

Relation of Lipid Profile with Ischemic Stroke

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ABSTRACT

Objective: To evaluate correlation of blood total cholesterol (TC), high-density lipoprotein (HDL), triglycerides, and the TC:HDL ratio as risk factors for ischemic stroke.

Materials and Methods: After ethical approval from hospital ethical board this case control study was conducted in the department of neurosurgery and neurology Lahore General Hospital Lahore/Punjab Institute of Neurosciences/ Postgraduate Medical Institute/Ameerudin Medical College Lahore. Duration of study was two years from October 2015 to October 2017. A total of 600 patients were included in the study after obtaining written consent from patients. After completion of data collection, data was entered in computer software SPSS version 23 and analyzed for continuous and categorical variables. Continuous/numerical variables were presented as mean and SD and categorical variables were presented in form of numbers and percentages. Independent t-test and chi-square test were applied to see significance of data. P value less than or equal to 0.05 was considered as significant.

Results: Overall, 100% (n = 600) patients were included in this study. The study comprised of two equal groups, 50% (n = 300) in each, i.e. cases and controls. The controls had mean total cholesterol (TC), High-density lipoprotein (HDL) and triglycerides 220.76 ± 4.29 mg/dL, 54.02 ± 4.45 mg/dL and 153.99 ± 2.68 mg/dL respectively. The TC: HDL ratio was 5.48 ± 1.41 and 4.09 ± 1.22 for cases and controls respectively. The mean differences between total cholesterol (TC), High-density lipoprotein HDL, triglycerides and total cholesterol (TC): HCL ratios were statistically significant among both groups.

Conclusion: Results of our study revealed that significant difference was observed between cases and controls regarding the levels of Total cholesterol, HDL, triglycerides and TC:HDL ratio. Cases of ischemic stroke were found with high levels of TC, Triglycerides, And TC:HDL ratio and low HDL, this difference was found statistically significant with P value 0.001. So it was concluded that hyperlipidemia has significant relation with ischemic stroke.

Abbreviations: TC: Total Cholesterol. HDL: High-density Lipoprotein.

Keywords: Ischemic Stroke, Total cholesterol, High density lipids, Triglycerides.

INTRODUCTION

Stroke is an enfeebling illness depicting hundreds of people to morbidity and mortality in the world/¹ Incidence of ischemic stroke is increasing day by day in Asian countries.² Pakistan is the main country which is taking huge burden of desolating illness in terms of finance, resource expenditure, and health services and men power of this country.³ Exact incidence an epidemiology of stroke is unknown in Pakistan, no extended

literature is available. Considering the incidence of stroke in Pakistan some full text detailed studies needed which represents exact epidemiology, risk factors and needs of the time.⁴ Incidence of stroke in America is 700000 per annum and ranked as 3rd major cause of mortality. Its economic burden on managing the stroke and dealing with morbidities is about fifty billion dollars.⁵

Among its risk factors increased total cholesterol

and deficit of high density lipoprotein are established facts which can cause obstruction of coronary artery/coronary heart disease. Many observational base studies have conducted showing role of lipid levels in risks of cerebral and vascular diseases. A recent meta-analysis was conducted on this topic and shows that clinical trials on early lowering of lipids reported that no additional benefits were observed on risk of stroke. Outcomes of statin intervention shows significant decrease in incidence of ischemic stroke. Statin acts by changing the cholesterol in blood serum through which ischemic stroke can be prevented according international previous data. Recent conflict in international observations regarding serum lipid level and its relation with ischemic stroke and ischemic heart disease started new debate.

Correlation of lipid profile and ischemic stroke is not studied extensively in our population, and local lipid lowering guidelines are based on international data local data on this subject is deficient. In this study we investigated total cholesterol, high density lipid, triglycerides and TC:HDL ratio as risk factors of ischemic stroke, this data will help to establish local guidelines and base for future research on this subject.

MATERIAL AND METHODS

After ethical approval from hospital ethical board this case control study was conducted in the department of neurology and neurosurgery Lahore General Hospital Lahore/Punjab Institute of Neurosciences/Postgraduate Medical Institute/Ameerudin Medical College Lahore. Duration of study was two years from October 2015 to October 2017. A total of 600 patients were included in the study after obtaining written consent from patients. Non probability consecutive sampling technique was used and sample size was calculated from WHO sample size calculator by using 95% CI, 80% power of study and proportion of hyperlipidemia in case group 21.7% and in 15.7% in control group. A focal neurological deficit with sudden onset through vascular mechanism was labeled as stroke. Stroke was diagnosed clinically as well as through radiological investigations (computed tomography and magnetic resonance imaging). We collected data of 600 patients of two categories (cases and controls). In case group 300 patients enrolled from indoor who were presented with neurological deficit. Complete detail history of these patients about smoking, diabetes, hypertension and alcohol use was taken. Blood sample of these patients was collected for hyperlipidemia and other baseline investigations.

After complete laboratory investigation and diagnosis of stroke patient was included in this group. Patients in control group were enrolled from outdoor department of medicine who were presented with hypertension, diabetes and having history of smoking and alcohol use. Blood sample of these patients were taken for hyperlipidemia and other laboratory investigations.

After completion of data collection, data was entered in computer software SPSS version 24 and analyzed for continuous and categorical variables. Continuous/numerical variables were presented as mean and SD like age, BMI, TC, HDL, Triglycerides and categorical variables were presented in form of numbers and percentages like gender, Diabetes, hypertension, alcohol use and exercise. Independent t-test and chi-square test was applied to see significance of data. P value less than or equal to 0.05 was considered as significant.

RESULTS

Overall, 100% (n = 600) patients were included in this study. The study comprised of two equal groups, 50% (n = 300) in each, i.e. cases and controls. The mean age and BMI of the cases was 57.33 ± 4.19 years and 23.14 ± 2.38 kg/m² respectively. While, the mean age and BMI of the controls was 57.04 ± 4.64 years and 23.21 ± 2.06 kg/m² respectively. The distribution of tobacco use, in cases, i.e. never, past, Current < 20/day and Current \geq 20/day revealed as 38.3% (n = 115), 45.7% (n = 137), 6% (n = 18) and 10% (n = 30) respectively. While, in controls, the distribution of tobacco use i.e. never, past, Current < 20/day and Current \geq 20/day revealed as 36.3% (n = 109), 45.7% (n = 137), 7.7% (n = 23) and 10.3% (n = 31) respectively. History of HTN noted as 54% (n = 162) and 25.3% (n = 76) for cases and controls respectively. There were 10.7% (n = 32) and 3% (n = 9) diabetes patients for cases and controls respectively. The distribution of alcohol use, in cases, i.e. daily, weekly, monthly and rare/never noted as 30.4% (n = 91), 40.3% (n = 121), 14% (n = 42) and 15.3% (n = 46) respectively. While, in controls, the distribution of alcohol use, in cases, i.e. daily, weekly, monthly and rare/never noted as 26.7% (n = 80), 40.6% (n = 122), 15% (n = 45) and 17.7% (n = 53) respectively. There were, in cases, 43.7% (n = 131) patients take exercise \geq 2 times per week, 28.3% (n = 85) < 2 times per week and 28% (n = 84) patients do not take exercise. While, in controls, there were 47.7% (n = 143) patients take exercise \geq 2 times per

week, 29.7% (n = 89) < 2 times per week and 22.6% (n = 68) patients do not take exercise. History of hyperlipidemia observed as 26.3% (n = 79) and 16.3% (n = 49) for cases and controls respectively. The differences between history of HTN, diabetes and history of hyperlipidemia were statistically significant, in groups (Table. 1).

The mean TC, HDL and triglycerides of the cases was 235.13 ± 4.25 mg/dL, 47.94 ± 5.60 mg/dL and

194.20 ± 4.38 mg/dL respectively. While, for controls, the mean TC, HDL and triglycerides was 220.76 ± 4.29 mg/dL, 54.02 ± 4.45 mg/dL and 153.99 ± 2.68 mg/dL respectively. The TC: HCL ratio was 5.48 ± 1.41 and 4.09 ± 1.22 for cases and controls respectively. The mean differences between TC, HDL, triglycerides and TC: HCL ratios were statistically significant with regards to groups (Table 2).

Table 1:

Baseline Characteristics of the Study Groups			
Characteristics	Cases (n = 300)	Controls (n = 300)	Test of Sig.
Age (years)	57.33 ± 4.19	57.04 ± 4.64	t = 0.803, p = 0.422
BMI* (kg/m ²)	23.14 ± 2.38	23.21 ± 2.06	t = -0.384, p = 0.701
Tobacco use	38.3% (n = 115)	36.3% (n = 109)	χ ² = 0.787, p = 0.853
Never			
Past	45.7% (n = 137)	45.7% (n = 137)	
Current <20/day	6% (n = 18)	7.7% (n = 23)	
Current ≥ 20/day	10% (n = 30)	10.3% (n = 31)	
History of HTN*	54% (n = 162)	25.3% (n = 76)	χ ² = 51.5, p = 0.000
Diabetes	10.7% (n = 32)	3% (n = 9)	χ ² = 13.85, p = 0.000
Alcohol use			
Daily	30.4% (n = 91)	26.7% (n = 80)	χ ² = 1.31, p = 0.727
Weekly	40.3% (n = 121)	40.6% (n = 122)	
Monthly	14% (n = 42)	15% (n = 45)	
Rare/never	15.3% (n = 46)	17.7% (n = 53)	
Exercise			
≥2 times per week	43.7% (n = 131)	47.7% (n = 143)	χ ² = 2.31, p = 0.316
< 2 times per week	28.3% (n = 85)	29.7% (n = 89)	
Rarely/never	28% (n = 84)	22.6% (n = 68)	
History of hyperlipidemia	26.3% (n = 79)	16.3% (n = 49)	χ ² = 8.94, p = 0.003

*BMI indicates body mass index; *HTN, hypertension. P < 0.05 is considered as significant.

Table 2:

Exposure Variables in Both Groups			
Characteristics	Cases (n = 300)	Controls (n = 300)	Test of Sig.
TC* mg/dL	235.13 ± 4.25	220.76 ± 4.29	t=41.17, p=0.000

HDL* mg/dL	47.94 ± 5.60	54.02 ± 4.45	t=-14.68, p=0.000
Triglycerides mg/dL	194.20 ± 4.38	153.99 ± 2.68	t=135.58, p=0.000
TC:HDL ratio	5.48 ± 1.41	4.09 ± 1.22	t=7.06, p=0.000

*Total cholesterol; *High-density Lipoprotein; P < 0.05 is Considered as Significant.

DISCUSSION

Total increase in cholesterol or hyperlipidemia is fatal for healthy individuals; it may risk the person for minor diseases to serious ischemic strokes. People with history of hypertension, diabetes, smokers and alcohol users are more prone to this event 11. In our study we compared incidence of hyperlipidemia in cases (patients of ischemic stroke) with controls (patients with smoking, hypertension and diabetes) but not presented with ischemic stroke. Results of our study revealed that increase in HDL and triglyceride is not a risk factor for stroke but increase total cholesterol is alarming sign.

In a study Iso H et al¹² reported that an increase in total serum cholesterol is associated with nonhemorrhagic stroke. This study is identical to our study. Another study conducted by Leppala JM et al¹³ in 1999 reported that an association was found between 5% total cholesterol and ischemic stroke but only in smokers, other habits of alcohol and co morbid diseases hypertension and diabetes were not associated with it. Results of this study are also comparable with our results.

A study conducted by Koren-Morag N et al 14 on patients of coronary artery disease and shows that increase in total cholesterol is associated with stroke and other cardiac and vascular diseases. A similar observational study was conducted by Shahar E et al¹⁵ on non coronary artery patients and reported that there was no association was observed between stroke and serum lipids. Results of both studies are comparable with our results which show significance of our study and nullification of our results.

Another study conducted by Wannamethee SG et al¹⁶ in 2000 reported that HDL may be protective against stroke specially non fatal stroke. In another study Sacco RL et al¹⁷ reported that increase in HDL also protective against ischemic stroke in elderly patients. He reported that in patients of coronary heart disease high density lipids are inversely related to ischemic stroke means a low level of HDL ratio is a risk factor for CHD in adult patients.

In some trials which are conducted on reductase

inhibitors it was demonstrated that this phenomenon associated with reduced ischemic strokes and cardiovascular diseases. He demonstrated that lipid phenomenon is common in both events 18, 19, 20 32 – 36. Another study conducted by Kinosian B et al²¹ on cholesterol and coronary artery disease and demonstrated that TC:HDL level is an important risk factor of coronary heart disease so its prevention is important in patients. Because of same mechanism of ischemic stroke was found in patients it is also a risk factor of ischemic stroke. Results of this study are also comparable with our findings.

CONCLUSION

Results of our study revealed significant difference between cases and controls regarding the levels of Total cholesterol, HDL, triglycerides and TC:HDL ratio. Cases of ischemic stroke were found with high levels of TC, Triglycerides, And TC:HDL ratio and low HDL, this difference was found statistically significant with P value 0.001. So it was concluded that hyperlipidemia has significant relation with ischemic stroke.

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