

## FREQUENCY OF RAISED LOW DENSITY LIPOPROTEIN LEVELS IN PATIENTS WITH ISCHEMIC STROKE AT A TERTIARY CARE HOSPITAL.

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### ABSTRACT

**Objective;** To determine frequency of raised LDL levels in ischemic stroke and its association with various risk factors causing cerebral ischemia in stroke patients. **Background;** Cerebrovascular accident(CVA) is a health concern worldwide. It causes enormous disabilities in adult age group, and is 2<sup>nd</sup> commonest cause of deaths throughout the world. It has been established that approximately 15 million people succumb to stroke each year worldwide, out of this 5 million don't survive and another 5 million become permanently handicapped and thus put significant burden on catering families. This study was conducted to identify contribution of different risk factors in causing ischemic stroke in our population. **Study Design:** Descriptive, case series study. **Setting:** Department of Medicine, DHQ Teaching Hospital, Sahiwal. **Duration of study;** One Year tenure spread between May 2017 to May 2018. **Material and Methods:** 205 cases between 40-70 years of age including both male and female patients with ischemic stroke, irrespective of disease duration were included in study. History of raised BP, previous stroke, history of stroke in family, diabetes and smoking was recorded on pre-designed questionnaire. Body mass index was calculated after noting weight and height of the patient. Venous blood (5 ml) sample was drawn and sent to the pathology laboratory Hospital for estimation of serum LDL level and blood glucose level. **Results;** Of these 205 study cases, 92 (44.9%) patients were male while 113 (55.1%) patients were female. Mean age of patients in our setting was noted to  $51.58 \pm 8.05$  years. In our study, 50 (24.4%) patients were smokers and 40 (19.5%) had history of hypertension. In our setting, family history of stroke was present in 39 (19%) and previous history of stroke was found in 31 (15.1%). Mean body mass index of our patients was calculated to be  $23.17 \pm 2.85$  kg/m<sup>2</sup> and 30(14.6%) cases were obese in our study. Mean fasting blood glucose level was  $118.32 \pm 23.21$  mg/dl (48 (23.4%) had diabetes). Mean low density lipoprotein level (LDL) noted in our study was  $109.59 \pm 49.15$  mg/dl and raised level of LDL was seen in 88 (42.9%) of our study cases. **Conclusion;** By identifying the share of various risk factors contributing in ischemic stroke, we can target population at risk of ischemic stroke and strict control and regulation of modifiable risk factors we can prevent this ominous condition to occur. Our study results point towards early diagnosis which will ultimately lead to proper management to improve clinical outcome in such patients. Raised levels of LDL were significantly associated with gender, diabetes, hypertension, obesity, family history and previous history of stroke.

**Keywords;** Ischemic stroke, low density lipoprotein, frequency.

## **Introduction;**

Cerebrovascular accident is an alarming health issue which is one of commonest cause of adult disability and the second largest factor causing mortality throughout the world<sup>1</sup>. Annually, 15 million people suffer from stroke approximately. It is suggested that number of non fatal stroke is 15 million, out of these about one third of patients become disabled. It puts an enormous burden of functional impairments; with 20% of patients who survive require institutional care for minimum of three months and 15-30% becomes handicapped for the rest of life. It puts enormous load on the stricken families and community, especially in the third world countries<sup>2</sup>. According to an estimate of the World Health Organization (WHO), by the year 2020 CVA will still be the 2<sup>nd</sup> largest cause of death along with coronary heart disease both in underdeveloped as well as affluent countries<sup>3</sup>. In addition, patients having stroke in underdeveloped territories are 10 years younger than those we see in western countries and hence the brunt of functional incapacity in survivors is very high.<sup>4</sup>

Cerebral infarction (Ischemic Stroke) occurs due to occlusion of blood vessel carrying blood to the brain tissue. It is responsible for 60-90% of all CVA cases in Pakistan.

The factors which contribute to ischemic stroke are divided as non-modifiable (gender, age, prior stroke, family history, and ethnicity) and modifiable risk factors (diabetes mellitus, hypertension, arterial fibrillation, dyslipidemia, coronary artery disease, smoking, physical inactivity, obesity, alcohol abuse<sup>5-10</sup>).

The raised LDL levels have also previously been reported to be associated with higher proportions of ischemic stroke in different population subsets, however their role with different risk factors have not been properly addressed. So this study was conducted to establish the role of different risk factors of ischemic stroke with raised LDL level in our local population of Southern Punjab.

## **Material and Methods;**

**Study Design;** Descriptive, Cross-sectional study

**Setting;** Department of Medicine, DHQ Teaching Hospital, Sahiwal, Pakistan.

**Duration of study;** One Year from May 2017 to May 2018

**Sample Size;** Sample size is 205 cases

**Sampling technique;** Non probability, consecutive sampling.

## **Inclusion Criteria;**

1. Age; 40-70 years.
2. Gender; both male and female patients.
3. Patients with ischemic stroke, irrespective of disease duration (as defined in operational definitions).

**Exclusion Criteria;**

1. Patients with intracerebral hemorrhage, subarachnoid hemorrhage or intra/extradural hematoma( on CT scan)
2. Patients with ischemic heart disease and low ejection fraction.
3. Previously diagnosed cases of brain tumors (with history and medical record).

**Operational Definition;**

**Obesity;** was defined as BMI more than 30 kg/m<sup>2</sup>

**Hypertension;** Known patients of hypertension taking or advised antihypertensive medication for more than 2 years.

**Diabetes;** Fasting glucose > 126 mg/dl on two different occasions 24 hours apart or already known diabetics taking oral hypoglycemic drugs/insulin for more than 2 years.

**Raised LDL;** Serum fasting LDL levels ≥ 100 mg/dl

All the patients having ischemic stroke (205), meeting inclusion criteria were enrolled from department of Medicine, DHQ teaching Hospital, Sahiwal, Pakistan. After taking informed consent from each patient/attendant, that case was included in this study and was properly informed about objectives of this study. Venous blood (5 ml) sample was drawn and analysed in pathology laboratory of the Hospital for the serum LDL level and blood glucose level estimation (FBS). Raised serum LDL level, diabetes, history of hypertension, smoking were recorded on pre-designed questionnaire. Data was processed and analyzed by SPSS-20. Descriptive statistics were used or the calculation mean and standard deviation for the patients age, height, weight, blood sugar level, LDL levels and BMI. Frequencies were estimated for categorical variables like raised LDL level (Yes/No), gender, age groups, family history of stroke, diabetes, smoking history of hypertension, and previous history of strokes. Chi-square test has been applied to establish the role of different risk factors of stroke with raised serum LDL levels at level of significance of 0.05 with 95 % confidence level.

**RESULTS;**

In our study, 205 patients having ischemic stroke were included in study. Among 205 cases, 92 (44.9%) were male and 113 (55.1%) were female. In our study, mean age of our patients was noted to be 51.58 ± 8.05 years, youngest patient age was 40 years while eldest was 70 years old. Mean fasting blood glucose level was 118.32 ± 23.21 mg/dl and 48 (23.4%) had diabetes. Out of 205 patients, 30 (14.6%) were obese and mean body mass index of our patients was found to be 23.17 ± 2.85 kg/m<sup>2</sup>. History of smoking was present in 50 (24.4%) patients and 40 (19.5%) had history of hypertension. Family history of stroke was present in 39 (19%) of our study cases while previous history of stroke was noted in 31 (15.1%) of our study cases. Mean low density lipoprotein level (LDL) noted in our study was 109.59 ± 49.15 mg/dl and raised level of LDL was seen in 88 (42.9%) of our case population. The role various risk factors of ischemic stroke with deranged LDL levels have been given in table 1 – 6.

**Table No. 1**

**Stratification of raised low density lipoprotein levels (LDL) with regards to gender.**

(n = 205)

Gender	Raised LDL		P – value
	Yes (n = 88)	No (n = 117)	
Male (n = 92)	50	42	<b>0.004</b>
Female (n = 113)	38	75	
<b>Total</b>	<b>205</b>		

**Table No. 2**

**Stratification of raised low density lipoprotein levels (LDL) with regards to diabetes.**

(n = 205)

Diabetes	Raised LDL		P – value
	Yes (n = 88)	No (n = 117)	
Yes (n = 48)	39	09	<b>0.000</b>
No (n = 157)	49	108	
<b>Total</b>	<b>205</b>		

**Table No. 3**

**Stratification of raised low density lipoprotein levels (LDL) with regards to obesity.**

(n = 205)

Obesity	Raised LDL		P – value
	Yes (n = 88)	No (n = 117)	
Yes (n = 30)	20	10	<b>0.005</b>
No (n = 175)	68	107	
<b>Total</b>	<b>205</b>		

**Table No. 4**

**Stratification of raised low density lipoprotein levels (LDL) with regards to hypertension.**

(n = 205)

Hypertension	Raised LDL		P – value
	Yes (n = 88)	No (n = 117)	
Yes (n = 40)	30	10	<b>0.000</b>
No (n = 165)	58	107	
<b>Total</b>	<b>205</b>		

**Table No. 5**

**Stratification of raised low density lipoprotein levels (LDL) with regards to family history.**

(n = 205)

Family History	Raised LDL		P – value
	Yes (n = 88)	No (n = 117)	
Yes (n = 39)	39	00	<b>0.000</b>
No (n = 166)	49	117	
<b>Total</b>	<b>205</b>		

**Table No. 6**

**Stratification of raised low density lipoprotein levels (LDL) with regards to previous history of stroke.**

(n = 205)

Previous History	Raised LDL		P – value
	Yes (n = 88)	No (n = 117)	
Yes (n = 31)	31	00	<b>0.000</b>
No (n = 174)	57	117	
<b>Total</b>	<b>205</b>		

### Discussion;

Cerebrovascular accident is a major contributory factor in causing death worldwide. Stroke remains the second largest cause of mortality and morbidity in the world<sup>11,12</sup> in spite of major advancements made in stroke prevention, nursing care, and rehabilitation in recent past. However, key to the success lies in the identification and confinement of all significant causal and modifiable risk factors<sup>8</sup>.

The study was conducted to identify relation of controllable risk factors such as diabetes mellitus, hypertension, and smoking with ischemic stroke.

In our study, a total of 205 patients with ischemic stroke meeting inclusion criteria were included. Among 205 patients, 92 (44.9%) patients were male and 113 (55.1%) were female. Sadreddini et al<sup>13</sup> also reported 54 % female gender predominance among patients with ischemic stroke from Iran. These findings are identical to that what we saw in our case. Abid et al<sup>7</sup> and Sacco et al<sup>14</sup> reported that prevalence of ischemic stroke in females is 52 % and 55 % respectively which is almost the same as we noticed. In our settings, mean age of patients was  $51.58 \pm 8.05$  years. We also noticed that most of our patients i.e. 116 (56.6%) were elderly with age more than 50 years. Khan et al<sup>15</sup> had similar finding regarding mean age i.e.  $58.11 \pm 15.29$  which is quite near to our results.

Abid et al<sup>7</sup> found  $55.96 \pm 13.75$  years as mean age of the patients who presented with cerebral ischemia which closely matches that of our study results. In our settings, 48 (23.4%) had diabetes, 30 (14.6%) were obese, 50 (24.4%) were smokers and 40 (19.5%) had history of hypertension. Sadreddini et al<sup>13</sup> reported from Iran that patients with ischemic stroke presented with diabetes in 24 % patients, hypertension in 78 % patients and smoking in 20 %. Our results are partially in compliance with that of Sadreddini et al<sup>13</sup> from Iran. Khan NI et

al<sup>16</sup> also reported obesity in 18 %, diabetes in 36.6% and smoking in 32 % patients with ischemic stroke. These results are in accordance with our study results. Family history of stroke was present in 39 (19%) of our cases while previous history of stroke was noted in 31 (15.1%) of our study cases. Sadreddini et al<sup>13</sup> from Iran reported 18 % previous history of stroke which is close to our study results.

Mean low density lipoprotein level (LDL) noted in our study was  $109.59 \pm 49.15$  mg/dl and raised level of LDL was seen in 88 (42.9%) of our study cases. Jehangir et al<sup>17</sup> also reported mean LDL levels to be  $127.21 \pm 34.31$  mg/dl among patients having ischemic stroke. Anwar et al<sup>18</sup> reported mean LDL levels to be  $137.21 \pm 38.21$  mg/dl which is near to our study results. Sadreddini et al<sup>13</sup> from Iran reported similar results. A study carried out by Mahmood et al<sup>19</sup> showed 7 % raised LDL levels in patients having ischemic stroke which is comparatively lower than that reported in our study. While another study by Smith et al<sup>20</sup> reported 52.1 % raised LDL levels which is close to our study results. A study from Jamshoro by Kumar et al<sup>21</sup> noticed 37 % raised LDL levels which is close to our study results.

Stratification against gender showed a significant predilection of raised LDL cholesterol in male patients with ischemic stroke. However when stratified against age, no significant difference was seen in patients below 50 or above 50 years. Diabetes, Hypertension, obesity, family history and previous history of stroke were significantly associated with raised LDL levels. Tsukinoki et al<sup>22</sup> from Japan also reported significant association of diabetes, hypertension and obesity with raised LDL levels among stroke patients, similar to that of our results.

### Conclusion;

By identifying the share of various risk factors contributing in ischemic stroke, we can target population at risk of ischemic stroke and by strict control and regulation of modifiable risk factors we can prevent this ominous condition to occur. Our study results point towards early diagnosis which will ultimately lead to proper management to improve clinical outcome in such patients. Raised levels of LDL were significantly associated with gender, diabetes, hypertension, obesity, family history and previous history of stroke.

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