



## Study of Total Cholesterol, LDL, HDL in Non-diabetics with Stroke

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### Abstract

**Background:** Stroke is an acute neurological injury which occurs due to vascular pathology with many modifiable risk factors, dyslipidemia being one of them. In this study lipid profile was studied in non-diabetic patients with stroke, because diabetes itself is associated with hyperlipidemia.

**Materials and Methods:** The study was conducted on 60 non-diabetic stroke patients and 60 age and sex matched controls who did not have stroke, after obtaining consent.

**Results:** The study shows the effect of Total Cholesterol, LDL and HDL on stroke.

**Conclusion:** This study showed significant association of total cholesterol, LDL cholesterol in non-diabetics with stroke. High levels of total cholesterol, LDL were associated with a higher level of stroke. Low levels of HDL were not associated with a higher risk of stroke.

**Keywords:** dyslipidemia, stroke, cholesterol, cerebrovascular accident, diabetes mellitus.

### Background

Stroke or cerebrovascular accident is an acute neurological injury which occurs due to vascular pathology<sup>[1]</sup> and presents as a brain infarction or hemorrhage. Stroke is a medical emergency. The risk factors of stroke have been identified<sup>[2]</sup>. The modification of risk factors in stroke has brought down both mortality and morbidity of stroke remarkably in the last 30 years<sup>[4]</sup>.

Dyslipidemia as a major risk factor for stroke is studied for many years. Various studies in different population have proved it to be true. Dyslipidemia is a correctable risk factor. It has been shown that reduction of total cholesterol,

LDL and increasing HDL cholesterol by drugs has decreased the incidence of stroke.

In our study, lipid profile was studied in non-diabetic patients with stroke. Diabetes itself is associated with hyperlipidemia and increases atherosclerosis which makes it an undisputed risk factor for stroke. The atherogenicity of diabetics and non-diabetics is different. So non-diabetic patients were included in the study.

### Materials and Methods

This is a Case Control Study conducted over a period of six months at Kilpauk medical college, Chennai.

Detailed history was taken. Clinical examination, radiological examination was done. Serum Total Cholesterol, LDL, HDL were estimated by enzymatic method.

**Inclusion Criteria**

All patients with infarct in CT Brain.

**Exclusion Criteria**

- Patients with diabetes mellitus
- Patients with drugs for dyslipidemia.
- Patients on dietary modification for dyslipidemia.
- Cerebral infarct associated with trauma or tumor.

**Results**

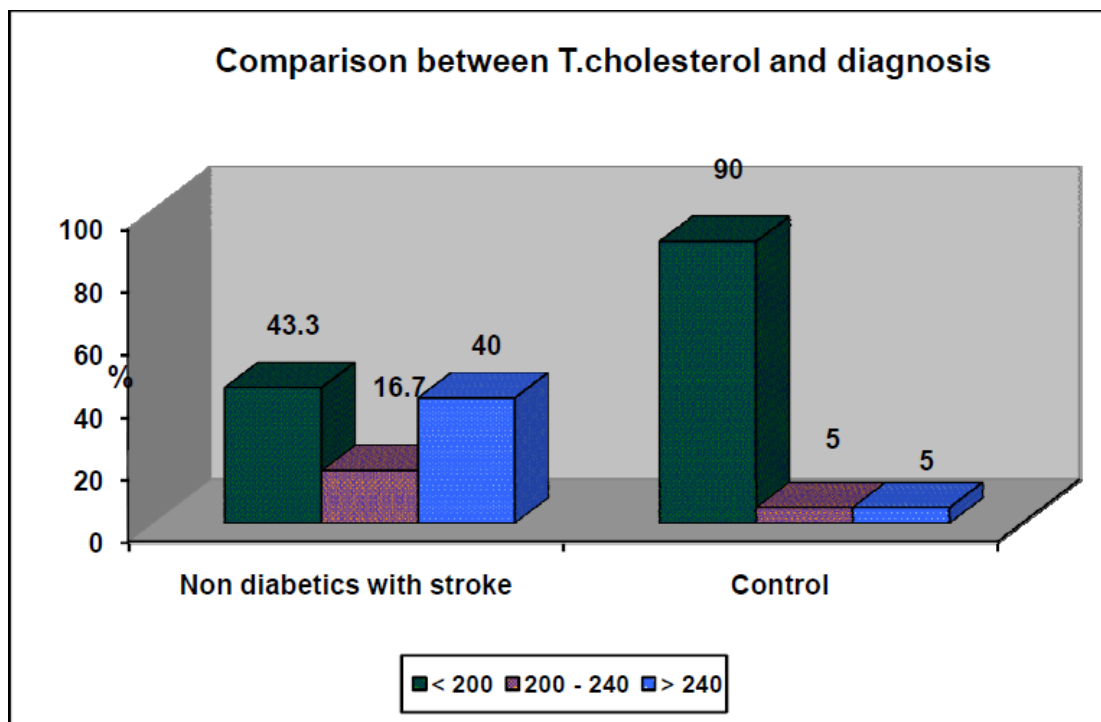
**Total Cholesterol**

			Non-diabetics with stroke	Control	Total
Cholesterol	<200	Count/ % within Diagnosis	26/43.3%	54/ 90%	80/ 66.7%
	200-240	Count/ % within diagnosis	10/16.7%	3/ 5%	13/ 10.8%
	>240	Count/% within diagnosis	24/ 40%	3/ 5%	27/ 22.5%
Total		Count? % within diagnosis	60/ 100%	60/ 100%	120/ 100%

The data shows associations of non diabetics with stroke and their controls with total cholesterol. 43.3% of stroke patients had normal values and 56.7% had high total cholesterol values. In the

control 90% had normal total cholesterol values and 10% had high Total Cholesterol values. The significance calculated was 0.000(p<0.001) which is highly significant<sup>[5]</sup>

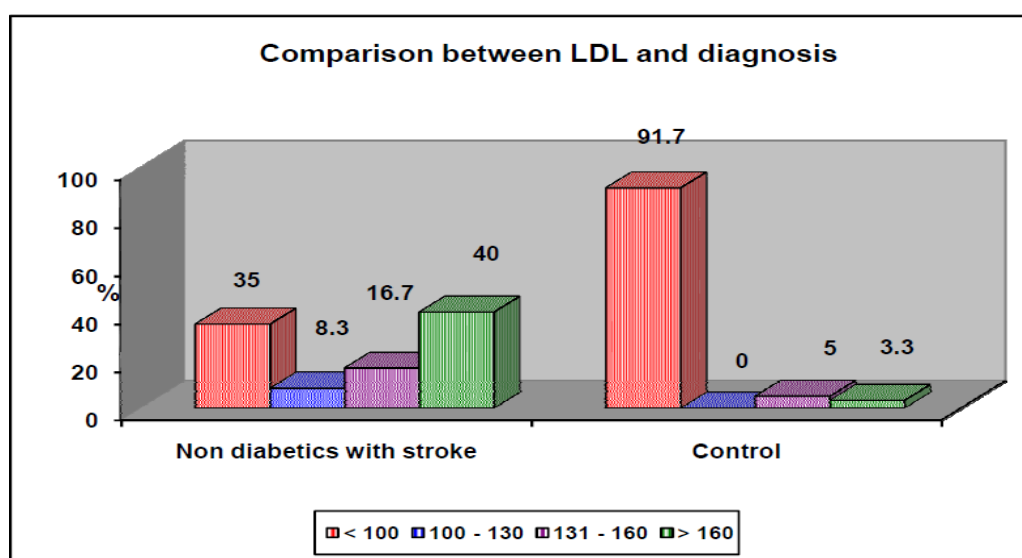
	Value	Df	Asymp. Sig
Pearson Chi square	29.903	2	0
Likelihood Ratio	32.580	2	0
Linear by Linear association	28.484	1	0
No. of valid cases	120		



**LDL  
CROSSTAB**

			Non-diabetics with Stroke	Control	Total
LDL	<100	Count/ % within diagnosis	21/35%	55/91.7%	76/63.3%
	100-130	Count/ % within diagnosis	5/8.3%	0	5/4.2%
	131-160	Count/ % within diagnosis	10/16.7%	3/5%	13/10.8%
	>160	Count/ % within diagnosis	24/40%	2/3.3%	26/21.7%
Total		Count/ % within diagnosis	60/100%	60/100%	120/100%

	value	Df	Asymp. Significance
Pearson Chi square	42.595	3	0
Likelihood ratio	48.613	3	0
Linear by Linear association	37.318	1	0
No. of valid cases	120		



The data shows association of non-diabetics with stroke and their controls to LDL. Only 35% of the patients had normal LDL levels. 65% had high values. In the control group 91.7% had normal

LDL values and the remaining 8.3% had high values. The significance calculated was 0.000 ( $p > 0.001$ ) which is highly significant.<sup>[7]</sup>

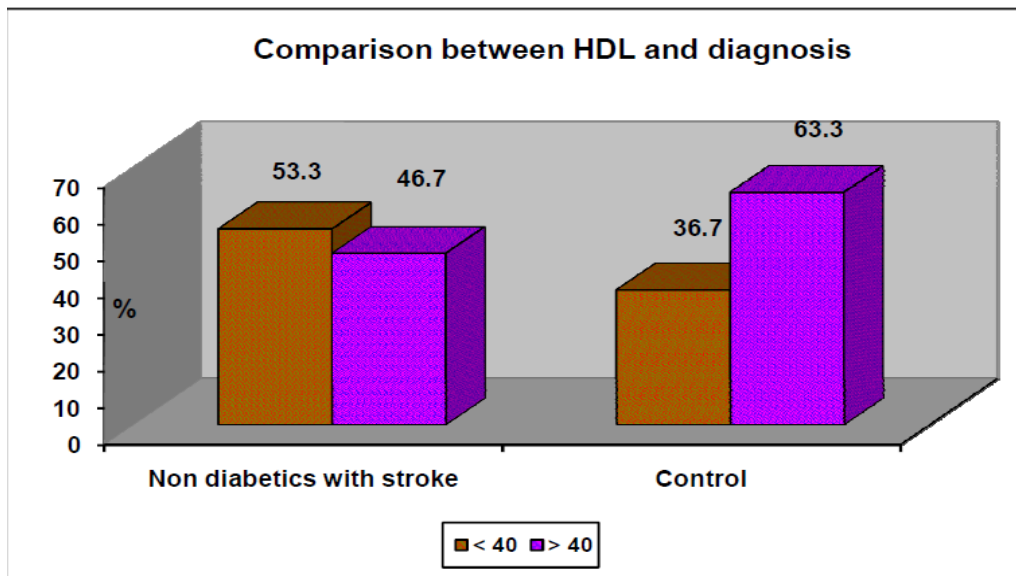
**HDL  
CROSSTAB**

			DIAGNOSIS		
			NON DIABETICS WITH STROKE	CONTROL	TOTAL
HDL	<40	COUNT % WITHN DIAGNOSIS	32 53.3%	22 36.7%	54 45%
	>40		28 46.7%	38 63.3%	66 55%
TOTAL			60 100%	60 100%	120 100%

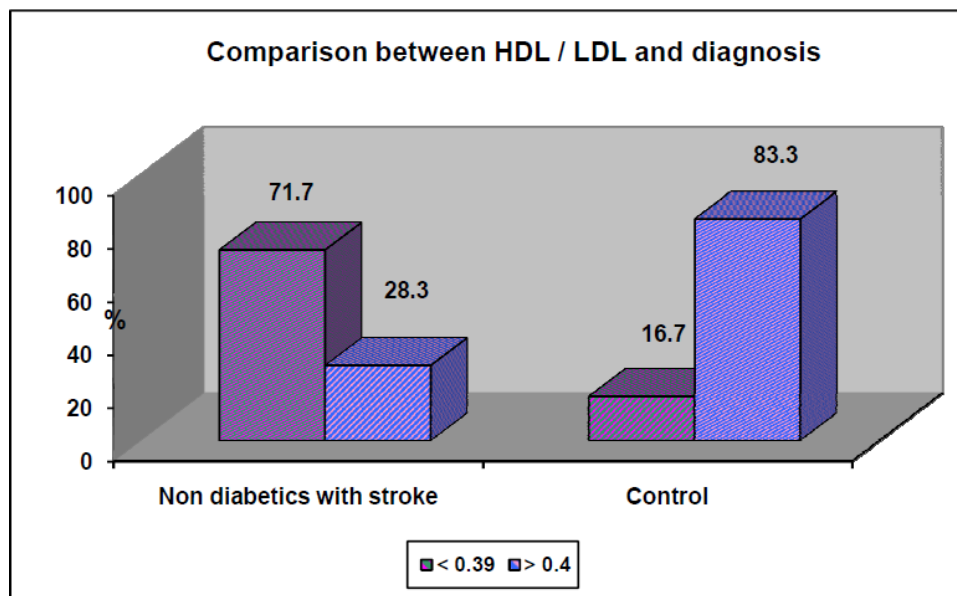
The data shows association of non-diabetics with stroke and their controls to HDL. Of the majority of the patients with stroke, 53.3% had low HDL

values in contrast to controls whereas 63.3% had high HDL values. The significance calculated was 0.067 which is not significant.<sup>[6]</sup>

	Value	Df	Asymp. significance	Exact significance (2 sided)	Exact significance (1 sided)
Pearson Chi square	3.367	1	0.067		
Continuity correction	2.727	1	0.099		
Likelihood ratio	3.384	1	0.066		
Fischer's exact test				0.098	0.049
Linear by Linear association	3.339	1	0.068		
No. of valid cases	120				



**HDL/LDL Ratio**



HDL/LDL	Non-diabetics with stroke	control
<0.39	71.7	16.7
>0.4	28.3	83.3

In non-diabetics with stroke, 71.7% had HDL/LDL ratio < 0.39. Only 28.3% of the same

group had HDL/LDL ratio >0.4 and 16.7% had HDL/LDL ratio >0.4, which is normal.

### Discussion

Dyslipidemia is a modifiable risk factor for stroke. Increased age, Male sex are associated with dyslipidemia. Dyslipidemia is associated with 1.8 – 2.6 times the relative risk of stroke. Fasting Lipid Profile provides a better guide to treatment of dyslipidemia.

Diet consists of saturated fat < 7% of total calories, Monounsaturated fat up-to 20% of total calories, Polyunsaturated fat up-to 10% of total calories, Cholesterol content less than 200mg/dl.

From the above study, it is inferred that increase in Total Cholesterol and LDL are associated with an increase in risk of stroke, while decrease in HDL is not associated with an increase in risk of stroke, and increase in HDL/LDL ratio is associated with a decrease in risk of stroke.

### Conclusion

Our study was conducted on 60 non diabetic stroke patients and 60 controls. Exclusion of diabetic patients was done because diabetes is associated with hyperlipidemia and atherosclerosis.

This study showed significant association of Total Cholesterol, LDL, HDL cholesterol in non-diabetics with stroke. High levels of total cholesterol, LDL were associated with a higher level of stroke.

HDL cholesterol levels were not significantly associated with stroke.

Dyslipidemia is a tip of an iceberg. The hidden cases are to be diagnosed and treated. Dyslipidemia if properly treated can reduce the incidence of stroke<sup>[3]</sup> thereby reducing the morbidity and mortality of stroke leading to a healthier society.

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