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Linkage between low density lipoproteins and ischemic stroke

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ABSTRACT… Objective: To determine the frequency of raised low density lipoproteins (LDL) in subjects with ischemic stroke (IS) in our local population. **Study Design:** Cross-sectional study. **Setting:** Medical Unit-III, Nishtar Medical College, Multan. **Period:** 12 March 2016 to 12 September 2016. **Material & Methods:** Eligibility criteria include subjects with age limit between 40-70 year of both sex surfing with ischemic stroke. Raised-LDL means serum fasting LDL level ≥ 100 mg/dl was deemed as raised LDL on two different reading 24 hours apart (both was raised). **Results:** Our study registered a total of 205 patients out of this 92 (44.9%) were male patients while 113 (55.1%) were female with ischemic stroke. Mean height and weight of our study cases was 159.94 ± 11.21 and 68.43 ± 6.33 respectively. Mean BMI was noted to be 23.17± 2.85 kg/m^2. Mean LDL level noted in our study was 109.59 ± 49.15 mg/dl and raised level of LDL was seen in 88 (42.9%) of our study cases. Raised level of LDL was observed significant in gender, diabetes, obesity, hypertension, family history and previous history of stoke. **Conclusion:** Very high frequency of raised serum LDL levels was noted in our study. Raised LDL were positively linked with male gender, hypertension, family history of stroke, diabetes, obesity and past event of stroke. Our study determines the initial diagnosis of stoke that eventually lead to suitable management to enhance clinical result in such subjects.

Key words: Ischemic Stroke, Raised Low Density Lipoproteins, Risk Factors.

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INTRODUCTION

Stroke is a worldwide health issue which is main cause of disability in young people and also 2nd leading reason of mortality globally.[1] Each year approximately 15 million people suffer with stroke leading to cause disability in about a third of patients. It is an important reason loss of body function and 20% cases need institutional care but 15-30% cases were disabled permanently. Disability hade a great impact on family of patient and society, mainly in the underdeveloped countries.[2] According to World Health Organization (WHO) 2020 estimation, stroke is the 2nd leading cause of death with ischemic heart disease in developing world and developed world.[3] In addition, stroke occur in 10 times younger individuals than western individuals and burden of disability is greater.[4] The main reason of Ischemic Stroke (IS) is obstruction occur in blood vessels that supply blood to brain. In Pakistan 60-90% stroke cases having obstacle in blood vessel.

The stroke risk factor was classified as non-modifiable (family history, age, prior stroke, ethnicity and gender) and modifiable risk factors (dyslipidemia, diabetes mellitus, smoking, coronary artery disease, hypertension, arterial fibrillation, physical inactivity obesity and alcohol abuse.[5-7]

Hyperlipidemia has been considered one of significant factor of stroke in the causation of IS. In our country hyperlipidemia is responsible of causing 37% IS subjects.[7] A study concludes that 7 % raised LDL levels in patients having IS.[8] While another study reported 52.1 % raised LDL levels.[9]

Different studies conducted in Pakistan to determine the risk factors of IS have documented varying dyslipidemia rates but only one study has reported raised LDL level from Karachi.[8] These

studies were done with very small sample size comprising of only 100 patients with IS which is too small to be generalized on our large population where presentation of IS was more common.

There is no such study which determine the incidence rate of raised low density lipoproteins in subjects with IS in our local population. The results of this study will generate useful database of our local population and impact of confounders. The findings of this study will help clinicians to manage and treat these patients properly which will not only decrease disease morbidity and mortality but will also improve their quality of life as well as productivity which will be helpful for our national health economy.

MATERIAL & METHODS

A cross-sectional study conducted at Medical Unit-III, Nishtar Medical College, a tertiary care hospital Multan. Duration of study 12 march 2016 to 12 September 2016. Ethical approval was taken from Institutional ethical committee of Nishtar Medical College and hospital Multan, No 20870-88 NMC & H. Data was collected with the help of Questionnaire. The subjects of IS 205 subjects filling inclusion criteria were recruited.

Eligibility criteria include subjects with age limit between 40-70 year of both sexes. Raised LDL means serum fasting LDL level ≥ 100 mg/dl was deemed as raised LDL on two different reading 24 hours apart (both was raised). Individual surfing with IS define as CT scan of brain shows hypo thick zone in particularly vascular territory. Density constant with IS i.e. 30 – 35 (irrespective of duration of disease), diabetics taking oral hypoglycemic drugs/insulin for more than 2 years, Individual taking antihypertensive medication for more than 2 years called as hypertension, Socio-economic status was defined as per monthly income of the family; Low Income; Those having monthly income less than Rs. 12000,00. Middle Income; Those having monthly income ranging 12001 to 35000 rupees. High Income; Having monthly income more than Rs. 35000,00. Obesity was calculated by using following formula; BMI = Weight (Kg) / Height (meters).[2] Subjects who smoke minimum 10 cigarettes daily for more than 6 months were define as smokers. Alcohol consumers are those taking one glass (a standard glass will measure 250 ml) of drink per week for more than 6 months. Family history of stoke and previous history of stoke. Subjects having hemorrhagic stroke, history of Coronary Artery Disease, previous history of brain tumors and using statin therapy were exclude from study.

Using Consecutive sampling technique blood sample was taken to perform LDL (Raised Low Density Lipoprotein) and FBS (Fasting Blood Sugar Level). The 5 ml Venous blood sample was collected and sent to the central laboratory of Nishtar Hospital Multan for the serum LDL level and FBS level estimation as given in operational definitions. These tests were performed by a senior pathologist having 15 years' experience after post-graduation. Two readings for raised serum LDL levels were taken and least was reported (24 hours apart) and noted in proforma. Sample size is 205 cases, calculated by using following formula; $n= z^2pq/d^2$ (Where z = 1.96, p = 7 % (frequency of raised LDL in IS) (8), q=100-p, d= 3.5 % at 95% confidence level).

Data was analyzed by SPSS-18 computer program. Frequencies and percentages were calculated for categorical variables. Post stratification chi-square test was applied to see their effect on outcome.

RESULTS

Our study registered a total of 205 patients with IS fulfil inclusion criteria of our study. Of these 205 study cases, 92 (44.9%) were male patients while 113 (55.1%) were female patients. Mean age of our study cases was noted to 51.58 ± 8.05 years. Mean age of the male patients was 53.92 ± 7.43 years while that of female patients is 49.67 ± 8.07 years (p = 0.000). Our study results have indicated that most of our patients i.e. 116 (56.6%) were aged more than 50 years. Mean height of our study cases was 159.94 ± 11.21 centimeters while mean weight of our study cases was 68.43 ± 6.33 kilograms. Mean body mass index of our study cases was noted to be 23.17± 2.85 kg/m^2. Mean fasting blood glucose level was 118.32 ± 23.21 mg/dl. Of these 205 study cases, 98 (47.8%)

were from rural areas and 107 (52.2%) were from urban areas. One hundred forty-seven (71.7%) were poor, 48 (23.4%) had diabetes, 30 (14.6%) were obese, 50 (24.4%) were smokers 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. History of alcohol consumption was zero in our study patients. (Table-I).

Parameters		n (%)
Gender	Female	113 (55.1%)
	Male	92 (44.9%)
Age	<50	89 (43.4%)
	>50	116 (56.6%)
Residential Status	Rural	98 (47.8%)
	Urban	107 (52.2%)
Socioeconomic status	Poor	147 (71.7%)
	Middle Income	558 (28.3%)
History of Diabetes	Yes	48 (23.4%)
	No	157 (76.6%)
Obesity	Yes	30 (14.6%)
	No	175 (85.4%)
Smoking habit	Yes	50 (24.4%)
	No	155 (75.6%)
Hypertension	Yes	40 (19.5%)
	No	165 (80.5%)
Family History	yes	39 (19.0%)
	No	166 (81.0%)
Previous History	Yes	31 (15.1%)
	No	147 (84.9%)

Table-I. Baseline characteristics of study population.

Data presented as mean ± standard deviation or n (%)

Mean LDL was 109.59 ± 49.15 mg/dl and raised LDL was seen in 88 (42.9%) of our study cases and 117(57.1%) with normal LDL level showed in Figure-1.

Raised level of LDL was observed significant in gender, diabetes, obesity, hypertension, family history and previous history of stoke (<0.004, <0.000, <0.005, <0.000, <0.000, <0.000) respectively. Raised-LDL was stratified with regards to gender, age, residential status, socioeconomic status, diabetes, obese, smoking, hypertension, family history of stroke and previous history of stroke. (Table-II).

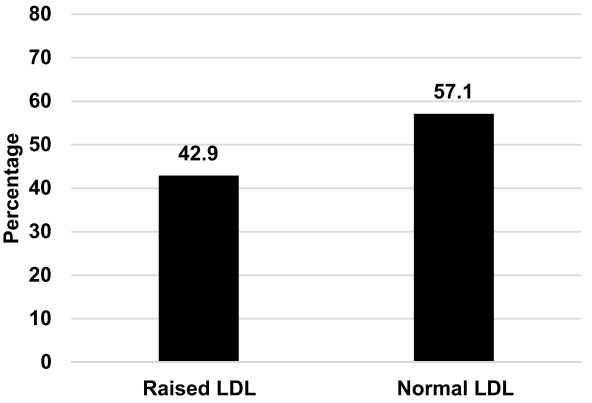

Figure-1. Level of LDL in study population.

Parameters		Yes	No	P-Value
Raised-LDL		88 (42.9%)	117 (57.1%)	
Gender	Male	50	42	0.004
	Female	38	75	
Age	<50	40	49	0.670
	>50	48	68	
Residential Status	Rural	49	49	0.066
	Urban	39	68	
Socioeconomic status	Poor	59	88	0.213
	Middle income	29	29	
Diabetes	Yes	39	09	0.000
	No	49	108	
Obesity	Yes	20	10	0.005
	No	68	107	
Smoking	Yes	21	29	1.000
	No	67	88	
Hypertension	Yes	30	10	0.000
	No	58	107	
Family History	Yes	39	0	0.000
	No	49	117	
Previous History	Yes	31	0	0.000
	No	57	117	

Table-II. Raised-LDL level in study population.

Data presented as mean ± standard deviation or n (%),
P-value<0.05 considered to be statistically

significant

DISCUSSION

Stroke is a leading cause of death worldwide.[10] Moreover, there is no such study in our local population in last five years. Dyslipidemia is a major risk factor for cardiovascular diseases.[11] Recent evidence suggests that raised LDL-cholesterol may worsen the atherosclerotic progression by rising inflammation and progress from subclinical wound to clinical event. The marker for initially recognized atherosclerosis is Carotid intima-media thickness (CIMT) and used to calculate future vascular incidence.[12] Amongst the lipid profile, raised reading of LDL has positively related with carotid plaque. Aggregate effect of achieving optimum levels of triglycerides, HDL-C, LDL-C and blood pressure is a decreased risk of repeated event of stroke and key cardiovascular events. The defensive effect of raised HDL-C was asserted by low values of LDL-C. Subjects surfing with recent stroke or temporary ischemic attack and not suffering with coronary heart disease, the raised levels of LDL-C may also predict the increased chances for recurrent stroke in such patients.[13] Significant quantity of residual cardiovascular risk remains in subjects taking statin as medicine due to raised triglycerides and low HDL-C, and well controlled LDL-C levels.[14] Niacin stimulates significantly amplify level of HDL-C and decreases the cardiovascular risk.[15] By merging the effect of niacin with the LDL-lowering treatment of statins, the risk of developing atherosclerosis is reduced down and remaining cardiovascular event like stroke was cut down. Non-pharmacological ways to control lipids in serum like physical activity on regular bases and alteration in everyday diet.[16] In the previous studies about atherosclerosis, among the lipid compositions, more attentions were paid to the role of low-density lipoprotein cholesterol (LDL cholesterol).

Total study registered subjects 205 out of which, 92 (44.9%) were male subjects and 113 (55.1%) were female subjects. There is some regional evidence which support our result such as study from Iran report 54% female[17] with IS another study finds 55% female were predominance of stoke due to Hyperlipidemia.[18] Our study results have indicated that most of our patients i.e. 116 (56.6%) were aged more than 50 years which are in compliance with Soyama et al study from Japan.[19] Study from Jinnah Post Graduate Medical Centre 32.7% were suffering from dyslipidemia and Shifa International Hospital (SIH), Islamabad dyslipidemia in 59.1% which is a risk factors of ischemic stroke.[20] Mean age of our study was (51.58 ± 8.05) previous study reported mean age (55.96 ± 13.75) years which is close to our study results.[7] One hundred forty-seven (71.7%) were poor, 48 (23.4%) had diabetes, 30 (14.6%) were obese, 50 (24.4%) were cigarette smoker and 40 (19.5%) had history of high blood pressure. Study reported that majority of patients with IS belonging to poor social background which is similar with our results.[21] Family history of stroke was present in 39 (19%) of our study cases while previous history of stroke was noted in 31 (15.1%) in study participant. History of alcohol consumption was zero in our study patients. Iran reported 18 % previous history of stroke which is close to our study results.[17]

Mean LDL level noted was 109.59 ± 49.15 mg/dl and raised LDL was 88 (42.9%) in current study. Jehangir et al reported mean LDL levels to be 127.21 ±34.31 mg/dl among patients having IS.[22] These results were alike with present study. Anwar et al state that mean LDL levels to be 137.21 ± 38.21 mg/dl that is near to our study outcomes.[23] A study performed by Mahmood et al described 7% raised LDL levels in patients having IS which is fairly lesser than that reported in our study.[8] While additional study by Smith et al stated 52.1% raised LDL levels which is nearby to our study findings.[9] Another study from Jamshoro by Kumar et al described 37% raised LDL levels which is close to our study results.[24] There are no considerable community depend epidemiologic report on stroke from Pakistan.[25]

CONCLUSION

Very high frequency of raised serum low density lipoprotein levels was noted in our study. Raised LDL were positively linked with male gender, hypertension, family history of stroke, diabetes, obesity and past event of stroke. Our

study determines the initial diagnosis of stoke that eventually lead to suitable management to enhance clinical result in such subjects.

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1	Nadeem Ullah	Concept, design, literature search, interpretation of data, wrote and approved the manuscript.	
2	Shahnawaz Hasan Gardezi	Interpretation of data, wrote, and approved the manuscript.	
3	Muhammad Azfar Tanveer	Literature search, edited and approved the manuscript.	
4	Kulsoom Baqa	Literature search, interpretation of data, wrote, and approved the manuscript.	
5	Asher Fawwad	Concept, design, edited and approved the manuscript.