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Assessment of Serum Lipid Profile Among Patients with Hemorrhagic Versus Ischemic Strokes at Muzaffarabad; A Comparative Study

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ABSTRACT

Objective: To assess the serum lipid level in adults with hemorrhagic versus ischemic stroke and determine the associated factors.

Methodology: A Comparative cross-sectional study was conducted at the Department of General Medicine, Combined Military Hospital Muzaffarabad, Azad Kashmir from 30-3-2020 to 30-9-2020. Out of 100 patients were enrolled and divided into two different groups. 3ml of blood was drawn and sent for fasting lipid profile to the single institutional laboratory. The blood samples were analyzed enzymatically using an autoanalyzer. All the obtained information was analyzed using SPSS.

Results: In ischemic stroke patients, the mean TC was 227.20±16.47 mg/dl; among hemorrhagic stroke patients, mean total cholesterol levels were 203.5 ±16.8 with the value of P=<0.001. The Total mean HDL was found 36.10±4.29 with a value of p=<0.001. In ischemic stroke patients, the mean LDL was 145.18±16.98; in hemorrhagic stroke patients, the mean LDL was 131.96±12.12 (p-value=<0.001). In ischemic stroke patients, the mean TG was 203.18±57.74 mg/dl while in hemorrhagic stroke patients, the mean TG was 164.67±53.25 with a value of p=0.001)

Conclusion: This study concluded that the mean TC, HDL, LDL, and TG of the patients was 215±20.42 mg/dl, 37.77±4.47 mg/dl, t 138.57±16.11 mg/dl, and 183.93±58.55 mg/dl respectively. This study further concluded that is substantial correlation exists between the serum lipid profile of adults and the type of stroke

Keywords: Stroke, HDL, LDL, Serum Lipid Profile hemorrhagic, ischemic strokes.

Introduction

Stroke is one of the most serious health conditions, and almost the third principal cause of a patient's disability however, it is the second most mortality-causing health problem worldwide.[1] Data presented in a study showed that 15 million people suffer from strokes which cause disability among them, however, it remains a major cause of functional impairment among patients where only 20% of patients survived after 3 months.[2]

The rate of associated morbidity and mortality has declined over several years in the western countries due to the preventive measures however the condition remains unchanged among underdeveloped countries. According to the data compiled from Pakistan, the rate of adults with strokes is 250 among 100,000 adult population, with underlined various risk factors i.e., diabetes mellitus, obesity, cardiac problems, dyslipidemia, high alcohol consumption, and physical inactivity.[3]

Multiple studies have been designed and published to assess the relationship between serum cholesterol levels

and ischemic strokes in the past and found a relationship between the risk of hemorrhagic strokes and serum high cholesterol levels[4] however according to the studies there is no linear association between strokes and cholesterol be considered straightforward unless the LDL and HDL cholesterol levels are higher and statistically significant among patients. [5]

There is limited literature available locally to compare the data on strokes and their association with serum lipid profile, the serum lipid and its subtypes' accurate knowledge and guidance in lipid-lowering therapies may decrease the incidence of strokes and associated deaths if the preventative measures are adopted completely.[6]

The etiology of the disease varies from patient to patient. However, in the case of strokes, the infarction differs among individuals, and the categorization into ischemic and hemorrhagic types is widely used. Around 80-90% of strokes are ischemic, likely caused by thrombotic or cerebrovascular occlusions, while the remaining stroke types are hemorrhagic. Only a small percentage of strokes result from aneurysmal subarachnoid hemorrhage.[7]

The difference between the types of strokes is one of the essential parts of the management of the strokes and subsequent management is vastly different, hemorrhagic strokes contribute to 10-20% of the total number of stroke patients. However hemorrhagic stroke is different in the United States, 8-15% and 18-24% in Japan and Korea. The percentage of incidence is continuously rising 12-15% among 100,000 individuals annually.[8] Which clearly states the incidences are high among lower and middle-income countries and increasing globally predominantly. whereas the rates of fatality are 25-30% in developed countries & slightly high in lower and middle-income countries such as 30-48%, the fatality rates depend on efficacy and critical care. [9]

The evaluation of different parameters and associations between the risk factors is one of the important steps towards the management of complicated health conditions like stroke, specifically among underdeveloped countries like Pakistan to understand, control, and prevent the complications.[10] There is only a limited number of studies available that present the current scenarios and ongoing problems locally. This study aimed to assess the fasting lipid levels of adult individuals with hemorrhagic and ischemic strokes and comparison of associated complications.

Methodology

A comparative cross-sectional study was conducted for six months from 30 March to 30 September 2020 at the Department of General Medicine, Combined Military Hospital Muzaffarabad, Azad Kashmir. Non-probability consecutive sampling technique was used to collect the samples. The sample size of n=100 patients is calculated WHO[11] formula $N=((Z_{1-\alpha/2})^2 x\ (\sigma)^2)/\varepsilon^2\mu^2$. Mean HDL cholesterol $=\mu=46.5mg/dl^9$, Standard deviation$=\sigma=19.1^9$ Absolute Precision required= d= within 5 mg% $Z_{1-\alpha/2}=$ 1.96.

All patients 25 – 70 years of age, of either gender with a diagnosis of ischemic and hemorrhagic Stroke (as per operational definition). Duration of illness ≤ 7 days. The study was conducted after permission from the institutional ethical review committee AIMS Muzaffarabad. A total of 100 patients (50 with Ischemic stroke and 50 with hemorrhagic stroke) fulfilling the eligibility criteria were enrolled after informed written consent explaining the study purpose. CT scans were performed from the same radiology department and reported by a consultant radiologist with at least 3 years post-fellowship experience for the presence of Ischemic versus hemorrhagic stroke. Demographic characteristics including age (in years), gender, smoking status, hypertension, diabetes mellitus and duration of illness were noted. The ischemic stroke Patients were considered clinically presenting with any one clinical symptom of low GCS (< 12 / 15), weakness of any limb (upper / lower) power grade < 5, loss or slurred speech and vision impairment that is persisting beyond 24 hours PLUS CT-brain showing hypodense area, however, the Hemorrhagic Stroke Patients clinically presenting with any one clinical symptom of low GCS (< 12 / 15), weakness of any limb (upper / lower) power grade < 5, loss or slurred speech and vision impairment that is persisting beyond 24 hours PLUS CT-brain showing hyperdense area. Height and weight were measured to calculate the patient's BMI. The patient was categorized as obese and non-obese as per the operational definition. Three milliliters (3 ml) of blood were drawn and sent for fasting lipid profile to the institutional laboratory. The blood samples were analyzed enzymatically using an autoanalyzer.

All the obtained information was noted on the proforma specifically designed for the study data was assessed using SPSS version 23. Quantitative data (age, BMI, duration of illness (days), and fasting serum lipid levels) were described using mean and standard deviation. Qualitative

data [gender, smoking status, hypertension, diabetes mellitus, obesity, and dyslipidemia] were described as frequency and percentages. Fasting lipid levels between the Hemorrhagic stroke and Ischemic stroke groups were compared using an independent sample t-test. The data was stratified concerning age groups, Obesity, smoking status, hypertension, and diabetes mellitus to see the effect of serum lipid levels. The independent T-test was applied after the stratification of samples.

Results

There were 73(73%) patients were male and 27(27%) patients were females. Male to female ratio of the patients was 2.7:1. In ischemic stroke patients 39(78%) patients were male and in hemorrhagic stroke patients, 34(68%) patients were male. Similarly, in ischemic stroke patients, 11(22%) patients were female, and in hemorrhagic stroke patients, 16(32%) patients were female. (Table I)

Table I: Frequency distribution of gender between types of stroke

		Types of stroke		Total
		Ischemic	Hemorrhagic	
Gender	Male	39	34	73
		78.0%	68.0%	73.0%
	Female	11	16	27
		22.0%	32.0%	27.0%
Total		50	50	100
		100.0%	100.0%	100.0%

The ages of individuals were calculated as 59.29±8.11 years. In ischemic stroke patients, the mean age of patients was 59.74±7.23 years while in hemorrhagic stroke patients, the mean age of patients was 58.84±8.95 years. (Table II)

Table II: Summary statistics of age & type of stroke.

	Statistics of age & type of stroke	N
Age (Years)	Mean	59.29
	Standard Deviation	8.11
	Minimum	42.00
	Maximum	70.00
	Types of stroke	Ischemic	Hemorrhagic
	N	50	50
	Mean	59.74	58.84
	Standard Deviation	7.23	8.95
BMI (Kg/m^2)	n	50	50
	Mean	26.70	26.56
	Standard Deviation	3.89	4.10

In ischemic stroke patients the mean BMI was 26.70±3.89 kg/m2 while in hemorrhagic stroke patients the mean BMI was 26.56±4.10 kg/m2. In this study, obesity was found in 59(59%) patients. In ischemic stroke patients' obesity was found in 31(62%) patients and hemorrhagic stroke patients' obesity was found in 28(56%) patients. In ischemic stroke patients the mean duration of illness was 2.74±1.31 days while in hemorrhagic stroke patients, the mean duration of illness was 2.98±1.28 day.

The mean TC of the patients was 215.±20.42 mg/dl, the mean HDL of the patients was 37.77±4.47 mg/dl, the mean LDL of the patients was 138.57±16.11 mg/dl and the mean TG of the patients was 183.93±58.55 mg/dl. In ischemic stroke patients the mean TC was 227.20±16.47 mg/dl while in hemorrhagic stroke patients the mean TC was 203.54±16.89 mg/dl (p-value=<0.001). In ischemic stroke patients the mean HDL was 36.10±4.03 mg/dl while in hemorrhagic stroke patients the mean HDL was 39.44±4.29 mg/dl (p-value=<0.001). (Table III)

Table III: Comparison of co-morbidities between types of stroke.

Parameters		Type of stroke		Total	p-value
		Ischemic Stroke	Hemorrhagic stroke		
Smoking	Yes	27	24	51	0.548
		54.0%	48.0%	51.0%	
	No	23	26	49	
		46.0%	52.0%	49.0%	
Hypertension	Yes	33	32	65	0.834
		66.0%	64.0%	65.0%	
	No	17	18	35	
		34.0%	36.0%	35.0%	
Diabetes Mellitus	Yes	34	32	66	0.673
		68.0%	64.0%	66.0%	
	No	16	18	34	
		32.0%	36.0%	34.0%	

In ischemic stroke patients the mean LDL was 145.18±16.98 mg/dl while in hemorrhagic stroke patients the mean LDL was 131.96±12.12 mg/dl (p-value=<0.001). In ischemic stroke patients the mean TG was 203.18±57.74 mg/dl while in hemorrhagic stroke patients, the mean TG was 164.67±53.25 mg/dl (p-value=0.001). (Table IV)

Table IV: Comparison of serum lipid profile between types of stroke.

	Types of stroke	n	Mean	Standard Deviation	p-value
TC	Ischemic	50	227.20	16.47	<0.001
	Hemorrhagic	50	203.54	16.89	
HDL	Ischemic	50	36.10	4.03	<0.001
	Hemorrhagic	50	39.44	4.29	
LDL	Ischemic	50	145.18	16.98	<0.001
	Hemorrhagic	50	131.96	12.12	
TG	Ischemic	50	203.18	57.74	0.001
	Hemorrhagic	50	164.67	53.25	

Table V: Comparison of serum lipid profile between types of stroke stratified by hypertension.

Lipid Profile	Hypertension	Types of stroke	Mean	Standard Deviation	p-value
TC	Yes	Ischemic	229.03	16.49	<0.001
		Hemorrhagic	205.47	17.49	
	No	Ischemic	223.65	16.35	<0.001
		Hemorrhagic	200.11	15.66	
HDL	Yes	Ischemic	35.61	4.54	0.001
		Hemorrhagic	39.66	4.45	
	No	Ischemic	37.06	2.65	0.096
		Hemorrhagic	39.05	4.09	
LDL	Yes	Ischemic	144.24	17.47	0.013
		Hemorrhagic	134.41	13.24	
	No	Ischemic	147.00	16.36	<0.001
		Hemorrhagic	127.61	8.51	
TG	Yes	Ischemic	183.06	34.76	0.106
		Hemorrhagic	164.98	52.47	
	No	Ischemic	242.25	73.05	0.001
		Hemorrhagic	164.11	56.16	

A statistical difference was observed after comparing the serum lipid profile and types of stroke stratified by age groups. i.e. p-value<0.05. There is statistically significant difference was found between the serum lipid profile and types of stroke stratified by obesity. i.e. p-value<0.05. (Table V)

Discussion

Stroke has been identified as a chronic health condition, and it is a serious source of disability among all other chronic diseases.[12] Various symptoms and complications are associated which need to be assessed and compared. Thus in our study In ischemic stroke patients, the mean TC was 227.20±16.47 mg/dl while in hemorrhagic stroke patients the mean TC was 203.54±16.89 mg/dl (p-value=<0.001).

In ischemic stroke patients the mean HDL was 36.10±4.03 mg/dl while in hemorrhagic stroke patients the mean HDL was 39.44±4.29 mg/dl (p-value=<0.001). In ischemic stroke patients the mean LDL was 145.18±16.98 mg/dl while in hemorrhagic stroke patients the mean LDL was 131.96±12.12 mg/dl (p-value=<0.001). In ischemic stroke patients, the mean TG was 203.18±57.74 mg/dl while in hemorrhagic stroke patients, the mean TG was 164.67±53.25 mg/dl (p-value=0.001).[14]

Previous studies showed the relationship of LDL-C, HDL-C, and TG with hemorrhagic stroke that was observed steady as per findings of our study.[15] A project conducted on stroke patients concluded that Ischemic stroke patients had high serum TC and lower HDL-cholesterol levels as compared to hemorrhagic stroke. The study suggested that ischemic stroke patients are tested and screened based on serum lipid levels to assess the type of management

therapy among stroke patients.[16] One study presented that the mean total cholesterol and LDL–C levels were remarkably higher among ischemic stroke patients when compared to patients with hemorrhagic stroke. "(183.7±34.5 versus 148.5±30.6, P = 0.0002, 118.7±26.7 versus 81.4±22.0, P = 0.0001)"[17] The differences in the mean TG, mean HDL – cholesterol (HDL – C) and mean VLDL – cholesterol (VLDL – C) levels were not statistically significant between the two groups.[18]

In a study of 50 patients both in ischemic and hemorrhagic stroke groups (N = 100), mean serum cholesterol 151±29 vs 190 ± 35 mg/dl, mean serum HDL 45.4±5 vs. 42.4±6mg/dl, mean serum LDL was 93±17 vs. 102±21 mg/dl and mean serum TG levels 125±30 vs. 137±30 mg/dl were reported for hemorrhagic and ischemic stroke respectively.[19] On the other hand, numerous research studies were conducted in Japanese populations which resulted in no association between Total Cholesterol (TC) and ischemic stroke, whereas certain other independent factors that influence the type of strokes and patient's health condition from worsening and causing the cardiac infarction may require secondary preventions.[20] A study showed no significant association between ischemic strokes and the serum levels of TG, HDL-C, and TC.[21]

A contrary exists between our study findings and a few of the previously published studies.[22-23] So it is suggested that in the future further studies should be done with a larger sample size and better methodology to evaluate the findings of our study. It is suggested that future studies should be done in multi-centered settings.

Conclusion

This study concluded that the mean TC, HDL, LDL, and TG of the patients was 215.±20.42 mg/dl, 37.77±4.47

mg/dl, t 138.57±16.11 mg/dl, and 183.93±58.55 mg/dl respectively. This study further concluded that there is a remarkable association between the serum lipid profile of adults and the type of stroke.

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