

**Research Article**

## Comparison of altered serum LDL levels between ischemic stroke and hemorrhagic stroke

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### ABSTRACT

**Objective:** To compare the Levels of LDL in Ischemic and hemorrhagic stroke to find out the association of LDL with stroke.

**Material and method:** This comparative study was conducted at DHQ Hospital, Lodhran from January 2017 to June 2017. Total 618 stroke patients were selected for this study and mean serum LDL levels were compared between the both groups.

**Results:** Mean age in group 1 was 60.15 and mean age in group 2 was 59.34. In group 1, 224 (72.5%) were males and 85 (27.5%) were females. In group 2, 204 (66%) were male and 105 (34%) were females. In Group 1, 180 (58%) patients found with abnormal LDL cholesterol levels and in Group 2, 120 (38%) found with abnormal LDL cholesterol levels. Strong association of abnormal LDL values with type of stroke was found. P.value 0.001.

**Conclusion:** Our study proved that LDL levels are higher in ischemic stroke than in hemorrhagic stroke. Statins should be given to reduce the risk of recurrent ischemic stroke.

**Keyword:** Low density lipoproteins, stroke, Intracerebral hemorrhage, Ischemic stroke.

### INTRODUCTION

Stroke is one of the leading causes of morbidity and mortality. It is an acute neurologic injury. It is a clinical syndrome describing a range of disorders, which result in focal cerebral ischemia. A uniform definition of stroke is vital for epidemiological studies.<sup>1</sup> The World Health Organization (WHO) definition of stroke has been widely used. According to it, stroke is defined as 'rapidly developing clinical signs of focal (or global) disturbance of cerebral function, with symptoms lasting 24 hours or longer, or leading to death, with no apparent cause other than that of vascular origin.'<sup>2</sup> This definition includes stroke due to both cerebral infarction or intracerebral and subarachnoid hemorrhage. An arbitrary time window of 24 hours distinguishes stroke from transient ischemic attack (TIA), which is defined as a neurological deficit lasting less than 24 hours.<sup>3</sup>

The two are best thought of as a continuum, and in fact, neuroimaging studies show that many cases of TIA are accompanied by cerebral infarction. The term cerebrovascular disease covers all vascular disease affecting the brain including stroke, vascular dementia, and asymptomatic cerebrovascular disease.

Approximately 80 percent of strokes are due to ischemic cerebral infarction and 20 percent are due to brain hemorrhage. An infarcted brain is pale initially, within hours to days, the grey matter becomes congested with engorged, dilated blood vessels and minute petechial hemorrhages.<sup>4</sup> When an embolus blocking a major vessel migrates, lyses, or disperses within minutes to days, recirculation into the infarcted area can cause a hemorrhagic infarction and may aggravate edema formation due to disruption of the blood-brain barrier.<sup>5</sup> A primary intracerebral

hemorrhage damages the brain directly at the site of the hemorrhage by compressing the surrounding tissue.<sup>6</sup>

An infarcted area is due to occlusion of a cerebral artery either due to thrombus or due to embolus from small or major artery like carotid artery.<sup>7</sup> The great majority of ischemic strokes are caused by a diminished supply of arterial blood, which carries sugar and oxygen to brain tissue.<sup>8</sup> Another cause of stroke that is difficult to classify is stroke due to occlusion of veins that drain the brain. Venous occlusion causes a backup of fluid resulting in brain edema, and in addition, it may cause both brain ischemia and hemorrhage into the brain.<sup>9</sup>

Stroke is the cause of one in eight deaths and constitutes a formidable burden of disability and misery for the patients, their relatives and the wider community.<sup>10</sup> A large number of patients with stroke are being admitted in secondary and tertiary care hospitals in Pakistan. Some of these die in hospitals while a significant proportion are left with partial or total disability. This puts economical and social burdens on the family and society. Measures should be taken to prevent cerebrovascular disease as not only "prevention is better than cure" but cost effective as well.<sup>10</sup>

The incidence and mortality of stroke vary greatly among different populations and has declined considerably in several foreign studies.<sup>11</sup> This is probably the result of better preventive measures. Common risk factors of stroke are hypertension, diabetes mellitus, coronary artery disease, atrial fibrillation, physical inactivity and alcohol. Strategies for stroke prevention, including the control of hypertension, treatment of atrial fibrillation, and smoking cessation, have reduced the disease burden, but stroke still remains an important public health challenge. Cerebrovascular diseases predominate in the middle and late years of life.<sup>12</sup>

## MATERIAL AND METHODS

This comparative study was conducted at DHQ Hospital, Lodhran from January 2017 to June 2017. Total 618 patients were included in this study after informed consent. An approval was taken from institutional review committee. Patients having acute neurological deficit with

hypodense or hyperdense area on CT Scan Brain were included in this study. Patients having no established infarction or hemorrhage on CT scan Brain, patients already on lipid lowering therapy, patients with past history of Cerebrovascular Disease, patients having TIAs and patients having chronic ailment like CRF, CCF, and CLD were excluded from the study.

To determine the subtype of stroke, clinical examination followed by CT scan was done. Stroke patients were divided into two groups, 309 patients in each group. CT scan reporting was done by the same radiologist. Finding of infarction (hypodense on CT scan) and hemorrhage (hyperdense on CT scan) were entered in proforma .

Venous sample for LDL were taken as per protocol after 8 hour of overnight fasting. All samples sent to laboratory for serum LDL levels. All the relevant information including LDL levels and confounding variables like age, gender, diabetes, hypertension, smoking and ischemic heart disease were entered on a Performa especially designed for this purpose.

Data was analyzed by using SPSS version 10. Mean and standard deviation was calculated for numerical data. Categorical data was presented as frequencies and percentages. Chi-square test was applied to find out the association of LDL with stroke. P value 0.05 was considered as significant.

## RESULTS

Our total study population consisted of six hundred and eighteen patients of stroke undergone for CT scan brain plain (n=609). It was divided into two groups. Group 1 is comprised of 309 patients and these patients were having infarction ( hypodense area) on CT scan brain. Group 2 is comprised of 309 patients and these patients were having hemorrhage (hyperdense area) on CT scan brain. Mean age in group 1 was 60.15 and mean age in group 2 was 59.34. In group 1, 224 (72.5%) were males and 85 (27.5%) were females. In group 2, 204 (66%) were male and 105 (34%) were females. The distribution of risk factors in group 1 was as followed: diabetes was present in 123 (39.8%), hypertension was present in 130 (42.1%), ischemic heart disease 184 (59.5%)

and smoking in 170 (55%) of patients. The distribution of risk factors in group 2 was as followed: diabetes was present in 78 (25.2%), hypertension was present in 226 (76.1%), ischemic heart disease 47 (15.2%) and smoking in 157 (50.2%) of patients. Shown in Table No.1.

**Table 1:** Distribution of study variables among two groups

STUDY VARIABLE		GROUP 1 Ischemic Stroke n(309)	GROUP 2 Hemorrhagic stroke n(309)
Age (mean)		60.15	59.34
Sex	Male	224(72.5%)	204(66%)
	Female	85(27.5%)	105(34%)
Diabetes Mellitus		123(39.8%)	78 (25.2%)
Hypertension		130(42.1%)	226 (76.1%)
Smoking		170(55%)	157 (50.2%)
Ischemic heart disease		184(59.5%)	47 (15.2%)

**Table 2:** Comparison of abnormal serum LDL cholesterol in ischemic and hemorrhagic stroke patients (n=618)

Type of Stroke	No. of cases with abnormal values of LDL (>150 mg/dl)		Total	P Value
	Yes (%)	No (%)		
Ischemic Stroke (Group 1)	180 (58.25%)	129 (41.75%)	309	.001
Hemorrhagic stroke (Group 2)	120 (38.83%)	189 (61.17%)	309	

## DISCUSSION

Stroke is a global public health problem associated with disturbing consequences.<sup>13</sup> It is a major health problem in developing countries of the world. Number of patients suffering from stroke is increasing all over the globe. It has many modifiable and non modifiable risk factors that contribute to the development and progression of atherosclerotic cerebrovascular disease.

We decided to conduct a study to see the relationship between stroke and LDL levels. Many studies have been done to find association of LDL levels with stroke. Association of ischemic stroke to elevated LDL levels is conflicting.<sup>14</sup> According to some studies increased LDL levels are associated with increased risk of ischemic stroke.<sup>14</sup> In some other studies it is shown that it has no association with ischemic stroke.<sup>15</sup>

Hemorrhagic stroke is found to have inverse relationship with elevated LDL levels.<sup>16</sup>

Present study was conducted to determine and document the association of LDL cholesterol

Table No.2 showing the comparison of abnormal serum LDL cholesterol in ischemic and hemorrhagic stroke patients. In Group 1, 180 (58%) patients found with abnormal LDL cholesterol levels and in Group 2, 120 (38%) found with abnormal LDL cholesterol levels. Strong association of abnormal LDL values with type of stroke was found. P.value 0.001.

with stroke in our setup. In our study, in group 1 (ischemic stroke ) mean age was 60.15 years while in group 2 (hemorrhagic stroke) mean age was 59.39 years. While in study conducted by Mahmood et al<sup>13</sup> mean age was 64.2+12 years and in Sulheria et al<sup>17</sup> it was 62+10 years. In our study male to female ratio was 2.6:1 while by Mahmood et al<sup>13</sup> male to female ratio was 3.6:1. Among risk factors in our study, diabetes mellitus was present in 123 (39.8%) patients of ischemic stroke and 78 (25.2%) patients of hemorrhagic stroke. While according to Mahmood et al,<sup>13</sup> out of 100 patients DM was present in 41 (41%) patients of ischemic stroke and in 25 (25%) patients of hemorrhagic stroke. So diabetes mellitus is a major risk factor for ischemic stroke. In our study, hypertension was found in 226 (76.1%) patients of hemorrhagic stroke and 130 (42.1%) patients of ischemic stroke. While Mahmood et al<sup>13</sup> found that out of 100 patients hypertension was present in 70 (70%) patients of ischemic stroke and 40 (40%) patients of hemorrhagic stroke. It is concluded

that hypertension is a major risk factor for hemorrhagic stroke.

In our study LDL levels were increased in ischemic stroke patients. In group 1 (ischemic stroke) patients LDL levels were increased in 180 (58%) patients while these were normal in 129 (42%) patients and this is comparable with the Sulheria et al<sup>17</sup> in which out of 40 ischemic stroke patients, LDL levels were increased in 22 (55%) patients and these were normal in 18 (45%) patients. In Mahmood et al,<sup>13</sup> out of 100 patients, increased LDL levels were seen in 42 (42%) patients of ischemic stroke.

In group 2 (hemorrhagic stroke), LDL levels were increased in 120 (38%) patients while these were normal in 189 (62%) patients. This is comparable with the Sulheria et al<sup>17</sup> in which out of 40 hemorrhagic stroke patients, LDL levels were increased in 18 (45%) patients and these were normal in 22 (55%) patients. In Mahmood et al,<sup>13</sup> out of 100 patients, increased LDL levels were seen in 22 (22%) patients of hemorrhagic stroke.

On comparison, there were significantly greater no of patients with raised LDL levels in ischemic stroke than in hemorrhagic stroke. Our p value is .001 which is significant and comparable with both studies in which p value is less than .005 in both studies.

## CONCLUSION

Present study concluded that:

- Increased LDL levels are major risk factor for ischemic stroke as compared to hemorrhagic stroke.
- Hypertension is seen more commonly in hemorrhagic stroke as compared to ischemic stroke.
- Ischemic heart disease is a major risk factor for ischemic stroke as compared to hemorrhagic stroke
- So statins must be used in ischemic stroke to minimize recurrent stroke.

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