ORIGINAL RESEARCH PAPER

General Medicine

CLINICAL PROFILE AND ITS RISK FACTORS WITH SPECIAL REFERENCE TO APOLIPOPROTEINS A1, B IN ACUTE ISCHEMIC STROKE PATIENTS PRESENTING TO TERTIARY CARE CENTRE IN SOUTH WESTERN MAHARASHTRA

KEY WORDS: Apolipoprotein A1, Apolipoprotein B, Acute Ischemic Stroke, NIHSS, Lipid Biomarkers.

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ABSTRACT

Background: Stroke is a major global health problem and remains the second leading cause of death as well as a significant contributor to long-term disability. In India, ischemic stroke constitutes the majority of cerebrovascular events, with increasing prevalence in both rural and urban populations. Although traditional risk factors such as hypertension, diabetes mellitus, dyslipidemia, and lifestyle habits play an important role, recent studies suggest that apolipoproteins may provide better prediction of cerebrovascular risk than conventional lipid parameters. Aimed to evaluate the clinical profile and risk factors of patients with acute ischemic stroke, with particular emphasis on Apolipoprotein A1 (ApoA1), Apolipoprotein B (ApoB), and the ApoB/ApoA1 ratio, and to determine their association with stroke severity.**Materials and Methods:** A cross-sectional observational study was conducted from July 2024 to December 2025 at Krishna Charitable Hospital and Medical Research Centre, Karad, Maharashtra. A total of 130 adult patients with MRI-confirmed acute ischemic stroke were included. Demographic characteristics, clinical history, lifestyle factors, laboratory investigations, and neuroimaging findings were recorded. Serum ApoA1 and ApoB levels were measured using the immunoturbidimetric method, and the ApoB/ApoA1 ratio was calculated. Stroke severity was assessed using the National Institutes of Health Stroke Scale (NIHSS). Statistical analysis included correlation testing and multiple linear regression.**Results:** The mean age of participants was 64.9 ± 11.9 years, with male predominance (63.8%). Hypertension (56.9%) and diabetes (24.6%) were common comorbidities. The mean NIHSS score was 17.0 ± 4.2. Conventional metabolic parameters showed no significant association with stroke severity. However, ApoA1 demonstrated a significant negative correlation with NIHSS ($r = 0.304$, $p < 0.001$), whereas ApoB ($r = 0.339$, $p < 0.001$) and the ApoB/ApoA1 ratio ($r = 0.260$, $p = 0.003$) showed positive correlations.**Conclusion:** Apolipoprotein parameters, particularly reduced ApoA1 and increased ApoB and ApoB/ApoA1 ratio, were significantly associated with greater stroke severity, suggesting their potential value in risk stratification and prognostic assessment in acute ischemic stroke.

INTRODUCTION:

Stroke remains a major public health concern in the modern era and is recognized as the second most common cause of death globally, while also representing a leading contributor to long-term neurological disability.1 In India, the disease burden has increased substantially, with prevalence estimates ranging from 84–262 per 100,000 population in rural regions and 334–424 per 100,000 in urban populations.2 Among cerebrovascular events, ischemic stroke constitutes nearly 70–80% of all cases worldwide and approximately 68% within the Indian subcontinent.3 Regions such as southwestern Maharashtra face additional challenges in stroke management because of mixed urban–rural populations and unequal access to healthcare facilities. Ischemic stroke occurs when cerebral blood flow is compromised due to thrombotic or embolic obstruction of brain arteries, resulting in oxygen deprivation and triggering complex pathological mechanisms such as excitotoxicity, oxidative stress, calcium imbalance, and inflammation, ultimately leading to neuronal injury and neurological deficits.[4]

The development of ischemic stroke is influenced by a combination of modifiable and non-modifiable determinants. Age, sex, ethnicity, and genetic predisposition represent non-modifiable factors, whereas hypertension, diabetes mellitus, dyslipidemia, smoking, alcohol consumption, obesity, sedentary lifestyle, and cardiac disorders are considered modifiable contributors.5 Despite the established role of these factors, nearly one-third of ischemic strokes remain unexplained, highlighting the importance of identifying additional biomarkers that may improve risk prediction.6,7 Dyslipidemia is traditionally evaluated through measurements of total cholesterol, LDL-cholesterol, HDL-cholesterol, and triglycerides. However, these conventional lipid parameters may not adequately reflect the true atherogenic burden, prompting increasing attention toward apolipoproteins, which serve as structural and functional components of lipoprotein particles.[8]

Apolipoprotein A1 (ApoA1), the principal protein component of HDL, plays a key role in reverse cholesterol transport by facilitating the removal of excess cholesterol from peripheral tissues to the liver for elimination. In addition, ApoA1 demonstrates anti-inflammatory, antioxidant, and antithrombotic effects that contribute to vascular protection.9 Several epidemiological investigations have reported an inverse relationship between ApoA1 concentrations and cardiovascular risk, indicating that reduced ApoA1 levels may independently predict adverse cardiovascular outcomes, including ischemic stroke.10 In contrast, Apolipoprotein B (ApoB) forms the major protein constituent of atherogenic lipoproteins such as VLDL, IDL, and LDL. Because each atherogenic particle contains a single ApoB molecule, its concentration reflects the total number of circulating atherogenic particles, thereby providing information beyond conventional LDL-cholesterol measurement. Elevated ApoB levels have been strongly associated with increased cardiovascular risk.[11]

The ratio of ApoB to ApoA1, which represents the balance between atherogenic and protective lipoproteins, has emerged as a powerful indicator of cardiovascular risk. Large international investigations, including the INTERHEART study, have identified this ratio as a strong lipid-related predictor of myocardial infarction.11 However, evidence regarding its role in ischemic stroke, particularly in diverse ethnic populations, remains limited. India presents a distinctive epidemiological pattern with relatively younger onset of stroke compared with Western countries.3 Considering the limited regional data on apolipoprotein profiles, the present cross-sectional observational study aims to evaluate the clinical characteristics and risk factor distribution, with particular emphasis on ApoA1 and ApoB levels, among patients with acute ischemic stroke admitted to

a tertiary care center in southwestern Maharashtra. The study further examines the association of these factors with stroke occurrence and severity, assessed using the NIHSS score, to improve understanding of stroke risk and potential preventive strategies in this population.

Material & Method:

A cross-sectional observational study was conducted at Krishna Charitable Hospital and Medical Research Centre, Karad, a tertiary care institution located in South-Western Maharashtra. The study period extended from July 2024 to December 2025. Prior to initiation, ethical clearance was obtained from the Institutional Ethics Committee (IEC approval number: KIMSDU/IEC/2023/127). All eligible participants or their legally authorized representatives provided written informed consent before inclusion in the study.

The study population consisted of patients admitted with clinical features suggestive of acute ischemic stroke and subsequently confirmed through neuroimaging. Participants were recruited using a stratified sampling approach to ensure adequate representation of different age categories and both genders. Patients aged above 18 years of either sex with MRI-confirmed acute ischemic stroke and willing to participate were included in the study. Individuals diagnosed with other forms of stroke such as intracerebral hemorrhage, subarachnoid hemorrhage, or post-traumatic stroke were excluded. Patients with primary or secondary neoplasms, central nervous system infections, or those unwilling to provide consent were also excluded.

Data collection was performed using a structured, pretested, and predesigned proforma. Demographic information recorded for each participant included name, age, gender, occupation, address, and socioeconomic status, which was assessed using the modified Kuppuswamy scale. A detailed clinical history was obtained with emphasis on the onset, duration, and progression of neurological symptoms. Particular attention was given to past medical history and family history related to established stroke risk factors such as hypertension, diabetes mellitus, ischemic heart disease, previous transient ischemic attacks, or prior stroke episodes. Lifestyle habits were also documented. Smoking history was categorized as never smoker, former smoker (cessation more than one year), or current smoker. Alcohol intake was recorded as non-drinker, occasional drinker (less than three drinks per week), or regular drinker (three or more drinks per week).

All patients underwent a comprehensive physical examination. General examination included assessment of vital parameters such as pulse rate, blood pressure, respiratory rate, and temperature. Anthropometric measurements including height, weight, and body mass index (BMI) were recorded. A detailed central nervous system examination was performed for each patient. Stroke severity at the time of admission was evaluated using the National Institutes of Health Stroke Scale (NIHSS). Blood samples were collected from all participants within 24 hours of stroke onset after obtaining consent. Routine laboratory investigations included hemoglobin, random blood glucose, HbA1c, blood urea, serum creatinine, and serum electrolytes (sodium and potassium). A complete lipid profile was also performed, including total cholesterol, triglycerides, high-density lipoprotein cholesterol, low-density lipoprotein cholesterol, and very low-density lipoprotein cholesterol. In addition, specific investigations were carried out to determine apolipoprotein levels. Apolipoprotein A1 (ApoA1) and Apolipoprotein B (ApoB) were measured using the immunoturbidimetric method, and the ApoB/ApoA1 ratio was subsequently calculated. All biochemical analyses were performed in the central laboratory of Krishna Charitable Hospital and Medical Research Centre using standardized procedures on a fully automated analyzer (Beckman Coulter AU680). Daily quality control procedures were implemented to maintain analytical accuracy and precision.

Neuroimaging was performed for all patients using magnetic resonance imaging of the brain to confirm the diagnosis of acute ischemic stroke. Imaging included diffusion-weighted sequences to detect acute infarction. MRI was conducted using a 1.5 Tesla scanner (Siemens Magnetom Aera) following a standard stroke protocol that included T1-weighted, T2-weighted, Fluid Attenuated Inversion Recovery (FLAIR), Diffusion-Weighted Imaging (DWI), Apparent Diffusion Coefficient (ADC), and Magnetic Resonance Angiography (MRA). The location and number of infarcts were documented for each patient. Operational definitions were standardized for the purpose of the study. Hypertension was defined as systolic blood pressure ≥140 mmHg or diastolic blood pressure ≥90 mmHg recorded on at least two occasions or current use of antihypertensive medication. Diabetes mellitus was defined as fasting blood glucose ≥126 mg/dL, 2-hour post-prandial glucose ≥200 mg/dL, HbA1c ≥6.5%, or ongoing antidiabetic therapy. Dyslipidemia was defined as total cholesterol >200 mg/dL, LDL cholesterol >130 mg/dL, HDL cholesterol <40 mg/dL in males or <50 mg/dL in females, triglycerides >150 mg/dL, or current lipid-lowering treatment. Obesity was defined as BMI ≥30 kg/m^2. Metabolic syndrome was identified according to the International Diabetes Federation criteria. Ischemic heart disease was defined as a documented history of angina, myocardial infarction, coronary angioplasty, or coronary artery bypass surgery. The study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki and Good Clinical Practice guidelines. Approval for the research protocol was granted by the Institutional Ethics Committee of Krishna Institute of Medical Sciences Deemed to be University, Karad. Written informed consent was obtained from all participants or their legally authorized representatives. Strict confidentiality of patient information was maintained, and all data were anonymized during analysis and reporting. Participants retained the right to withdraw from the study at any stage without affecting their standard medical care.

Statistical Analysis: All collected data were compiled and analyzed using SPSS software version 21.0. Categorical variables were summarized using frequencies and percentages, while continuous variables were expressed as mean values with corresponding standard deviations. Relationships between variables were evaluated using Pearson's correlation test. In addition, multiple linear regression analysis was applied to determine the association between various risk factors and stroke severity as measured by the NIHSS score. A p-value of less than 0.05 was considered statistically significant.

RESULT: Present study included total of 130 cases with mean age of 64.94±11.85yrs.

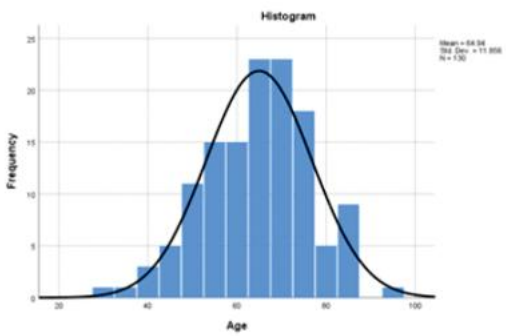


Figure 1: Showing the mean age of patients

Table 1: Distribution of parameters

		Count	N %
Gender	Female	47	36.2%
	Male	83	63.8%
Occupation	Businessman	5	3.8%
	Engineer	3	2.3%
	Farmer	32	24.6%
	Housewife	42	32.3%
	Laborer	1	0.8%
	Retired	32	24.6%
	Shopkeeper	8	6.2%
	Teacher	7	5.4%
SES Category	Lower	42	32.3%
	Lower Middle	51	39.2%
	Middle	34	26.2%
	Upper Middle	3	2.3%
History Type 2 DM	No	98	75.4%
	Yes	32	24.6%
History HTN	No	56	43.1%
	Yes	74	56.9%
History MISC	No	118	90.8%
	Yes	12	9.2%
Family History DM	No	109	83.8%
	Yes	21	16.2%
Family History HTN	No	100	76.9%
	Yes	30	23.1%
Smoking	No	82	63.1%
	Former	17	13.1%
	Current	31	23.8%
Alcohol	No	101	77.7%
	Occasional	10	7.7%
	Regular	19	14.6%
Tobacco Chewer	No	110	84.6%
	Yes	20	15.4%
BMI >30	No	127	97.7%
	Yes	3	2.3%

Among them 63.8% were male and 36.2% were female with clear male preponderance in the present study. Housewives constituted the largest occupational group (32.3%), followed by farmers and retired individuals (24.6% each), indicating a predominance of non-salaried and economically dependent or post-employment groups. Professionals such as engineers and businessmen formed a small proportion, while laborers were minimally represented (0.8%), reflecting an occupational distribution skewed toward household and agrarian roles. The majority of participants belonged to the lower middle socioeconomic category (39.2%), followed by the lower class (32.3%). A smaller proportion fell into the middle category (26.2%), while very few participants were from the upper middle socioeconomic group (2.3%), indicating an overall predominance of lower socioeconomic strata in the study population.

Most participants did not have a history of type 2 diabetes mellitus (75.4%), while about one-fourth (24.6%) reported diabetes. In contrast, a majority had a past history of hypertension (56.9%). Other comorbid conditions were relatively uncommon, with only 9.2% reporting miscellaneous past illnesses. A majority of participants had no family history of diabetes (83.8%) or hypertension (76.9%). Regarding smoking status, 63.1% were non-smokers, while 23.8% were current smokers and 13.1% were former smokers, indicating a substantial proportion with active or prior tobacco exposure. Most participants did not consume alcohol (77.7%), while 14.6% reported regular alcohol use and 7.7% consumed alcohol occasionally. Tobacco chewing was absent in the majority (84.6%), with 15.4% reporting the habit.

The study population had a mean height of 164.9 ± 7.2 cm and a mean body weight of 68.4 ± 8.6 kg, resulting in an average BMI of 25.0 ± 1.7 kg/m², indicating that most participants were in the overweight range. The majority of participants had a BMI ≤30, accounting for 97.7% of the study population, while obesity (BMI >30) was observed in only a small proportion of individuals (2.3%).

Table 2: Distribution according to presenting complaints

		Count	N %
Presenting complaint	Aphasia	6	4.6%
	Ataxia	25	19.2%
	Blurring of vision	4	3.1%
	Dysphagia	2	1.5%
	Hemiparesis	23	17.7%
	Hemiplegia	26	20.0%
	Loss of consciousness	9	6.9%
	Monoparesis	5	3.8%
	Seizure	7	5.4%
	Slurring of speech	20	15.4%
	Tingling sensation in limbs	3	2.3%

Motor deficits were the most common presenting complaints, with hemiplegia (20.0%) and ataxia (19.2%) being predominant, followed by hemiparesis (17.7%). Speech-related symptoms were also frequent, including slurring of speech (15.4%) and aphasia (4.6%). Loss of consciousness (6.9%) and seizures (5.4%) were reported in a smaller proportion, while sensory symptoms and other complaints such as blurring of vision, monoparesis, dysphagia, and tingling sensations were relatively uncommon.

Table 3: Showing the mean level of lipid parameters

	Mean	SD
Total Cholesterol	172.0	48.7
Triglycerides	134.3	76.8
HDL	40.4	18.1
LDL	107.9	39.9
VLDL	27.8	18.3
ApoA1	93.0	10.1
ApoB	123.4	15.4
ApoB/ApoA1 Ratio	1.37	.44

The lipid profile showed a mean total cholesterol of 172.0 ± 48.7 mg/dL and LDL cholesterol of 107.9 ± 39.9 mg/dL, indicating borderline dyslipidemia in a subset of participants. Triglyceride levels averaged 134.3 ± 76.8 mg/dL, while HDL cholesterol was relatively low (40.4 ± 18.1 mg/dL), suggesting an atherogenic lipid pattern. Apolipoprotein analysis revealed a mean ApoB level of 123.4 ± 15.4 mg/dL and ApoA1 of 93.0 ± 10.1 mg/dL, with an elevated ApoB/ApoA1 ratio of 1.37 ± 0.44, reflecting increased cardiovascular risk in the study population.

Table 4: Showing distribution according to region of lesion

		Count	Percent
Region	Parietal lobe	21	16.15%
	Gangliocapsular region(basal ganglia +/- internal capsule)	20	15.38%
	Subcortical white matter	18	13.85%
	Cerebellum	11	8.46%
	Thalamus	11	8.46%
	Brainstem	10	7.69%
	Occipital lobe	10	7.69%
	Frontal lobe	8	6.15%
	Frontal lobe+ parietal lobe	4	3.08%
	Occipital lobe+ parietal lobe	4	3.08%
	Parietal lobe + temporal lobe	3	2.31%
	Temporal lobe	3	2.31%
	Frontal lobe + Temporal lobe	3	2.31%
	Occipital lobe+ temporal lobe	1	0.77%
	Occipital lobe+ Parietal lobe+ Temporal lobe	1	0.77%

	Brainstem+ Gangliocapsular region	1	0.77%
	Cerebellum + Occipital lobe	1	0.77%

Among the 130 patients studied, parietal lobe involvement was the most common MRI finding, seen in 21 cases (16.15%), followed by gangliocapsular region (basal ganglia ± internal capsule) in 20 cases (15.38%). Subcortical white matter involvement was observed in 18 patients (13.85%).

Involvement of deep and posterior fossa structures included the thalamus and cerebellum in 11 cases each (8.46%), and the brainstem in 10 cases (7.69%). Occipital and frontal lobe lesions accounted for 7.69% and 6.15% of cases, respectively. Multilobar involvement was relatively uncommon, with individual combinations contributing ≤3.08% of cases, and complex patterns involving three regions or combined brainstem involvement observed in <1%. Overall, MRI findings predominantly showed single-region involvement, with parietal and gangliocapsular regions being most frequently affected.

Table 5: Showing mean NIHSS with various factors

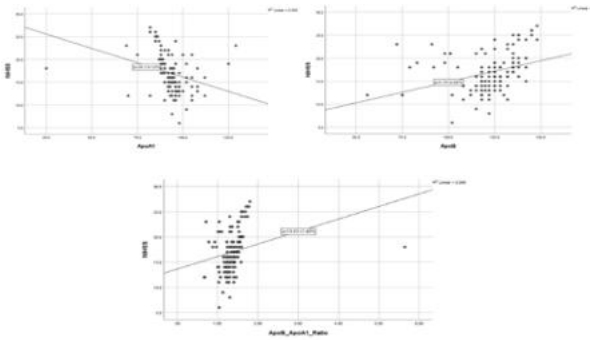
		NIHSS	
		Mean	SD
Gender	Female	17.6	4.5
	Male	16.7	3.9
History Type 2 DM	No	17.0	4.4
	Yes	16.9	3.3
History HTN	No	16.1	3.8
	Yes	17.7	4.3
Family history DM	No	16.6	4.0
	Yes	19.3	4.3
Family history HTN	No	16.9	4.2
	Yes	17.2	3.9
Smoking	No	17.4	4.6
	Former	15.9	3.2
	Current	16.5	3.3
Alcohol	No	17.2	4.3
	Occasional	16.3	3.9
	Regular	16.4	3.3

NIHSS scores were broadly comparable across most demographic and clinical subgroups. Females showed a slightly higher mean NIHSS than males. Patients with hypertension and those with a family history of diabetes tended to have higher NIHSS scores, suggesting greater stroke severity in these groups. In contrast, the presence of type 2 diabetes, family history of hypertension, smoking status, and alcohol consumption did not show marked differences in mean NIHSS scores, indicating relatively similar neurological severity across these categories. Age showed a significant positive correlation with NIHSS scores (r = 0.271, p = 0.002), indicating that increasing age was associated with greater stroke severity. In contrast, systolic and diastolic blood pressure, BMI, HbA1c, and lipid parameters (total cholesterol, triglycerides, HDL, LDL, and VLDL) did not demonstrate any statistically significant correlation with NIHSS scores, suggesting that these metabolic and hemodynamic variables were not independently associated with neurological severity in the present study.

Table 6: Correlation of NIHSS with Apolipoprotein parameters

		NIHSS
ApoA1	r	-.304**
	Sig.	.001
ApoB	r	.339**
	Sig.	.001
ApoB/ApoA1 Ratio	r	.260**
	Sig.	.003

The table demonstrates a statistically significant association between lipid-related biomarkers and stroke severity as assessed by the NIHSS score. Serum ApoA1 showed a moderate negative correlation with NIHSS (r = 0.304, p < 0.001), indicating that lower ApoA1 levels were associated with higher stroke severity. In contrast, ApoB exhibited a moderate positive correlation with NIHSS (r = 0.339, p < 0.001), suggesting that increasing ApoB levels were linked to more severe neurological deficits. Similarly, the ApoB/ApoA1 ratio showed a significant positive correlation with NIHSS (r = 0.260, p = 0.003), implying that a more atherogenic lipid profile was associated with greater stroke severity. Overall, these findings indicate that reduced protective lipoproteins and elevated atherogenic markers correlate with worse clinical presentation in acute stroke.



DISCUSSION:

Total 130 cases included with mean age of 64.94 ± 11.85 years, with male predominance was observed, with men accounting for 63.8% of cases and women 36.2%. This demographic trend is consistent with previous reports. Kostapanos et al., described a similar age distribution with male predominance among patients experiencing first-time ischemic stroke,12 while Sabino et al., also observed a higher proportion of male patients and reported increasing stroke severity with advancing age.13 The relationship between age and stroke severity observed in the current study is further supported by Walldius et al., who demonstrated that age significantly influenced ischemic stroke risk in relation to apolipoprotein levels.[14]

Hypertension emerged as the most prevalent comorbidity, present in 56.9% of participants, whereas type 2 diabetes mellitus was reported in 24.6%. Other comorbid conditions were relatively uncommon. These findings are comparable with those reported by Kim et al.,15 and Park et al., where hypertension and diabetes were among the most prevalent vascular risk factors in ischemic stroke patients.16 However, similar to our findings, Kim et al., demonstrated that conventional risk factors, including hypertension and diabetes, lost significance after adjustment, whereas the apoB/apoA1 ratio remained independently associated with atherosclerotic stroke.[15]

Motor deficits were the predominant presenting features, with hemiplegia (20.0%), ataxia (19.2%), and hemiparesis (17.7%) being most common. Speech disturbances, including slurring of speech (15.4%) and aphasia (4.6%), were also frequently observed. Loss of consciousness and seizures were less common, and sensory or cranial symptoms were reported infrequently. Speech disturbances observed in our cohort are also consistent with clinical profiles described in large Asian stroke registries cited by Zheng et al..17 Comparable severity distributions were reported by Kostapanos et al., demonstrated that higher baseline NIHSS scores were predictive of poorer outcomes and were significantly associated with apolipoprotein abnormalities.12 Glycemic indices revealed suboptimal control in a subset of patients, with mean HbA1c of 7.0 ± 2.0%. Suboptimal glycemic control observed in a subset of patients aligns with findings by Walldius et al.14 and Zheng et al.,17 who noted that apolipoprotein-related stroke risk remained significant

irrespective of diabetes status. The wide variability in renal parameters in the present study reflects systemic vascular involvement, a factor also adjusted for in multivariate models used by Kostapanos et al.12 The present study demonstrated borderline abnormalities in conventional lipid parameters but marked elevation of apoB levels, reduced apoA1 levels, and an increased apoB/apoA1 ratio. This finding strongly corroborates results from Kim et al.,15 Park et al.,16 and Chei et al.,18 all of whom reported that apolipoprotein measures were superior to conventional lipid indices in reflecting atherosclerotic burden and stroke risk. Sharma et al., similarly reported stronger associations of apoB/apoA1 ratio with ischemic stroke compared to LDL- or total cholesterol-based ratios in a South Asian population.[19]

In the present study, increasing age showed a significant positive correlation with NIHSS scores, whereas BMI, blood pressure, glycemic indices, and conventional lipid parameters did not show significant associations with stroke severity (as assessed by the NIHSS score). Walldius et al., also demonstrated that apoB/apoA1 ratio retained predictive value independent of conventional metabolic variables.[14]

A significant association was observed between apolipoprotein levels and neurological severity (as assessed by the NIHSS score). Serum ApoA1 showed a moderate negative correlation with NIHSS scores, indicating a protective role, while ApoB and the ApoB/ApoA1 ratio demonstrated positive correlations with NIHSS, signifying that a more atherogenic apolipoprotein profile was associated with more severe ischemic stroke. These results are in strong agreement with Kostapanos et al., who demonstrated that higher apoB levels and apoB/apoA1 ratio independently predicted poor functional outcome, while higher apoA1 levels were protective.12 Similarly, Sabino et al., reported that elevated apoB/apoA1 ratio was independently associated with greater stroke severity (as assessed by the NIHSS score), early neurological deterioration, and poor functional outcome.20 Long-term prognostic relevance of these findings is further supported by Zheng et al., who demonstrated increased risks of recurrent stroke and adverse outcomes with higher apoB/apoA1 ratios.[17]

CONCLUSION:

The study findings suggest that apolipoprotein markers may better reflect atherogenic burden and cerebrovascular risk than conventional lipid measures alone. Overall, the study supports the hypothesis that an adverse apolipoprotein profile, along with established clinical risk factors, plays a significant role in the severityof acute ischemic stroke (as assessed by the NIHSS score) and underscores the potential value of incorporating ApoA1, ApoB, and their ratio into routine risk stratification and prognostic assessment in stroke patients.

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Conflict of interest: Nil

REFERENCES:

1. Katan M, Luft A. Global Burden of Stroke. Semin Neurol. 2018;38(2):208–11.
2. Kamalakannan S, Gudlavalleti AS V, Gudlavalleti VSM, Goenka S, Kuper H. Incidence & prevalence of stroke in India: A systematic review. Indian J Med Res. 2017;146(2):175–85.
3. Pandian JD, Sudhan P. Stroke epidemiology and stroke care services in India. J stroke. 2013;15(3):128.
4. Dirnagl U, Iadecola C, Moskowitz MA. Pathobiology of ischaemic stroke: an integrated view. Trends Neurosci. 1999;22(9):391–7.
5. O'Donnell MJ, Chin SL, Rangarajan S, Xavier D, Liu L, Zhang H, et al. Global and regional effects of potentially modifiable risk factors associated with acute stroke in 32 countries (INTERSTROKE): a case-control study. Lancet. 2016;388(10046):761–75.
6. Kang SY, Lee WI. Apolipoprotein E polymorphism in ischemic stroke patients with different pathogenetic origins. Korean J Lab Med. 2006;26(3):210–6.
7. Gu L, Su L, Chen Q, Liang B, Qin Y, Xie J, et al. Association between the apolipoprotein E gene polymorphism and ischemic stroke in Chinese populations: New data and meta-analysis. Exp Ther Med. 2013;5(3):853–9.
8. Sniderman AD, Williams K, Contois JH, Monroe HM, McQueen MJ, de Graaf J, et al. A meta-analysis of low-density lipoprotein cholesterol, non-high-density lipoprotein cholesterol, and apolipoprotein B as markers of cardiovascular risk. Circ Cardiovasc Qual Outcomes. 2011;4(3):337–45.
9. Rader DJ, Hovingh GK. HDL and cardiovascular disease. Lancet. 2014;384(9943):618–25.
10. Used R. Lipid-related markers and cardiovascular disease prediction. Jama. 2012;307(2499):506.
11. Yusuf S, Hawken S, Ounpuu S, Dans T, Avezum A, Lanas F, et al. Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (the INTERHEART study): case-control study. Lancet (London, England). 2004;364(9438):937–52.
12. Kostapanos MS, Christogiannis LG, Bika E, Bairaktari ET, Goudevenos JA, Elisaf MS, et al. Apolipoprotein B-to-A1 ratio as a predictor of acute ischemic nonembolic stroke in elderly subjects. J Stroke Cerebrovasc Dis. 2010;19(6):497–502.
13. Dahlén EM, Länne T, Engvall J, Lindström T, Grodzinsky E, Nystrom FH, et al. Carotid intima-media thickness and apolipoprotein B/apolipoprotein A-I ratio in middle-aged patients with type 2 diabetes. Diabet Med. 2009;26(4):384–90.
14. Walldius G, Aastveit AH, Jungner I. Stroke mortality and the apoB/apoA-I ratio: results of the AMORIS prospective study. J Intern Med. 2006;259(3):259–66.
15. Kim JS, Nah HW, Park SM, Kim SK, Cho KH, Lee J, et al. Risk factors and stroke mechanisms in atherosclerotic stroke: intracranial compared with extracranial and anterior compared with posterior circulation disease. Stroke. 2012 Dec;43(12):3313–8.
16. Park JH, Hong KS, Lee EJ, Lee J, Kim DE. High levels of apolipoprotein B/AI ratio are associated with intracranial atherosclerotic stenosis. Stroke. 2011 Nov;42(11):3040–6.
17. Zheng J, Sun Z, Zhang X, Li Z, Guo X, Xie Y, et al. Non-traditional lipid profiles associated with ischemic stroke not hemorrhagic stroke in hypertensive patients: results from an 8.4 years follow-up study. Lipids Health Dis. 2019;18(1):9.
18. Chien KL, Hsu HC, Su TC, Chen MF, Lee YT, Hu FB. Apolipoprotein B and non-high density lipoprotein cholesterol and the risk of coronary heart disease in Chinese. J Lipid Res. 2007;48(11):2499–505.
19. Sharma R, Reddy K, Sharma V. Apolipoproteins and carotid artery atherosclerosis in ischemic stroke patients: a case-control study. Ann Indian Acad Neurol. 2018;21(2):102–7.
20. Sabino A, Lima L, Sousa M. ApoB/ApoA-I ratio is independently associated with carotid intima-media thickness in type 2 diabetic subjects. Clin Chim Acta. 2018;480:63–8.