

COMPARISON OF LIPID PROFILE AMONG PATIENTS WITH ISCHEMIC VERSUS HEMORRHAGIC STROKE

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Abstract

Objective:

To determine the prevalence of dyslipidemia in patients with stroke and to compare lipid profiles among patients with ischemic versus hemorrhagic stroke.

Methods:

In this descriptive cross-sectional study, we included 177 patients aged 35 - 65 years, either male or female gender, and presenting with new onset ($\leq$ 3-day duration) stroke (ischemic/hemorrhagic). All the patients underwent a CT scan of the brain as per hospital protocol and were categorized as ischemic/hemorrhagic stroke on the basis of CT findings. The frequency of dyslipidemia was determined.

Results:

The average age of participants was 56.3 years ($\pm$ 11.8). The mean body mass index (BMI) was 24.5 ($\pm$ 2.4) kg/m². The study reports that 65 (36.7%) individuals were classified as obese. Regarding stroke types, 103 (58.2%) individuals experienced ischemic strokes, while 74 (41.8%) participants had hemorrhagic strokes. Out of 177 patients, dyslipidemia was diagnosed in 76 (43.0%) patients.

Conclusion:

There is a high frequency of dyslipidemia in patients of stroke. The incidence of dyslipidemia is high among ischemic stroke patients in comparison to hemorrhagic stroke patients.

INTRODUCTION

Stroke ranks among the top causes of death and disability globally, posing a major public health challenge. It results from an interruption in cerebral blood flow, either due to a blood vessel blockage or rupture. The World Health Organization reports that annually, around 15 million individuals experience strokes—approximately 89.13 million of whom succumb to the condition, while another 5 million are left with lasting disabilities.^{1, 2} In

developed nations, stroke is a significant risk factor for conditions such as epilepsy, falls, and depression. It leads to considerable functional impairments, with about 20% of stroke survivors needing institutional care after three months, and between 15% and 30% remaining permanently disabled.³ Strokes are generally classified into two primary categories: ischemic and hemorrhagic. The former, accounting for roughly 85% of cases, occurs when a blood clot

obstructs blood flow to the brain, while the latter, comprising approximately 15% of strokes, results from bleeding caused by ruptured blood vessels within the brain.⁴

Cholesterol is essential for several vital bodily functions, such as maintaining cell structure and producing steroid hormones and bile acids. However, elevated blood cholesterol levels can lead to issues like artery narrowing and blockages, especially in coronary arteries. As a result, high cholesterol is widely recognized as a major contributor to morbidity and mortality in humans.^{5,6} Serum lipid levels are known to significantly influence short-term mortality rates among elderly stroke patients, making them a critical focus in both the primary and secondary prevention strategies for stroke.⁷ However, the connection between lipid profiles and different stroke subtypes is not yet fully understood, and further research is necessary to clarify this relationship.⁸ Therefore, the aim of the present study was to determine the prevalence of dyslipidemia in patients with stroke and to compare lipid profile among patients with ischemic versus hemorrhagic stroke.

METHODS:

In this descriptive cross-sectional study, we included 177 patients aged 35 - 65 years, either male or female gender, and presenting with new onset (≤ 3 -day duration) stroke (ischemic/hemorrhagic). In contrast, patients with chronic kidney or liver disease were excluded. The study was conducted in the Department of Medicine, Nishtar Hospital, Multan, from January 2024 to January 2025. Written consent was obtained from each patient.

All the patients underwent a CT scan of the brain as per hospital protocol and were categorized as ischemic/hemorrhagic stroke on the basis of CT findings. All the enrolled patients had venous blood samples drawn after 12 hours of fasting by standard techniques for measurement of serum lipid levels. All the tests were performed from a single laboratory through standard methods. Dyslipidemia was diagnosed if any >1 of the following fasting serum lipid levels was deemed positive as dyslipidemia: Cholesterol ≥ 240 mg/dl, High density lipoprotein ≤ 40 mg/dL, low density lipoprotein ≥ 130 mg / dl, and Triglyceride ≥ 150 mg/dl.

All the patients were uniformly managed according to stroke category and for dyslipidemia if positive as per hospital protocol.

RESULTS:

The baseline characteristics reveal that the average age of participants was 56.3 years (± 11.8). The mean body mass index (BMI) was 24.5 (± 2.4) kg/m². In terms of gender, 58.8% (104 participants) were male, and 41.2% (73 participants) were female. The study reports that 65 (36.7%) individuals were classified as obese. Smoking was common among 27.1% (48 participants) of the sample. Hypertension was present in 72.3% (128 people), and diabetes affected 63.8% (113 participants). Additionally, 7.9% (14 participants) had ischemic heart disease (IHD). Regarding stroke types, 103 (58.2%) individuals experienced ischemic strokes, while 74 (41.8%) participants had hemorrhagic strokes.

Out of 177 patients, dyslipidemia was diagnosed in 76 (43.0%) patients (Figure 1).

Table 1. Baseline Study Characteristics.

Age	56.3 $\pm$ 11.8
BMI	24.5 $\pm$ 2.4
Gender (Male/Female) (%)	104 (58.8%) / 73 (41.2%)
Obesity (%)	65 (36.7%)
Smoking (%)	48 (27.1%)
Hypertension (%)	128 (72.3%)
Diabetes (%)	113 (63.8%)
Ischemic Heart Disease (IHD) (%)	14 (7.9%)
Type of Stroke (%)	
Ischemic	103 (58.2%)

Hemorrhagic

74 (41.8%)

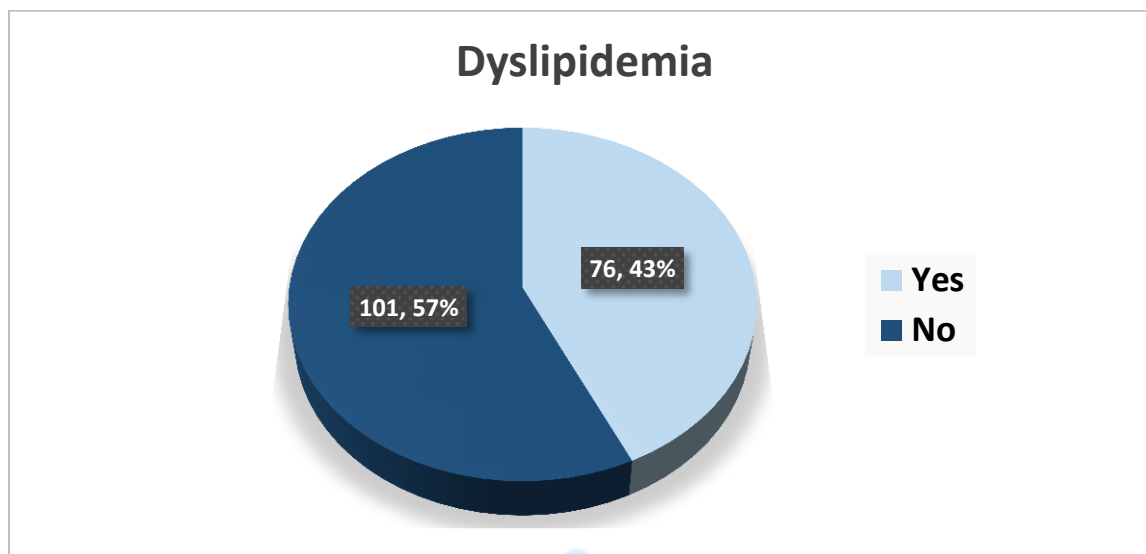


Figure 1. Frequency of Dyslipidemia.

Among the 103 patients suffering from ischemic stroke, 55 (53.4%) individuals were found to have dyslipidemia. In contrast, among the 74 patients with hemorrhagic stroke, only 24 (32.4%) patients exhibited dyslipidemia, with a P-value of 0.005. This

suggested that dyslipidemia was more prevalent in patients with ischemic stroke compared to those with hemorrhagic stroke (Table 2).

Table 2. Comparison of Frequency of Dyslipidemia in Ischemic and Hemorrhagic Stroke Patients.

Dyslipidemia	Ischemic Stroke (N=103)	Hemorrhagic Stroke (N=74)	P-value
Yes	55 (53.4%)	24 (32.4%)	0.005
No	48 (46.6%)	50 (67.6%)	

DISCUSSION:

Lipid imbalance is a significant risk factor for stroke. In this study, we assessed the prevalence and occurrence of dyslipidemia among patients with ischemic and hemorrhagic stroke. And we found a significant association between ischemic stroke and dyslipidemia.

Singh et al. enrolled 64 consecutive ischemic stroke cases and 64 hemorrhagic stroke cases. They found that raised serum total cholesterol and raised LDL cholesterol were seen in 39.1% and 29.7% patients with ischemic stroke versus 18.8% and 9.4% in patients with hemorrhagic stroke ($p=0.019$ & 0.007).⁹

Ebraheem YE et al. enrolled 50 patients with ischemic stroke and 50 patients with hemorrhagic

stroke. It was seen that raised serum total cholesterol, high triglyceride, raised LDL cholesterol, and low HDL cholesterol were seen in 40%, 6%, 4% and 28% patients with ischemic stroke, versus 12%, 4%, 4% and 8% of patients with hemorrhagic stroke, respectively.¹⁰

A total of 201 stroke patients, including 114 ischemic and 87 hemorrhagic stroke types, were studied by Alkhanen et al. The mean age was 68 ± 13 years, and 59% of patients were males. Prevalence of dyslipidemia was 8% ($n=16$). A comparison of the serum lipid profile of two categories of strokes showed no statistical significance in comparing serum values of total cholesterol, triglycerides, LDL-C, and in ischemic and hemorrhagic stroke patients.⁷

Zhang and colleagues conducted a comprehensive study involving 3,914 stroke patients, examining various subtypes including 3,085 cases of ischemic stroke (IS), 497 of intracerebral hemorrhage (ICH), and 332 of subarachnoid hemorrhage (SAH). Their findings revealed that lower levels of high-density lipoprotein cholesterol (HDL-C) and an elevated total cholesterol (TC) to HDL-C ratio were linked to a higher likelihood of developing IS across both sexes. Additionally, among men, higher TC levels showed a positive association with IS risk. Conversely, in women, an inverse relationship was observed between TC levels and ICH risk. Furthermore, an increased TC-to-HDL-C ratio was also associated with a greater risk of IS.¹¹

In a study conducted by Sacco and colleagues involving 539 patients with ischemic stroke (IS) and a control group of 905 individuals, findings indicated that higher levels of HDL cholesterol (HDL-C) are linked to a decreased risk of developing ischemic stroke.¹²

CONCLUSION:

There is a high frequency of dyslipidemia in patients of stroke. The incidence of dyslipidemia is high among ischemic stroke patients in comparison to hemorrhagic stroke patients.

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