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Study of Effect of Acute Coronary Syndrome and Stroke on Lipid Profile at Tertiary Care Centre

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HIGHLIGHTS

1. Investigating lipid profile changes post-ACS.
2. Analyzing stroke impact on lipid levels.
3. Tertiary care insights into cardiovascular health.
4. Acute conditions' effects on cholesterol metrics.
5. Understanding lipid dynamics in critical patients.

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ABSTRACT

Cardiovascular disease (CVD), including acute coronary syndrome (ACS) and stroke, is a leading global cause of mortality. Dyslipidemia, a key modifiable risk factor, significantly influences the pathophysiology of both conditions, particularly through its role in atherosclerosis. This study examines the effect of ACS and stroke on lipid profiles during the acute phase, with lipid parameters monitored over a four-week period post-hospitalization. A total of 50 patients aged 18-75 years were included, with 33 males and 17 females. Baseline lipid profiles-total cholesterol, LDL-C, HDL-C, and triglycerides-were assessed at intervals of 72 hours, one week, and four weeks post-event. Results revealed significant reductions in total cholesterol, HDL-C and LDL-C levels at 72 hours and one week, followed by partial recovery at four weeks. Triglyceride levels increased significantly during the first week, remaining elevated throughout the study. These findings suggest that lipid metabolism undergoes transient disruption during ACS and stroke, underscoring the importance of early lipid assessment and management. Timely intervention with lipid-lowering therapies may help reduce the risk of recurrent cardiovascular events. Further research is needed to explore the underlying mechanisms driving these lipid alterations and to develop targeted strategies for optimizing patient outcomes.

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INTRODUCTION

Cardiovascular disease (CVD) is the leading cause of death worldwide, accounting for nearly 30% of all deaths. Acute coronary syndrome (ACS) and stroke, key components of CVD, place immense health and economic burdens due to their high prevalence and associated complications. Blood cholesterol levels-total cholesterol, LDL, HDL-and triglycerides play a crucial role in the understanding and management of cardiovascular diseases [1,2].

ACS, which encompasses conditions like myocardial infarction and unstable angina, is triggered by the rupture of atherosclerotic plaques and subsequent blood clot formation. Managing lipid profiles is vital, as dyslipidemia is a significant, modifiable risk factor for atherosclerosis. Elevated LDL cholesterol (LDL-C) is especially linked to the development and progression of atherosclerotic plaques, making aggressive lipid-lowering therapies essential in the acute phase of ACS. Globally, ACS incidence remains alarmingly high, with millions affected annually. For example, Europe reports about 1.8 million ACS cases each year, underscoring the significant healthcare burden. In Asia, ACS rates are increasing, driven by urbanization and lifestyle changes that heighten cardiovascular risk [3,4].

Ischemic stroke, often caused by embolic events stemming from atherosclerotic plaques or cardiac sources, also emphasizes the importance of lipid management. High cholesterol levels are associated with an increased risk of stroke, underscoring the need for comprehensive lipid monitoring and control in stroke prevention strategies. Globally, about 15 million people suffer strokes annually, making it a leading cause of long-term disability, particularly in low and middle income countries where stroke incidence is higher [5,6].

Lipid metabolism plays a critical role in the pathophysiology of both ACS and stroke. Dyslipidemia is a well-established risk factor for atherosclerosis, the underlying cause of most ACS and ischemic strokes. Key lipid parameters, including total cholesterol, are crucial to the development and progression of atherosclerotic plaques. Studies show that patients with ACS typically have elevated LDL-C and triglycerides, coupled with reduced HDL-C levels, contributing to plaque instability and myocardial infarction. Similar lipid profile changes are observed in stroke patients, where dyslipidemia increases the risk of both ischemic and hemorrhagic strokes [7,8].

Effective management of lipid abnormalities is essential for reducing the risk of recurrent cardiovascular events and improving outcomes in ACS and stroke patients. Therapeutic strategies, including lifestyle modifications and pharmacological interventions, aim to optimize lipid levels and reduce the risk of further atherosclerotic complications. Statins are well-researched and proven to significantly reduce cardiovascular morbidity and mortality by lowering LDL-C and stabilizing atherosclerotic plaques. Additionally, newer agents such as PCSK9 inhibitors and ezetimibe offer further options for patients who cannot achieve target lipid levels with statins alone or who have statin intolerance [9,10].

Recognizing the pivotal role of dyslipidemia in the development of ACS and stroke, our study seeks to examine the specific changes in lipid profiles associated with these acute cardiovascular events at a tertiary care center. Understanding these lipid alterations will offer critical insights into the underlying mechanisms of these conditions, helping to inform more targeted therapeutic approaches for improving patient outcomes [11,12].

This research will add to the existing knowledge on the relationship between lipid metabolism and acute cardiovascular events, ultimately supporting more effective management and prevention strategies in clinical practice [13].

The study aims to investigate the impact of acute coronary syndrome (ACS) and stroke on lipid profiles during the acute phase. Specifically, it seeks to assess baseline lipid levels and track changes in lipid parameters over a four week period following hospitalization for ACS or stroke, evaluating whether any clinically significant alterations occur compared to baseline levels.

MATERIAL AND METHODS

The study was conducted over a 20 month period from January 2023 to August 2024. During this time, patients aged 18-75 years with acute coronary syndrome or stroke were enrolled. Lipid profiles were assessed at baseline and monitored over four weeks post-hospitalization. Data collection included clinical history, physical examination, and blood tests, with follow-up assessments on Day 3, Day 7, and at four weeks. Statistical analysis was performed to evaluate changes in lipid levels.

Study Population

The study population included 150 patients, aged 18-75 years, diagnosed with either Acute Coronary Syndrome (ACS) or stroke, treated at a tertiary care center. Of these, 100 had ACS and 50 had stroke. ACS patients were admitted to the Intensive Care Unit, while stroke patients were placed in either the wards or ICU based on severity. Following deaths and loss to follow-up, data from 50 patients were ana-

-lyzed: 16 STEMI, 8 NSTEMI, 13 UA, 9 ischemic stroke, and 4 hemorrhagic stroke cases.

Data Analysis

Data analysis focused on lipid profile changes in patients with Acute Coronary Syndrome (ACS) or stroke during a four week period post-hospitalization. Patients were aged 18-75, not on lipid lowering therapy, and had no uncontrolled diabetes, sepsis, liver disease, or thyroid disorders. Statistical tests were used to assess changes in lipid levels (total cholesterol, LDL-C, HDL-C, triglycerides) at baseline and follow up intervals (Day 3, Day 7, 4 weeks). A p-value of less than 0.05 was considered statistically significant.

RESULTS

The study included 50 patients, with ages ranging from 45 to 75 years. The mean age was 57.16 years, and the mean BMI was 30.34 kg/m². Of the total patients, 66% were male (33 patients) and 34% were female (17 patients). Regarding smoking, 46% of the patients (23) were smokers, while 54% (27) were non-smokers.

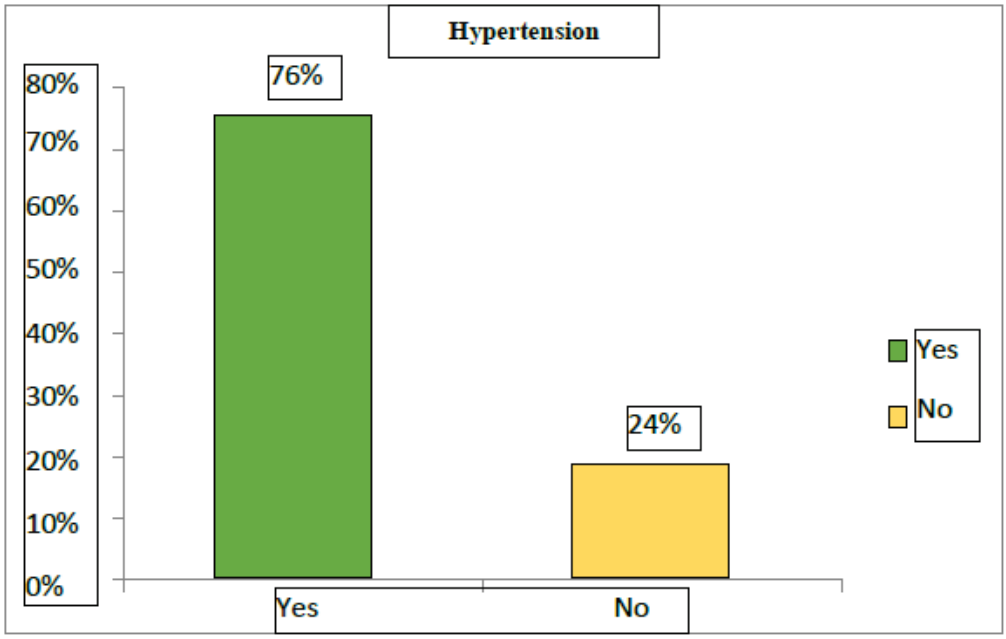

Figure 1: Graph of Distribution of Hypertension of Patients

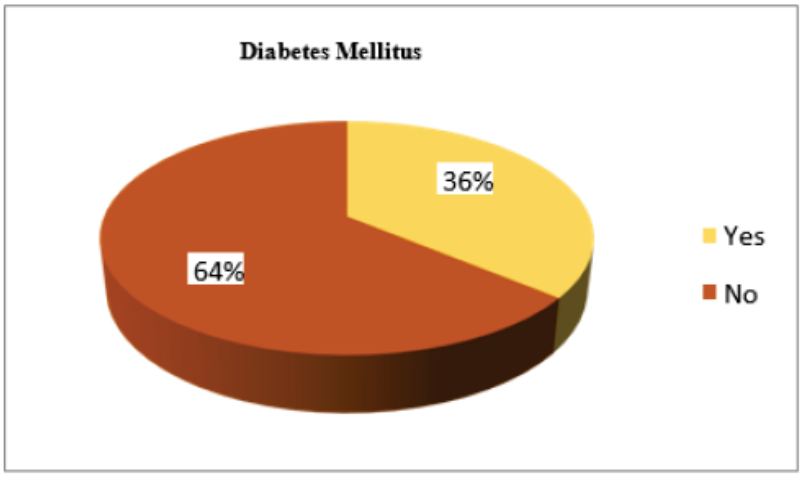

Figure 2: Graph of Distribution of Diabetes Mellitus of Patients

Hypertension was prevalent in 76% of patients (38), while 24% (12) did not have hypertensi-on. Diabetes mellitus was present in 36% of patients (18), and absent in 64% (32).

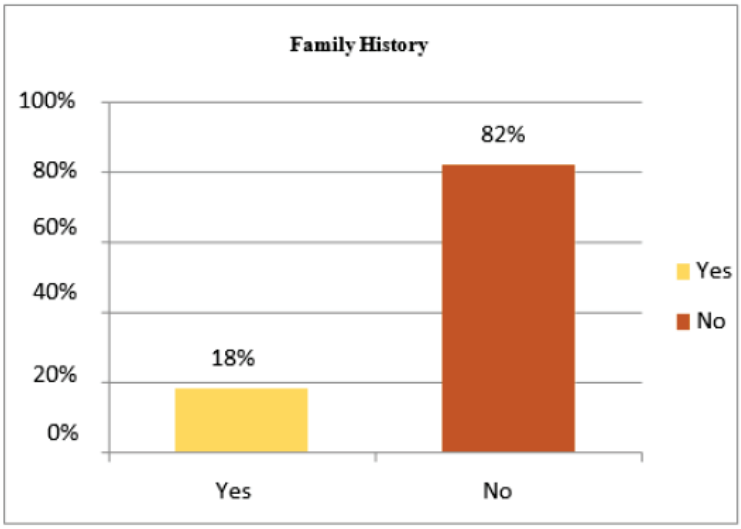

Figure 3: Graph of Distribution of Diabetes Mellitus of Patients

Out of a total of 50 patients, 9 individuals (18%) reported having a family history, while the remaining 41 patients (82%) indicated no family history.

Table 1: Effect of Stroke on Total Cholesterol Over a Period of 4 Weeks After Hospitalisation

Total Cholesterol	Baseline (N=50)	72Hours (N=50)	1 Week (N=50)	4 Weeks (N=50)
Mean ± SD	173.6 ±24.38	157±26.97	150 ± 20.46	174.4 ±25.05
P- value		0.001059	8.806e-08	0.6338

Table 2: Effect of Stroke on High Density Lipoprotein Cholesterol Over a Period of 4 Weeks After Hospitalisation

High-Density Lipoprotein Cholesterol	Baseline (N=50)	72Hours (N=50)	1 Week (N=50)	4 Weeks (N=50)
Mean + SD	39.38 +5.88	35.54+4.789	35.23 + 7.60	40.08 + 5.54
P- value		0.0001838	0.02807	0.02178

Table 3: Effect of Stroke on Low Density Lipoprotein Cholesterol Over a Period of 4 Weeks After Hospitalisation

Low-Density Lipoprotein Cholesterol	Baseline (N=50)	72Hours (N=50)	1 Week (N=50)	4 Weeks (N=50)
Mean + SD	125.7+31.88	112.2+29.83	100.8 + 25.80	120.8 +31.72
P- value		0.0003741	1.432e-07	0.1142

Table 4: Effect of Stroke on Very Low Density Lipoprotein Cholesterol Over a Period of 4 Weeks After Hospitalisation

Very Low- Density Lipoprotein Cholesterol	Baseline (N=50)	72Hours (N=50)	1 Week (N=50)	4 Weeks (N=50)
Mean + SD	29.54+10.32	30.46+10.73	30.69 + 10.53	30.38 + 10.94
P- value		0.2242	0.119	0.1894

Table 5: Effect of Stroke on Triglycerides on Very Low Density Lipoprotein Cholesterol Over a Period of 4 Weeks After Hospitalisation

Triglycerides	Baseline (N=50)	72Hours (N=50)	1 Week (N=50)	4 Weeks (N=50)
Mean + SD	165+28.01	178.8+31.34	191.2 +33.88	172.2 +29.14
P- value		6.347e-06	1.816e-05	0.01981

Table 6: Effect of Acute Coronary Syndrome on Total Cholesterol Over a Period of 4 Weeks After Hospitalisation

Total Cholesterol	Baseline (N=50)	72Hours (N=50)	1 Week (N=50)	4 Weeks (N=50)
Mean + SD	166.4 +22.47	150.5+21.43	140.9+ 21.07	167.5+20.26
P- value		2.961e-11	5.472e-15	0.3049

Table 7: Effect of Acute Coronary Syndrome on High Density Cholesterol Over a Period of 4 Weeks After Hospitalisation

High-Density Lipoprotein Cholesterol	Baseline (N=50)	72Hours (N=50)	1 Week (N=50)	4 Weeks (N=50)
Mean + SD	41.00 +10.44	36.68+8.50	34.32+ 8.69	41.86+ 10.39
P- value		3.685e-06	9.803e-10	0.0009167

Table 8: Effect of Acute Coronary Syndrome on Low Density Cholesterol Over a Period of 4 Weeks After Hospitalisation

Low-Density Lipoprotein Cholesterol	Baseline (N=50)	72Hours (N=50)	1 Week (N=50)	4 Weeks (N=50)
Mean + SD	116.2+27.02	99.73 +25.08	90.7+ 24.37	115.4+27.37
P- value		6.781e-11	2.689e-14	0.2713

Table 9: Effect of Acute Coronary Syndrome on Very Low Ddensity Lipoprotein Cholesterol Over a Period of 4 Weeks After Hospitalisation

Very Low- Density Lipoprotein Cholesterol	Baseline (N=50)	72Hours (N=50)	1 Week (N=50)	4 Weeks (N=50)
Mean ± SD	31.43 +10.52	31.22+9.22	33.35 +10.06	32.59 +10.18
P- value		0.7679	0.04587	0.01662

Table 10: Effect of Acute Coronary Syndrome on Triglycerides Over a Period of 4 Weeks After Hospitalisation

Triglycerides	Baseline (N=50)	72Hours (N=50)	1 Week (N=50)	4 Weeks (N=50)
Mean + SD	146.5 +35.19	161.2 +38.22	176+ 43.44	156.6+ 37.53
P- value		2.708e-09	2.747e-13	2.22e-05

DISCUSSION

This study aimed to investigate the impact of acute coronary syndrome (ACS) and stroke on lipid profiles over a four week period, conducted at a tertiary care center. The research sought to provide valuable insights into how these acute cardiovascular events influence lipid dynamics and their implications for patient management. By examining lipid level changes during these critical events, the study adds to the understanding of lipid metabolism in the context of acute coronary and cerebrovascular conditions [14].

The cohort consisted of 50 patients, with ages ranging from 45 to 75 years and a mean age of 57.16 years. The mean body mass index (BMI) for the study participants was 30.34 kg/m², indicating a population with a significant proportion of individuals classified as overweight or obese. The demographic analysis revealed a predominance of males (66%), which aligns with the commonly observed gender distribution in cardiovascular studies, where males often show a higher incidence of acute coronary events and strokes. Among the patients, 76% had hypertension, a condition strongly linked with both ACS and stroke, further emphasizing the cardiovascular risk profile of this population. Additionally, 36% of the patients had diabetes mellitus, 46% were smokers, and 18% had a family history of cardiovascular diseases. These factors collectively contribute to an elevated cardiovascular risk profile and highlight the complex interplay of pre-existing conditions that may exacerbate the severity and outcomes of acute cardiovascular events [15,16,17].

In patients who experienced a stroke, significant changes in lipid profiles were observed. Total cholesterol levels decreased notably from baseline values, with a marked drop at 72 hours and one week post-stroke, followed by a return to near baseline levels by the end of the four week period. This pattern suggests an acute phase response to the stroke event, characterized by a significant initial reduction in total cholesterol, which then stabilizes over time. High-density lipoprotein (HDL) cholesterol, known for its protective role in cardiovascular health, initially decreased, reflecting a transient reduction in protective cholesterol levels. However, HDL levels rebounded to higher values by the conclusion of the four week study period. Low density lipoprotein (LDL) cholesterol, which is often associated with increased cardiovascular risk, also decreased significantly during the acute phase, with levels demonstrating partial recovery by four weeks. Interestingly, very low density lipoprotein (VLDL) cholesterol levels remained relatively stable throughout the study, showing minimal fluctuations. In contrast, triglyceride levels increased significantly from baseline values at 72 hours and one week, before declining to elevated levels by the end of the study. This trend indicates an initial surge in triglycerides, followed by a decrease that did not fully return to baseline, suggesting ongoing metabolic changes even after the acute event [18,19,20].

Similarly, in patients with ACS, lipid profiles exhibited a comparable trajectory. Total cholesterol levels showed a significant decrease from baseline at 72 hours and one week, with a partial return to baseline

values by the four week mark. HDL cholesterol followed a similar pattern to that observed in stroke patients, with an initial decrease followed by a rebound to higher levels. LDL cholesterol levels decreased significantly during the acute phase, mirroring the trend in total cholesterol, and showed a partial rebound by the four-week mark. Triglyceride levels increased markedly at 72 hours and one week, with levels remaining elevated compared to baseline at four weeks. This transient but notable alteration in triglyceride levels following ACS underscores the acute impact of the event on lipid metabolism [21,22].

These fluctuations in lipid profiles underscore the importance of early and accurate lipid assessment in patients with ACS and stroke. Timely monitoring of these changes is crucial for adjusting therapeutic strategies to effectively manage dyslipidemia. Early evaluation of lipid profiles allows healthcare providers to guide the selection of appropriate lipid lowering therapies, which are essential for mitigating cardiovascular risk and optimizing patient outcomes [23].

The study highlights several important findings. First, the significant initial decreases in total cholesterol, HDL, and LDL cholesterol levels observed in both stroke and ACS patients, followed by partial recovery, suggest an acute phase response that requires careful monitoring. Second, the persistence of elevated triglyceride levels, despite a reduction from peak values, points to ongoing metabolic disturbances that may necessitate targeted management. Finally, the stable VLDL cholesterol levels observed across both patient groups suggest that this lipid fraction may be less responsive to acute changes associated with cardiovascular events compared to other lipid parameters [24].

Overall, the results of this study emphasize the need for comprehensive lipid management strategies in the acute setting. Accurate baseline lipid profiles and subsequent monitoring are vital for tailoring treatment plans and addressing cardiovascular risk factors effectively. By understanding the temporal changes in lipid profiles following ACS and stroke, healthcare providers can enhance their approach to managing dyslipidemia and improve long-term patient outcomes. The study underscores the critical importance of early lipid assessment and targeted therapy to mitigate cardiovascular risk and optimize patient care in the context of acute cardiovascular events. Further research is needed to explore the underlying mechanisms of these lipid profile changes and to develop targeted interventions that could lead to improved patient outcomes and better management strategies for individuals affected by ACS and stroke [25].

CONCLUSION

The study found that acute coronary syndrome (ACS) and stroke significantly impact lipid profiles, with notable changes occurring within the first week after the event. Specifically, levels of total cholesterol, HDL cholesterol, and LDL cholesterol decreased substantially at 72 hours and one week post event, reflecting acute disruptions in lipid metabolism. By four weeks, these levels generally returned to baseline, indicating that the changes were mostly transient. In contrast, VLDL cholesterol levels showed minimal variation, while triglycerides remained elevated compared to baseline. These results highlight the importance of closely monitoring lipid levels in the early post event period for effective cardiovascular risk management. The study suggests that further research is needed to understand the mechanisms behind these lipid changes and to develop targeted interventions for better patient outcomes.

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