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A Non-Interventional Study to Evaluate the Correlation and Importance of Lipid Profile and Troponin in Patients Diagnosed with Cardiac Stroke

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ABSTRACT
Aim: A Non-Interventional Study to Evaluate the Correlation and Importance of Lipid Profile and Troponin in Patients Diagnosed with Cardiac Stroke.
Objective: To evaluate the correlation between lipid profile (total cholesterol, LDL, HDL, and triglycerides) and troponin levels in patients diagnosed with cardiac stroke.
To analyse the significance of elevated troponin levels as a predictor of stroke severity in patients with a history of cardiovascular disease.
To identify trends in lipid profile components that correlate with increased troponin levels in cardiac stroke patients.
To explore the impact of lipid profile management on stroke prognosis

I. INTRODUCTION:

Heart attacks and strokes are usually acute events and are mainly caused by a blockage that prevents blood from flowing to the heart. The most common reason for this is a build-up of fatty deposits on the inner walls of the blood vessels that supply the heart.

1.1 Symptoms of heart attacks and strokes

Often, there are no symptoms of the underlying disease of the blood vessels. A heart attack or stroke may be the first sign of underlying disease. Symptoms of a heart attack include:

- Pain or discomfort in the centre of the chest; and/or
- Pain or discomfort in the arms, the left shoulder, elbows, jaw, or back.

In addition, the person may experience difficulty in breathing or shortness of breath; nausea or vomiting; light-headedness or faintness; a cold sweat; and turning pale. Women are more likely than men to have shortness of breath, nausea, vomiting, and back or jaw pain.

The most common symptom of a stroke is sudden weakness of the face, arm, or leg, most often on one side of the body. Other symptoms include sudden onset of:

- numbness of the face, arm, or leg, especially on one side of the body;
- confusion, difficulty speaking or understanding speech;
- difficulty seeing with one or both eyes;
- difficulty walking, dizziness and/or loss of balance or coordination;
- severe headache with no known cause; and/or
- fainting or unconsciousness.

People experiencing these symptoms should seek medical care immediately.

1.2 Lipid Profile Test

Is a standard blood test that monitors and screens different cholesterol and triglyceride levels. Balancing the levels of both these fats is important because excess fat can build up in your arteries and blood vessels, hence, damaging them.

1.3 Purpose of Lipid Profile

The blood test measures five different cholesterol and triglycerides. The lipid profile test diagnoses diabetes, kidney diseases, obesity, high cholesterol, and polycystic ovary disease. Doctors generally recommend it to monitor cholesterol levels in the blood to diagnose health issues. Lipid profile test details include the following parameters-

Study Type: Observational, retrospective or prospective cohort study.

- **Total Cholesterol**: It is the sum of LDL, VLDL, and HDL cholesterol. In adults, the normal range is below 200 mg/dL, and the borderline high is 200 to 239 mg/dL. Whereas a report of 240 mg/dL or above is considered high.

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- **Low-density lipoprotein (LDL) cholesterol**: These are termed 'bad cholesterol,' a surplus that can build up plaque in your arteries. LDL cholesterol should be below 100 mg/dL.
- **Very low-density lipoprotein (VLDL) cholesterol**: It is a bad cholesterol as its high values can cause plaque deposits on artery walls. This lipid profile test normal ranges are below 30 mg/dL.
- **High-density lipoprotein (HDL) cholesterol**: It is considered good cholesterol, helping to remove other forms of cholesterol from the blood. For men, the normal range is 35 to 65 mg/dL, and for women, it is 35 to 80 mg/dL.
- **Triglycerides**: These are a type of fat found commonly in the body. They come from the food we eat, especially oils, butter, and other fats. Its normal range is below 150 mg/dL.

If the lipid profile is high, it may indicate the risk of type 2 diabetes, peripheral artery disease, and coronary artery disease, which may lead to heart attack, cardiovascular disease or stroke.

High lipids or high cholesterol symptoms may show signs that may lead you to get it done. Some of them are given below-

- Yellowish skin bumps
- White rings around the cornea
- Yellowish lumps near the eye
- Chest pain

1.4. Cardiac troponins (cTn) are highly specific biomarkers of myocardial injury and play a crucial role in guiding the management of chest pain. Elevated troponin-I (cTnI) levels have also been linked to poor prognoses in various conditions including critical illness, pulmonary embolism, cardiac and non-cardiac surgery, stroke, and end stage renal disease.

It is widely acknowledged that elevated levels of low-density lipoproteins (LDL), triglycerides (TG), and total cholesterol (TC), along with decreased levels of high-density lipoproteins (HDL), are associated with an increased incidence of cardiac events and are recognized risk factors. Therefore, in this retrospective study, the association between lipid profile parameters and troponin-I test results in predicting cardiac events is investigated.

II. METHODS:

Data Collection: Retrospective review of patient records from hospital databases or prospective data collection through patient interviews and chart reviews. Collection of baseline characteristics: age, gender, comorbidities (hypertension, diabetes) and history of cardiovascular disease. Record of lipid profile (total cholesterol, LDL, HDL, and triglycerides) and troponin levels taken during hospitalization. Stroke severity and outcomes will be recorded.

Duration: 1 month.
Setting: Hospitals with a dedicated cardiology unit, stroke unit, or cardiovascular research department.
Participants: Patients diagnosed with cardiac stroke (either ischemic or haemorrhagic strokes due to cardiovascular causes).
Inclusion criteria: Adults aged 18 or above. Patients diagnosed with cardiac stroke. Patients who have had a lipid profile and troponin test conducted within a predefined time frame (24-48 hours post stroke). patients who are willing to provide informed consent for participation in this study.
Exclusion criteria: patients with a history of non-cardiac stroke causes (cerebrovascular disease unrelated to heart conditions). patients with major systemic diseases that affect lipid or troponin levels (e.g., severe liver disease, acute kidney failure). pregnant or breast-feeding woman. Patients with incomplete clinical records or who have not had the required lab tests done.

Outcome Measures:

Primary Outcome: The strength and nature of the correlation between lipid profile ((total cholesterol, LDL, HDL, and triglycerides) and troponin levels.

Secondary Outcome: Stroke severity and its relationship to lipid profile and troponin. Mortality or long-term disability outcomes (e.g., disability scale, reinfarction rate) and its association with lipid levels and troponin.

III. STATISTICAL ANALYSIS:

Descriptive statistics to summarize patient demographics and clinical characteristics. Correlation analysis (e.g., Pearson or Spearman correlation) between lipid profile components and troponin levels. Multivariable regression models to adjust for confounding factors (age, gender, comorbidities). Chi-square or t-tests for categorical or continuous variables as appropriate.

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IV. ETHICAL CONSIDERATIONS:

Informed Consent: Since this is a non-interventional observational study, informed consent will be obtained from all participants for data usage.

Confidentiality: Patient information will be anonymized or de-identified
to ensure privacy.

Institutional Review Board (IRB) Approval: Ethical approval will be sought from the relevant IRB or ethics committee of participating institutions.

V. RESULTS:

TABLE-1 SUMMARY STATSTICS OF DEMPGRAPHICS	
Parameter	**Mean ± SD**
Gender	Male n=16 (80%), Female n=4 (20%)
Age (Min & Max) (yrs)	(Min-43) (Max-73)
Height (mts)	1.67 ± 0.08
Weight (kgs)	86.55 ± 9.27
BMI ($kg/mts^{2)}$	37.09 ± 6.76

TABLE-2 SUMMARY STATSTICS OF VITAL SIGNS	
Parameter	**Mean ± SD**
Pulse Rate	94.65 ± 8.55
Respiratory Rate	20.15 ± 1.23
SBP	126.9 ± 8.67
DBP	86.2 ± 7.30
Temperature	97.81 ± 0.60

TABLE-3 SUMMARY STATSTICS OF INVESTIGATIONS	
Parameter	**Mean ± SD**
TC	217.75 ± 69.95
LDL	69.95 ± 15.26
HDL	79.15 ± 15.46
TGL	276 ± 71.27
VLDL	55.2 ± 14.25
LDL/HDL RATIO	0.94 ± 0.37
TROPONIN-I	2826.741 ± 5327.69

TABLE-4 SUMMARY STATSTICS OF QUESTIONNARIES		
Parameter	**At Admission Mean ± SD**	**At Discharge Mean ± SD**
Stroke scale	0.85 ± 1.14	0.25 ± 0.44
Disability rating scale	1.0 ± 1.17	0.0 ± 0.00

TABLE-5 CORRELATION ANALYSIS USING SPEARMAN CORRELATION BETWEEN LIPID PROFILE COMPONENTS AND TROPONIN LEVELS.	
Parameter	**SPEARMAN CORRELATION**
Total Cholesterol vs Troponin I	rs = 0.13424, p (2-tailed) = 0.57259. By normal standards, the association between the two variables would not be considered statistically significant.
LDL vs Troponin I	rs = -0.1644, p (2-tailed) = 0.48854. By normal standards, the association between the two variables would not be considered statistically significant.
HDL vs Troponin I	**rs = 0.47077, p (2-tailed) = 0.03617.**

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	By normal standards, the association between the two variables would be considered statistically significant.
TGL vs Troponin I	rs = 0.1318, p (2-tailed) = 0.57966. By normal standards, the association between the two variables would not be considered statistically significant.
VLDL vs Troponin I	rs = 0.1318, p (2-tailed) = 0.57966. By normal standards, the association between the two variables would not be considered statistically significant.
LDL/HDL RATIO vs Troponin I	rs = -0.40064, p (2-tailed) = 0.08003. By normal standards, the association between the two variables would not be considered statistically significant.

VI. SUMMARY & DISCUSSION:

6.1 From Table-1 it was evident that the Gender among study population was 80% male (n=16) and 20% female (n=4), Age of Participants ranged in age from 43 to 73 years, The average height is 1.67 meters with a standard deviation of 0.08 meters, Weight, the average weight is 86.55 kg with a standard deviation of 9.27 kg and the average Body Mass Index (BMI) is 37.09 kg/m² with a standard deviation of 6.76.

6.2 From Table-2 it was evident that the average pulse rate is 94.65 beats per minute with a standard deviation of 8.55, The average respiratory rate is 20.15 breaths per minute with a standard deviation of 1.23, The average SBP is 126.9 mmHg with a standard deviation of 8.67,The average DBP is 86.2 mmHg with a standard deviation of 7.30 and The average body temperature is 97.81°F with a standard deviation of 0.60°F.Overall, the vital signs show normal ranges for respiratory rate and temperature, while pulse rate, blood pressure (SBP and DBP) are slightly elevated, potentially indicating a higher level of cardiovascular risk.

6.3 Table-3 it was evident that the average total cholesterol is 217.75 mg/dL with a standard deviation of 69.95, The average LDL is 69.95 mg/dL with a standard deviation of 15.26,the average HDL is 79.15 mg/dL with a standard deviation of 15.46,the average triglycerides level is 276 mg/dL with a standard deviation of 71.27.the average VLDL is 55.2 mg/dL with a standard deviation of 14.25,the average LDL/HDL ratio is 0.94 with a standard deviation of 0.37,the average troponin-I level is 2826.74 pg/mL with a standard deviation of 5327.69.

The lipid profile shows that total cholesterol is slightly elevated (217.75 mg/dL), while LDL is within a healthy range and HDL is relatively high, which is generally beneficial. However, triglycerides and VLDL are elevated, which could indicate dyslipidaemia. The LDL/HDL ratio of 0.94 is favourable, suggesting a lower cardiovascular risk. The elevated Troponin-I level is notable, as it is typically associated with heart muscle damage, and may require further investigation for potential cardiovascular events or risks.

6.4 From Table-4 From Table-4 it was evident that the Stroke ScaleAt Admission: Mean = 0.85, SD =1.14,At Discharge: Mean = 0.25, SD = 0.44The stroke scale shows a significantimprovement from admission to discharge, with a reduction in both the mean and standard deviation, indicating a decrease in the severity of stroke-related symptoms. Disability Rating ScaleAt Admission: Mean = 1.0, SD = 1.17 and At Discharge: Mean = 0.0, SD = 0.00 The disability rating scale also shows a complete recovery or improvement by discharge, as the mean score decreases to 0.0, with no variation (SD = 0.00).

6.5 From Table-5 it was evident that the table presents Spearman correlation values and p-values for the relationship between various components of the lipid profile (Total Cholesterol, LDL, HDL, Triglycerides, VLDL, LDL/HDL ratio) and Troponin I levels. The results indicate the following: Total Cholesterol vs Troponin I: rs = 0.13424, p = 0.57259There is no statistically significant correlation between total cholesterol and troponin I levels ($p > 0.05$). LDL vs Troponin I:rs = -0.1644, p = 0.48854, No statistically significant correlation between LDL and troponin I levels ($p > 0.05$). HDL vs Troponin I:rs = 0.47077, p = 0.03617, There is a statistically significant positive correlation between HDL and troponin I levels ($p < 0.05$), suggesting that higher HDL levels are associated with higher troponin I levels. Triglycerides (TGL) vs Troponin I:rs = 0.1318, p = 0.57966, No statistically significant correlation between triglycerides and troponin I levels ($p > 0.05$).VLDL vs Troponin I:rs = 0.1318, p = 0.57966, No statistically significant correlation between VLDL and troponin I levels ($p > 0.05$). LDL/HDL Ratio vs Troponin I:rs = -0.40064, p = 0.08003, No statistically significant correlation

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between the LDL/HDL ratio and troponin I levels ($p > 0.05$).

VII. CONCLUSION:

The data presents a group with a predominance of males (80%) compared to females (20%). The participants are relatively older, with ages ranging from 43 to 73 years. The average height is 1.67 meters, and the average weight is 86.55 kg, indicating a generally heavier cohort. The average BMI of 37.09 kg/m² falls within the category of obesity, as it exceeds the normal BMI range (18.5–24.9). This suggests that the participants in this group may be at higher risk for obesity-related health issues.

The data on vital signs reveals that while most of the participants' respiratory rate and body temperature are within normal ranges, the pulse rate and blood pressure values are slightly elevated. The average pulse rate of 94.65 bpm suggests mild tachycardia, and the systolic (126.9 mmHg) and diastolic (86.2 mmHg) blood pressures are on the higher end of the normal range, possibly indicating prehypertension. This, combined with the elevated BMI from Table 1, may suggest that the participants are at a higher cardiovascular From risk and could benefit from further monitoring and health interventions. The lipid profile and troponin levels suggest a mixed cardiovascular risk profile. While LDL is within a healthy range and HDL is relatively high, indicating a protective effect, total cholesterol, triglycerides, and VLDL levels are elevated, which may indicate dyslipidaemia and increased cardiovascular risk. The LDL/HDL ratio is favourable, suggesting a relatively low risk. However, the significantly elevated troponin-I levels are concerning, as they typically signal heart muscle damage, which warrants further investigation for potential heart-related issues or events. These findings point to a need for close monitoring of cardiovascular health in this population.

In conclusion, the group demonstrates a mixed cardiovascular risk profile. Despite some favourable lipid indicators (normal LDL, high HDL, and favourable LDL/HDL ratio), the elevated BMI, elevated blood pressure, and significant troponin-I levels signal potential cardiovascular risks and underlying heart-related concerns. Further health monitoring and intervention are strongly recommended for this population to address these risks and prevent possible future cardiovascular events. Out of all the lipid profile components analysed, only HDL showed a statistically significant positive correlation with troponin I levels, suggesting that higher HDL levels are associated with elevated troponin I levels. However, most of the lipid profile components (Total Cholesterol, LDL, Triglycerides, VLDL, and LDL/HDL ratio) did not show statistically significant correlations with troponin I, indicating that they may not be directly related to heart muscle damage as indicated by troponin levels in this sample.

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