Section: General Medicine

Original Research Article

ANALYSIS OF ROLE OF SERUM LIPID PROFILE AS RISK FACTOR FOR DEVELOPMENT OF ISCHEMIC STROKE AT A TERTIARY CARE HOSPITAL

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ABSTRACT

Background: Stroke, a cerebrovascular accident, is prevalent across patient populations and can be a significant cause of morbidity and mortality. Ischemic occlusions contribute to around 85% of casualties in stroke patients, with the remainder due to intracerebral bleeding. Hyperlipidemia is a major contributor to coronary heart disease, but its relationship to stroke is complicated. Hence; the present study was conducted for assessing the role of serum lipid profile as risk factor for development of ischemic stroke.

Materials & Methods: A total of 100 patients with ischemic stroke and 100 controls who came for routine medical check-up were enrolled. Complete demographic and clinical details of all the patients was obtained. The diagnosis of stroke was confirmed by taking CT scan of brain. Lipid profile was taken following a 12 hour fasting on the next day of admission. Serum total cholesterol less than200mg/dl, LDL cholesterol<100 mg/dl, triglyceride less than150mg/dl, and HDL more than 40 mg/dl was taken as normal. Data was analyzed using SPSS software.

Results: Mean age of the stroke patients and controls was 53.9 years and 55.1 years respectively. Majority proportion of patients of both the study group and control group were males. Significant difference was obtained while comparing TC, LDL-C and HDL-C among the stroke patients and controls. While comparing the dyslipidemia, is was seen that ischemic stroke group had significantly higher proportion of patients with dyslipidemia in comparison to controls.

Conclusion: Lipids give significant contribution to stroke risk and that lipid profile assessment must be taken into account in estimating the individual risk of stroke.

Key words: Lipid, Ischemic, Stroke.

INTRODUCTION

Stroke, a cerebrovascular accident, is prevalent across patient populations and can be a significant cause of morbidity and mortality. Strokes can be categorized as ischemic, hemorrhagic, or subarachnoid. Among ischemic strokes, the Trial Org 10172 in Acute Stroke Treatment (TOAST) classification is used to subdivide the categories that include cardioembolism, small-vessel occlusion, large-artery atherosclerosis, and stroke of undetermined etiology. The etiology of ischemic stroke is due to either a thrombotic or embolic event that causes a decrease in blood flow to the brain. In a thrombotic event, the blood flow to the brain is obstructed within the blood vessel due to dysfunction within the vessel itself, usually secondary to atherosclerotic disease, arterial dissection, fibromuscular dysplasia, or inflammatory condition. In an embolic event, debris from elsewhere in the body blocks blood flow through the affected vessel.

The etiology of stroke affects both prognosis and outcomes.[1-3]

Ischemic occlusions contribute to around 85% of casualties in stroke patients, with the remainder due to intracerebral bleeding. Ischemic occlusion generates thrombotic and embolic conditions in the brain. In thrombosis, the blood flow is affected by narrowing of vessels due to atherosclerosis. The build-up of plaque will eventually constrict the vascular chamber and form clots, causing thrombotic stroke. In an embolic stroke, decreased blood flow to the brain region causes an embolism; the blood flow to the brain reduces, causing severe stress and untimely cell death (necrosis).[3] Hyperlipidemia is a major contributor to coronary heart disease, but its relationship to stroke is complicated. Total cholesterol is associated with risk of stroke, whereas high-density lipoprotein (HDL) decreases stroke incidence. Therefore, evaluation of lipid profile enables estimation of the risk of stroke. In one study, low levels of HDL (<0.90 mmol/L), high levels of total triglyceride (>2.30 mmol/L) and hypertension were associated with a two-fold increase in the risk of stroke-related death in the population.[4-6] Hence; the present study was conducted for assessing the role of serum lipid profile as risk factor for development of ischemic stroke.

MATERIAL AND METHODS

The present study was conducted for assessing the role of serum lipid profile as risk factor for development of ischemic stroke. A total of 100 patients with ischemic stroke and 100 controls who came for routine medical check-up were enrolled. Complete demographic and clinical details of all the patients was obtained. The diagnosis of stroke was confirmed by taking CT scan of brain. Lipid profile was taken following a 12 hour fasting on the next day of admission. Serum total cholesterol less than 200mg/dl, LDL cholesterol<100 mg/dl, triglyceride less than 150mg/dl, and HDL more than 40 mg/dl was taken as normal. Data was analyzed using SPSS software.

RESULTS

Mean age of the stroke patients and controls was 53.9 years and 55.1 years respectively. Majority proportion of patients of both the study group and control group were males. Significant difference was obtained while comparing TC, LDL-C and HDL-C among the stroke patients and controls. While comparing the dyslipidemia, is was seen that ischemic stroke group had significantly higher proportion of patients with dyslipidemia in comparison to controls.

Table 1: Relationship of serum lipid profile and ischemic stroke

Lipid profile	Ischemic stroke	Controls	p-value
TG (mg/dL)	125.6	120.8	0.13
TC (mg/dL)	193.4	141.9	0.01*
LDL-C (mg/dL)	123.2	90.9	0.00*
HDL-C (mg/dL)	55.9	41.8	0.00*

***: Significant**

Table 2: Correlation of abnormal lipid profile with ischemic stroke

Lipid profile	Ischemic stroke (n)	Controls (n)	p-value
TG (> 150 mg/dL)	**20**	**14**	**0.01***
TC (>200 mg/dL)	**49**	**21**	**0.00***
LDL-C (>100 mg/dL)	**66**	**45**	**0.00***
HDL-C (<40 mg/dL)	**33**	**20**	**0.01***

DISCUSSION

Stroke is defined by the World Health Organization as a clinical syndrome consisting of rapidly developing clinical signs of focal (or global in case of coma) disturbance of cerebral function lasting more than 24 hours or leading to death with no apparent cause other than a vascular origin. Stroke is classified broadly into three categories; ischemic stroke, hemorrhagic stroke and subarachnoid hemorrhage. Ischemic stroke occurs due to blockage of blood vessel which limits the blood supply to the brain whereas hemorrhagic stroke occurs due to rupture of blood vessel leading spillage of blood in the intracranial cavity. Depending on the site of blood spillage the hemorrhagic stroke could be classified as intracerebral hemorrhage or subarachnoid hemorrhage. Approximately 60–80% of all strokes is ischemic.[7-9]

The most common stroke symptoms people present with are facial numbness and weakness, visual impairment, weakness of the upper or lower limbs on one side of the body, impaired balance, nausea, abrupt severe headache of an unknown cause and speech impairment. These traditional symptoms are reported to present equally in men and women, but women are more likely to present with non-traditional stroke symptoms like light headedness and loss of consciousness. Fast, accurate diagnosis of stroke is vital for selection of appropriate acute stroke treatment, such as intra venous tissue plasminogen activator (IV tPA) or endovascular mechanical thrombectomy treatment.[8,9] Hence; the present study was conducted for assessing the role

of serum lipid profile as risk factor for development of ischemic stroke.

Mean age of the stroke patients and controls was 53.9 years and 55.1 years respectively. Majority proportion of patients of both the study group and control group were males. Significant difference was obtained while comparing TC, LDL-C and HDL-C among the stroke patients and controls. While comparing the dyslipidemia, is was seen that ischemic stroke group had significantly higher proportion of patients with dyslipidemia in comparison to controls. Immanuel S et al determined the role of low HDL-cholesterol, and high total cholesterol, LDL-Cholesterol and triglyceride as risk factors for ischemic stroke. A study was conducted on 76 patients with an age range of 40-70 years. Subjects consisted of 38 post ischemic stroke patients and 38 control subjects with a diagnosis other than stroke. The study sample consisted of serum for lipid profile assessment. Total cholesterol and triglyceride were assessed using enzymatic method, while HDL-cholesterol and LDL-cholesterol using direct homogenous enzymatic method. Statistical analysis was performed using chi-square and multivariate analysis using logistic regression. Low HDL-cholesterol was found in ischemic stroke patients and demonstrated a significant difference compared to control subjects ($p<0.05$). The results of total cholesterol, triglyceride, LDL-cholesterol did not demonstrate a significant difference. The odds ratio demonstrates that low HDL-cholesterol is a risk factor for ischemic stroke. A low HDL-cholesterol level is a risk factor for ischemic stroke, with an odds ratio of 3.09, while total cholesterol, triglyceride and high LDL-cholesterol levels were not risk factors for ischemic stroke.[10]

Gong X et al retrieved 50 prospective cohort studies containing 3,301,613 individuals. An increase in total cholesterol (TC) is associated with an increased IS risk ($P < 0.001$) and a reduced HS risk ($P < 0.001$). Similarly, an increase in triglyceride links with a greater IS risk ($P < 0.001$) but with a lower HS risk ($P = 0.014$). On the opposite, high-density lipoprotein cholesterol (HDL-C) correlates with a reduced IS risk ($P = 0.004$) but has no significant association with the HS risk ($P = 0.571$). Moreover, an increase in low-density lipoprotein cholesterol (LDL-C) or non–high-density lipoprotein cholesterol has no statistically significant effect on both IS and HS. The pooled effect estimates on the risk of IS and HS revealed that TC and LDL-C levels should be controlled under 6.0 and 3.5 mmol/L, respectively, to reduce worsening effects on the IS risk while maintaining potential beneficial effects on reducing the HS risk. They revealed comprehensive relationships between lipid profiles and the risk of stroke, suggesting controlling the TC and LDL-C levels under 6.0 and 3.5 mmol/L, respectively, to balance both the IS and HS risk.[11]

Alkhaneen, et al compared the serum lipid profiles of patients with ischaemic and hemorrhagic strokes. The mean age of presentation of stroke was 68±13, 59% of patients were males, and 41% were females. BMI ranged from 30±8. Obesity (BMI 30 or above) was predominant in both stroke subtypes. Among all patient comorbidities, hypertension was the most predominant. Diabetes was present in 71% of the population. Of the participants in this study, 114 had ischemic stroke and 87 had a hemorrhagic type. A comparison of the serum lipid profile of two categories of strokes showed no statistical significance in serum values of total cholesterol, triglycerides, and LDL-C in ischemic and hemorrhagic stroke patients.[12]

CONCLUSION

Lipids give significant contribution to stroke risk and that lipid profile assessment must be taken into account in estimating the individual risk of stroke.

REFERENCES

1. Adams HP, Bendixen BH, Kappelle LJ, Biller J, Love BB, Gordon DL, Marsh EE. Classification of subtype of acute ischemic stroke. Definitions for use in a multicenter clinical trial. TOAST. Trial of Org 10172 in Acute Stroke Treatment. Stroke. 1993 Jan;24(1):35-41.
2. Ntaios G. Embolic Stroke of Undetermined Source: JACC Review Topic of the Week. J Am Coll Cardiol. 2020 Jan 28;75(3):333-340.
3. Pierik R, Algra A, van Dijk E, Erasmus ME, van Gelder IC, Koudstaal PJ, Luijckx GR, Nederkoorn PJ, van Oostenbrugge RJ, Ruigrok YM, Scheeren TWL, Uyttenboogaart M, Visser MC, Wermer MJH, van den Bergh WM., on behalf of the Parelsnoer Institute-Cerebrovascular Accident Study Group. Distribution of Cardioembolic Stroke: A Cohort Study. Cerebrovasc Dis. 2020;49(1):97-104.
4. Disertori M., Quintarelli S., Grasso M., Pilotto A., Narula N., Favalli V., Canclini C., Diegoli M., Mazzola S., Marini M., et al. Autosomal recessive atrial dilated cardiomyopathy with standstill evolution associated with mutation of Natriuretic Peptide Precursor A. Circ. Cardiovasc. Genet. 2013; 6:27–36.
5. Iribarren C., Jacobs D.R., Sadler M., Claxton A.J., Sidney S. Low total serum cholesterol and intracerebral hemorrhagic stroke: Is the association confined to elderly men? The Kaiser Permanente Medical Care Program. Stroke. 1996; 27:1993–1998.
6. Denti L., Cecchetti A., Annoni V., Merli M.F., Ablondi F., Valenti G. The role of lipid profile in determining the risk of ischemic stroke in the elderly: A case-control study. Arch. Gerontol. Geriatr. 2003; 37:51–62.
7. Hatano S. Experience from a multicentre stroke register: a preliminary report. Bulletin of the World Health Organisation. 1976;54(5):541—553.
8. Caplan LR. Caplan's Stroke: A Clinical Approach, 4th ed, Saunders Elsevier, Philadelphia: 2009. Basic pathology, anatomy, and pathophysiology of stroke. p.22.
9. Lozano R, Naghavi M, Foreman K, Lim S, Shibuya K, Aboyans V et al. Global and regional mortality from 235 causes of death for 20 age groups in 1990 and 2010: a systematic analysis for the Global Burden of Disease Study 2010. Lancet. 2012; 380:2095.
10. Immanuel S, Giantini A, Dharma RS; Samino. The role of lipid profile as a risk factor indicator for ischemic stroke at Cipto Mangunkusumo Hospital, Jakarta. Acta Med Indones. 2006;38(1):11-16.
11. Gong, X., Chen, L., Song, B., Han, X., Xu, W., Wu, B., Sheng, F., & Lou, M. Associations of lipid profiles with the risk of ischemic and hemorrhagic stroke: A systematic review and meta-analysis of prospective cohort studies. Frontiers in cardiovascular medicine 2022; 9, 893248.
12. Alkhaneen, H., Alsadoun, D., Almojel, L., Alotaibi, A., & Akkam, A. Differences of Lipid Profile Among Ischemic and Hemorrhagic Stroke Patients in a Tertiary Hospital in Riyadh, Saudi Arabia: A Retrospective Cohort Study. Cureus 2022; 14(5), e25540.