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Study Association Between Altered Lipid Metabolism And Acute Cerebral Ischemia

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ABSTRACT:-

Introduction: Stroke is a major cause of mortality and morbidity worldwide, with ischemic stroke (IS) being the predominant type (approximately 80%) found in stroke patients. Stroke or a cerebro-vascular accident is an acute neurological injury which occurs due to vascular pathology and presents as a brain infarction or haemorrhage. Stroke is a medical emergency. Dyslipidaemia as a major risk factor for stroke is studied for many years. Dyslipidaemia is a correctable risk factor. It has been shown that reduction of total cholesterol, LDL cholesterol triglycerides, VLDL cholesterol and increasing HDL cholesterol by drugs has decreased the incidence of stroke. Carotid Intima-Media thickness (CIMT) is a non-invasive alternative marker of atherosclerotic disease that has been used extensively. CIMT is defined as the distance between the lumen-intima interface, which corresponds to the inner and outer echogenic lines seen on the B-mode ultrasound (Carotid Doppler) image.

Material and Methods: In this cross-sectional study, 50 consecutive patients with acute stroke admitted to the neurology department of hospital were studied. The main goal was to determine whether hypocholesterolemia is a risk factor for primary ICH. The second goal was to compare the serum cholesterol and Triglyceride (TG) levels in the two types of stroke. Patients between 40-80 years of age of either sex with clinical findings, brain CT-scan or MRI indicative of cerebral infraction or intra-cerebral hemorrhage were enrolled in this study. The patients with any underlying diseases especially liver disease, familial hypercholesterolemia and hypothyroidism, taking anti lipid and sympathomimetic drugs, and the patients in whom the cerebral hemorrhage was secondary to cerebral tumor, trauma or previous coagulation disorders were excluded from the study.

Results: In our study the distribution of 50 patients according to fasting lipid profile. Majority of the patients 66% had high total cholesterol, 72% had high LDL, 66% had low HDL and 72% had high triglycerides. The table above shows distribution of gender with fasting lipid profile. There was no significant correlation between gender and fasting lipid profile. Majority of male patients (42%) with high total cholestrol, (46%) with high triglycerides, (46%) with low HDL and (46%) with high LDL. Majority

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of female patients (24%) with high total cholestrol, (26%) with high triglycerides, (20%) with low HDL and (26%) with high LDL. There was no significant correlation between gender and CIMT. 46 % of male patients and 26% of female patients had high CIMT.

Conclusion: It could be concluded that LDL levels can be considered as a risk factor for both ischemic and hemorrhagic cerebral events. In view of our study results, total cholesterol was a risk factor in ischemic stroke whereas high TG levels had a protective role against hemorrhagic events. As a result, treating high LDL levels can be a helpful option to reduce these events and eventually decrease the related morbidity and mortality rates.

Keywords: Lipid, Acute Cerebral Ischemia, Stroke.

INTRODUCTION

Stroke is a major cause of mortality and morbidity worldwide, with ischemic stroke (IS) being the predominant type (approximately 80%) found in stroke patients [1].Stroke or a cerebro-vascular accident is an acute neurological injury which occurs due to vascular pathology and presents as a brain infarction or haemorrhage. Stroke is a medical emergency. [2] With the current ageing population, the number of people suffering from stroke will inevitably escalate leading to increasing demand for more effective prevention, diagnosis and treatment strategies. [3]

Therefore, it is important to identify early risk factors as a strategy of primary prevention. The modification of risk factors in stroke has brought down both mortality and morbidity of stroke remarkably in the last 30 years. [4] Equally imperative is to identify factors which may predict recurrence of the disease for those already burdened for planning secondary prevention and treatment. [5]

Dyslipidaemia as a major risk factor for stroke is studied for many years. Various studies in different population has shown dyslipidaemia is associated with stroke. Dyslipidaemia is a correctable risk factor. [6] It has been shown that reduction of total cholesterol, LDL cholesterol triglycerides, VLDL cholesterol and increasing HDL cholesterol by drugs has decreased the incidence of stroke. [7]

Carotid Intima-Media thickness (CIMT) is a non-invasive alternative marker of atherosclerotic disease that has been used extensively. CIMT is defined as the distance between the lumen-intima interface, which corresponds to the inner and outer echogenic lines seen on the B-mode ultrasound (Carotid Doppler) image. Increased CIMT has consistently been shown to predict future vascular events. [8]

The carotid intima media thickness has emerged as a reliable independent marker of atherosclerosis and cerebrovascular disease. However well-defined population cut off value for CIMT is not there. [9]

So in this study we are trying to see at what value of CIMT the individual with risk factors will be prone for stroke in our study population. An increased CIMT may help select patients at high risk for brain infarction and change in lifestyle and prophylactic treatment with statins may prevent these devastating events. [10]

Measurement of the carotid intimal-medial thickness (CIMT) of the common carotid artery (CCA) by B-mode ultrasound was found to be a suitable non-invasive method to visualize the arterial walls and to monitor the early stages of the atherosclerotic process. [11]

MATERIAL AND METHODS

In this cross-sectional study, 50 consecutive patients with acute stroke admitted to the neurology department of hospital were studied.

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The main goal was to determine whether hypocholesterolemia is a risk factor for primary ICH. The second goal was to compare the serum cholesterol and Triglyceride (TG) levels in the two types of stroke.

Patients between 40-80 years of age of either sex with clinical findings, brain CT-scan or MRI indicative of cerebral infraction or intra-cerebral hemorrhage were enrolled in this study. The patients with any underlying diseases especially liver disease, familial hypercholesterolemia and hypothyroidism, taking anti lipid and sympathomimetic drugs, and the patients in whom the cerebral hemorrhage was secondary to cerebral tumor, trauma or previous coagulation disorders were excluded from the study.

Lipid profile was measured by collecting the patients' blood after fasting for 9 to 12 hours. The lipid profile of 187 apparently healthy subjects living in the same community was provided for comparison. The subjects were matched for age and sex within the stroke patients and were selected not to have any underlying disease or a positive history of stroke.

STATISTICAL ANALYSIS

Statistical analyses were performed using IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp. Results on categorical measurements were presented as Frequency (Percentage).

RESULTS

Table No.1: Distribution Of Cases Based On Lipid Profile

Variables	Low/High	No. of Patients	Percentage
TC	<200mg/dl	17	34
	>200 mg/dl	33	66
LDL	<130 mg/dl	14	28
	>130 mg/dl	36	72
HDL	<40 mg/dl	33	66
	>40 mg/dl	17	34
TG	<150 mg/dl	14	28
	>150 mg/dl	36	72

Above table shows the distribution of 50 patients according to fasting lipid profile. Majority of the patients 66% had high total cholesterol, 72% had high LDL, 66% had low HDL and 72% had high triglycerides.

Table No.2 : Distribution Of Gender With Fasting Lipid Profile.

	Low/High	Female N(%)	Male N(%)	P value
TC	<200mg/dl	5(10.0)	12(24.0)	0.757
	>200 mg/dl	12(24.0)	21(42.0)	
TG	<150 mg/dl	4(8.0)	10(20.0)	0.746
	>150 mg/dl	13(26.0)	23(46.0)	
HDL	<40 mg/dl	10(20.0)	23(46.0)	0.534
	>40 mg/dl	07(14.0)	10(20.0)	
LDL	<130 mg/dl	04(8.0)	10(20.0)	0.746
	>130 mg/dl	13(26.0)	23(46.0)	

The table above shows distribution of gender with fasting lipid profile. There was no significant correlation between gender and fasting lipid profile. Majority of male patients (42%) with high total cholestrol, (46%) with high triglycerides, (46%) with low HDL and (46%) with high LDL.Majority of

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female patients (24%) with high total cholestrol, (26%) with high triglycerides, (20%) with low HDL and (26%) with high LDL.

Table No.:3: Distribution Of Gender With Cimt:

Sex	CIMT (<0.75) N(%)	CIMT (>0.75) N(%)
Male	10(20)	23 (46)
Female	04(08)	13(26)

P=0.746

Table shows distribution of gender with CIMT. There was no significant correlation between gender and CIMT. 46 % of male patients and 26% of female patients had high CIMT.

Table No.4: Distribution Of Diabetes With Fasting Lipid Profile:

	Low/High	Diabetes		P value
		No N(%)	Yes N (%)	
TC	<200mg/dl	14(28.0)	3(6.0)	0.001*
	>200 mg/dl	1(2.0)	32(64.0)	
TG	<150 mg/dl	12(24.0)	2(4.0)	0.001*
	>150 mg/dl	3(6.0)	33(66.0)	
HDL	<40 mg/dl	11(22.0)	22(44.0)	0.533
	>40 mg/dl	4(8.0)	13(26.0)	
LDL	<130 mg/dl	12(24.0)	2(4.0)	0.001*
	>130 mg/dl	3(6.0)	33(66.0)	

The above table shows the distribution of diabetes with fasting lipid profile. There was a statistically significant correlation between diabetes and total cholesterol (p= 0.001) , triglycerides(p= 0.001) and LDL(p= 0.001). Number of diabetic patients with high total cholesterol (64%) , triglycerides(66%) , low HDL (44%) and high LDL(66%).

Table No.: 5: Hypertension And Lipid Profile Distribution:

	Low/High	Hypertension		P value
		No N(%)	Yes N (%)	
TC	<200mg/dl	5(10.0)	12(24.0)	1.00
	>200 mg/dl	11(22.0)	22(44.0)	
TG	<150 mg/dl	4(8.0)	10(20.0)	1.00
	>150 mg/dl	12(24.0)	24(48.0)	
HDL	<40 mg/dl	10(20.0)	23(46.0)	0.757
	>40 mg/dl	6(12.0)	11(22.0)	
LDL	<130 mg/dl	04(08)	10(20)	1.00
	>130 mg/dl	12(24)	34(68)	

The table shows distribution of hypertension with lipid profile. There was no positive correlation between them. The number of hypertensive patients with high cholesterol(44%) , high triglycerides (48%) ,low HDL(46%) and high LDL (68%) among the study population.

Table No.6: Correlation Of Fasting Lipid Profile With Cimt:

	Low/High	CIMT		P value
		(<0.75) N(%)	(>0.75) N (%)	

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TC	<200mg/dl	14(28.0)	3(6.0)	0.001*
	>200 mg/dl	0	33(66.0)	
TG	<150 mg/dl	13(26.0)	01(2.0)	0.001*
	>150 mg/dl	01(2.0)	35(70.0)	
HDL	<40 mg/dl	11(22.0)	22(44.0)	0.327
	>40 mg/dl	03(6.0)	14(28.0)	
LDL	<130 mg/dl	13(26.0)	01(2.0)	0.001*
	>130 mg/dl	01(2.0)	35(70.0)	

Table shows that there was a statistically significant positive correlation between the CIMT and total cholesterol (p= 0.001), triglycerides (p= 0.001) and LDL(p= 0.001). Among the study population, the number of patients with high total cholesterol(60%) , high triglycerides (70%) , low HDL (44%) and high LDL (70%).

DISCUSSION

Stroke makes a considerable contribution to morbidity and mortality and is one of the top four causes of death worldwide. The ICH and ischemic infarction are the main causes of cerebrovascular accidents. There are several reasons and risk factors influencing the risk of developing strokes. [12]

Lipid profile changes are thought to be a risk factor in the occurrence of stroke. On the other hand, stroke itself is also associated with changes in the lipid levels probably because of the accompanying stress and catecholamine overproduction that occurs during an acute stroke. In fact, the available reports have pointed out that stress is associated with considerable decrease in the lipid profile. [13]

The present study showed higher levels of total cholesterol in patients with ischemic stroke compared with the control group; it should be noted that there was no significant relations between the site of infarction and the measured level. [14]

Cholesterol can be differently involved in stroke, depending on the etiologic subtype. In this view, a large part of the inconsistency of observational data from large studies on the relation between cholesterol and stroke can be due to gathering data by having both types of stroke together in a same group. This can explain the absence of any detectable association between cholesterol and stroke when all types of the stroke, irrespective of the cause, are considered as outcomes. [15] Indeed, the lack of association might conceal the positive association with ischemic stroke together with a negative association with hemorrhagic stroke, as resulted in this study. The same results were also suggested by some other studies. Denti et al reported that LDL-C concentrations over 100 mg/dl along with low HDL-C levels were associated with higher stroke risk. [16]

In the present study, we compared the data on the lipid profile of the patients with different types of stroke (hemorrhagic and ischemic) and the control group. Findings revealed a significant relation between lipid profile and the occurrence of the ischemic stroke. LDL was considered as a predictor of hemorrhagic stroke, as well. [17] It also reported that increased cholesterol and LDL levels are associated with higher risk of developing ischemic stroke. TG, however, was not reported to have a considerable role in the development of ischemic stroke. Findings of the present study indicating no role for TG in the ischemic strokes are on the contrary to that of certain previous studies; the variable, however, showed a protective effect in patients with ICH. [18]

CONCLUSION

It could be concluded that LDL levels can be considered as a risk factor for both ischemic and hemorrhagic cerebral events. In view of our study results, total cholesterol was a risk factor in ischemic stroke whereas high TG levels had a protective role against hemorrhagic events. As a result, treating high LDL levels can

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be a helpful option to reduce these events and eventually decrease the related morbidity and mortality rates. Performing a larger study would be helpful to figure out the definite role of HDL and TG levels in cerebral vascular insults, as well.

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