of cases and controls

	Parameter	Hcy (µmol/l)	Lp (a) (mg/dl)	T.chol (mg/dl)	TG (mg/dl)	HDL (mg/dl)	LDL (mg/dl)
Cases	Mean	18.19	29.74	239.05	162.70	38.11	163.64
Controls	Mean	9.72	24.95	161.68	115.71	48.61	97.25

Table 2: `t´ test results

Parameter	p value
Hcy	<0.0003
Lp a	<0.0238
T.chol	<0.0001
TG	<0.0001
HDL	<0.0001
LDL	<0.0001

Among cases of ischemic stroke mean value of Hcy was 18.19 ±12.47 µmol/l and among controls mean was 9.72±3.13µmol/l. Mean of Lp a in cases was 29.74±10.42mg/dl and 24.95±8.12 mg/dl in controls. Mean values of total cholesterol, triglycerides, HDL, LDL were 239.05± 39.03, 162.70±24.91, 38.11±2.65, 163.64±41.18 respectively.

DISCUSSION

Stroke is the most common life threatening neurological disease [17]. Inspite of advances made in the diagnosis and management of stroke patients,there remains a substantial number of stroke events that cannot be explained on the basis of conventional risk factors leading to search for newer risk factors.

In the present study, Mean plasma homocysteine levels were significantly elevated compared to controls and establishing homocysteine as an independent risk factor for stroke. Homocysteine has primary atherogenic and prothrombotic properties [18]. Histologic hallmarks include intimal thickening, elastic lamina disruption, smooth muscle hypertrophy, marked platelet accumulation and the formation of platelet enriched occlusive thrombi [19].

The mean levels of Lipoprotein (a) were significantly increased in cases compared to controls and correlates with various studies. Milionis *et al*. suggested that determination of Lp(a) levels may be important in identifying elderly individuals at risk of ischemic stroke independently of other risk factors and concurrent metabolic derangements [20]. It is a risk factor for cardiovascular diseases and has been suggested that the atherogenic property of Lp(a) may be associated with its structural similarity to plasminogen [21]. Moreover, lipoprotein (a) may interfere in clot lysis by competing for the same binding sites as plasminogen [22].

Strong association has been found between high levels of serum cholesterol especially of low-density lipoprotein (LDL) cholesterol and the development of atherosclerosis, while elevated levels of high-density lipoprotein (HDL) cholesterol play a protective role [23, 24].

CONCLUSION

Hyperhomocysteinemia is an risk factor for stroke and it would be a useful tool for screening the stroke patients who present no clue for vascular disease and thrombosis, who have an ischemic stroke at young age and who have a family history of premature atherosclerosis[25]. Because of the low cost and security of the therapy a daily combined vitamin therapy is advised to patients with an ischemic stroke and hyperhomocysteinemia [25]. Lipoprotein (a) is an emerging finding in its association with coagulation markers of thrombosis and studies suggested that an increased Lp(a) level could represent a risk factor for ischemic stroke [22, 26]. Further studies are needed to investigate the role of Lp(a) as an established risk factor for stroke. Further research is required to gain insight into the true significance of increased lp(a) concentrations in these various clinical settings. Therefore, further research should aim at developing inexpensive and efficient systems to improve goal attainment of optimal serum lipid levels in ischemic stroke.

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