



Original article

Comparative study of risk factors and lipid profile pattern in ischemic and haemorrhagic stroke

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Abstract

Stroke is a devastating and disabling cerebrovascular disease with significant amount of residual deficit leading on economic loss. Creating awareness on common risk factors will reduce the incidence of stroke. The study was conducted to compare the risk factors and lipid profile pattern in ischemic and hemorrhagic strokes. This was a descriptive retrospective cross sectional study carried on new onset acute stroke patients admitted to Osmania General Hospital, Telangana State. 100 patients (n=50 ischemic stroke (isch), n=50 hemorrhagic stroke (haem)) were studied over a period of one year from May 2014 to April 2015. Data such as risk factors like hypertension, diabetes, smoking, alcohol, fasting lipid profile, CT or MRI brain were collected from medical records. A total of 100 patients were studied of whom 68 were males (isch n=32, haem n=36) and 32 were females (isch n=18, haem n=14). Patients with age <40 years were n=10; age between 41-59 years n=53 and age >60 years n=37. Risk factors included were hypertension n=62 (isch n=29, haem n=33), diabetes n=22 (isch n=12, haem n=10), both diabetes and hypertension n=15; smoking n=41 (isch n=24, haem n=17) alcoholism n=38 (isch n=22, haem n=16) and >2 risk factors in n=46 (isch n=26, haem n=20). Dyslipidemia (LDL >130, TC>200, HDL<40) as per ATP III guidelines was present in n=69 (43 isch+26 haem) patients. Patients with high LDL were n=15 (9 isch, 6 haem), high total cholesterol was found in n=15 (10 isch, 5 haem), low HDL cholesterol in n=60 (isch n=35, haem n=25) with a p=0.0124. Present study concludes hypertension in 62 %, low HDL (< 40 mg/dl) in 60 %, smoking in 41% are the risk factors for both ischemic and haemorrhagic strokes which are modifiable risk factors. Low HDL cholesterol is more significant with a p=0.0124 which can be improved by exercise.

Key words: Haemorrhagic stroke, Hypertension, Ischemic stroke, Modifiable risk factors, Smoking

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Stroke is a common medical emergency. The incidence rises steeply with age, and in many lower and middle income countries. It

is rising in association with less healthy life styles. Stroke is the most common clinical manifestation of cerebrovascular disease of which more than

99% are due to arterial involvement and less than 1% due to venous involvement in the form of cerebral venous thrombosis (CVT) and results in episodes of brain dysfunction. Among arterial causes 85% are due to infarction and 15% due to haemorrhage¹.

A stroke (or cerebrovascular accident) is a rapidly developing clinical symptoms and /or signs of focal, and at times global (applied to patients in deep coma and to those with sub arachnoid haemorrhage) loss of cerebral function, with symptoms lasting more than 24 hours or leading to death, with no apparent cause other than that of vascular origin². The national commission of macro economics and health has estimated that there will be 1.67 million stroke cases in India by 2015³.

According to WHO figures, global stroke deaths were 5.8 million in 2005 and are projected to increase to 6.5 million in 2015 and 7.8 million in 2030. Stroke, whether of ischemic or haemorrhagic origin, is a major health burden globally. It is the second most common cause of death, the leading

cause of disability in adults and the second most important cause of dementia worldwide⁴.

Risk factors, that may be classified as modifiable and non modifiable, increase the risk for ischemic stroke. Non modifiable risk factors for stroke include old age, male gender, ethnicity, family history and prior history of stroke. Modifiable risk factors may be subdivided into lifestyle and behavioural risk factors and non-lifestyle factors. Modifiable lifestyle risk factors include cigarette consumption and illicit drug use. Non-lifestyle risk factors include low socioeconomic status, arterial hypertension, dyslipidemia, heart disease and asymptomatic carotid artery disease⁵. Lifestyle modification is recommended as an initial therapy for patients with blood pressure of 120/80 mmHg or higher^{6,7}. Effective lifestyle interventions include weight loss, limited alcohol intake, aerobic physical activity, adequate potassium intake, reduction in sodium intake, and dietary regimens such as the Dietary Approaches to Stop Hypertension (DASH) eating plan as shown in table 1^{6,8}.

Table 1: Life style modifications for prevention and management of hypertension⁷

Lifestyle Modifications for Prevention and Management of Hypertension JNC 7		
Modification	Recommendation	Average Systolic BP Reduction Range Achieved with Intervention*
Weight reduction	Maintain normal body weight (BMI = 18.5-24.9 kg/m ²)	5-20 mm Hg/ 10 kg
DASH eating plan	Adopt a diet rich in fruits, vegetables, and low-fat dairy products with reduced content of saturated and total fat	8-14 mm Hg
Dietary sodium restriction	Reduce dietary sodium intake to 100 mmol/day (2.4 g sodium or 6 g sodium chloride)	2-8 mm Hg
Aerobic physical activity	Regular aerobic physical activity (e.g., brisk walking) at least 30 min/day, most days of the week	4-9 mm Hg
Moderation of alcohol consumption	Men: limit to 2 drinks† per day; women and lighter-weight persons: limit to 1 drink per day	2-4 mm Hg

Antihypertensive medications are recommended in addition to lifestyle measures for patients with blood pressure of 140/90 mmHg or higher, with a lower threshold of 130/80 mmHg or higher in those with diabetes and chronic kidney disease. Of all the identified modifiable risk factors for stroke, hypertension appears to be the most important, owing to its high prevalence and its associated three to fivefold increase in stroke risk^{6,9}. Modification of risk factors itself can help achieve 2% reduction in overall stroke mortality per annum¹⁰.

Materials and methods

Source of data

A total of 100 new onset acute stroke patients admitted at Osmania General Hospital were assessed. A detailed history, physical examination details were collected from patients records. Data pertaining to risk factors such as hypertension, diabetes, smoking, alcoholism, fasting lipid profile and Computerized Tomography (CT) or Magnetic Resonance Imaging (MRI) brain were collected.

Duration of study

The study was carried out on patients presenting with stroke during 12 months period from May 2014 to April 2015 with acute stroke.

Inclusion criteria

100 patients between 20 to 80 years of age who were admitted in the department of General Medicine with acute stroke in Osmania General Hospital, Hyderabad, Telangana State were included.

Exclusion criteria:

Patients who had brain tumour, head trauma, previously on lipid lowering drugs, transient ischemic attack, syncopal attacks and presumptive diagnosis of stroke with no evidence on CT were excluded.

Results

A total of 100 patients were studied of whom 68 were males (isch n=32, haem n=36) and females were 32 (isch n=18, haem n= 14). In our study there is male preponderance in 41-59 years age group. Patients with age <40 years were n=10, age between 41-59 years n=53 and age >60years n=37 (Fig 1).

As shown in figure 2, the commonest risk factor being hypertension n= 62 (isch n=29, haem n=33), followed by > 2 risk factors in n=46 (isch n=26, haem n=20), smoking n=41 (isch n=24, haem n=17), diabetes n=22 (isch n=12, haem n=10).

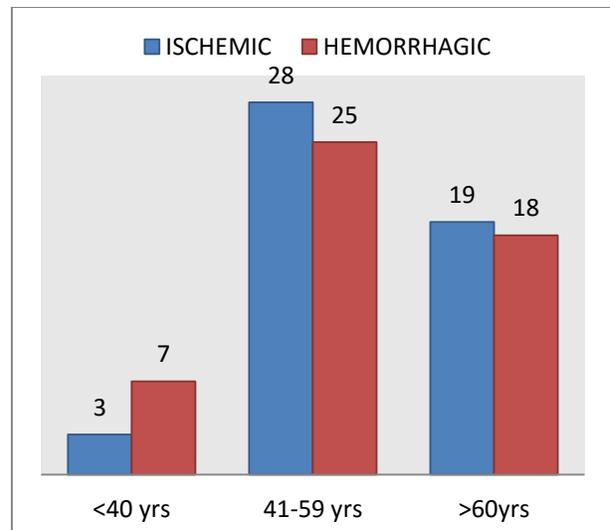


Fig 1. Age distribution

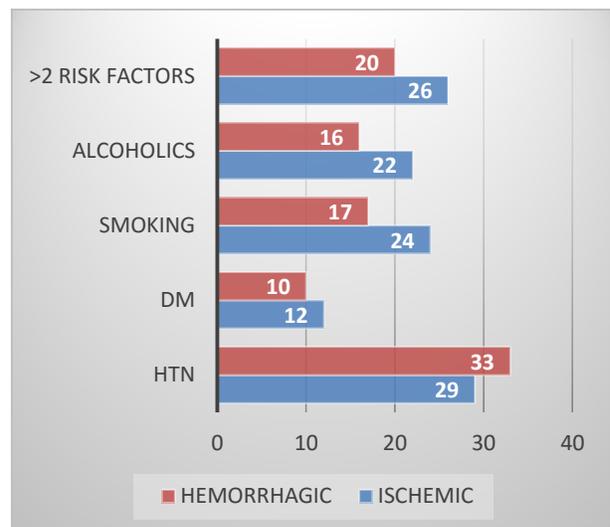


Fig 2. Risk factors

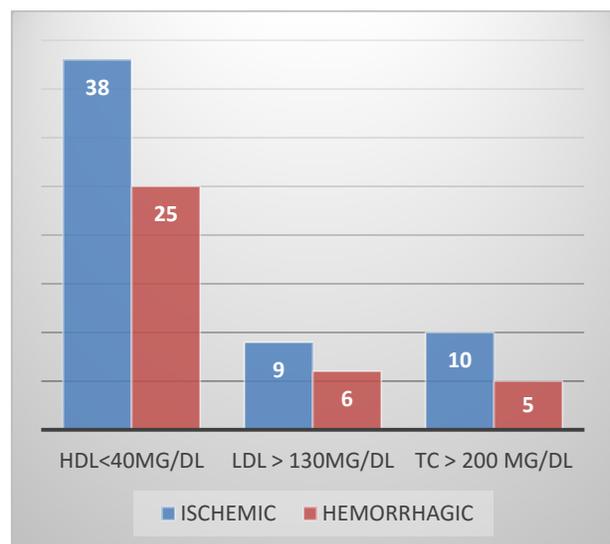


Fig 3. Dyslipidaemia pattern

Table 2: Comparison of risk factors in ischemic and haemorrhagic stroke

Risk factors	Ischemic	Haemorrhagic	Fischer exact test, p value
HDL <40	35 (70%)	25 (50%)	0.0124
LDL>130	9 (18%)	6 (12%)	0.5766
TC>200	10 (20%)	5 (10%)	0.2623
Hypertension	29 (58%)	33 (66%)	0.5368
Diabetes mellitus	12 (24%)	10 (20%)	0.8097
Alcohol	22 (44%)	16 (32%)	0.3030
Smoking	24 (48%)	17 (34%)	0.2223
>2 risk factors	26(52%)	20(40%)	0.3158

In our study patients with high LDL were n= 15 (9 isch, 6 haem), high total cholesterol was found in n=15 (10 isch, 5 haem), low HDL cholesterol in n=60 (isch n=35, haem n=25) with a p value 0.0124 as shown in figure 3 and table 2.

Discussion

Stroke is also a leading cause of morbidity with 20% of survivors requiring institutional care after 3 months and 15-30% remaining permanently disabled³. Three types of major strokes are ischemic, haemorrhagic and lacunar strokes. Ischemic variety with cerebral infarction results from atherothrombosis or brain embolism to cerebral vessels¹¹. Ischemic stroke is generally caused by one of three pathogenic mechanisms: large artery atherosclerosis in extracranial and large intracranial arteries, embolism from the heart, intracranial small-vessel disease (lacunar infarcts)¹². Transient ischemic attack (TIA), a temporary neurologic deficit caused by a cerebrovascular disease leaves no clinical or imaging trace. TIA defines rapid regression of a focal stroke syndrome that reverses itself entirely and dramatically over a period of minutes or up to one hour¹³. The term lacune was first introduced in 1843 by M. Durand-Fardel to describe small, sub-cortical areas lacking gray and white matter¹⁴. Less than 2 cm in diameter, lacunes are small infarcts that result from occlusion of small penetrating branches arising from large arteries¹⁵. Transient ischemic attacks (TIAs) accounted for 14.8% of the total cerebrovascular events¹⁶. Of all the identified modifiable risk factors for stroke, hypertension appears to be the most important, owing to its high prevalence and its associated three to fivefold increase in stroke risk¹⁷. Based on epidemiologic data, approximately 50% of strokes

could be prevented if hypertension were to be eliminated¹⁸. Hypertension contributes to each of the major intermediate causes of both ischemic and hemorrhagic stroke including carotid stenosis, intracranial atherosclerosis, small-vessel arteriosclerosis, and both macroscopic and microscopic aneurysms. Cigarette smoking increases the risk of sub-arachnoid haemorrhage by 100% or more, perhaps by increasing the release of proteolytic enzymes that effect blood vessel integrity¹⁹. Alcohol induced hypertension, relative anticoagulation, or increased cerebral blood flow may be responsible. The association between alcohol and stroke risk appears much stronger for intra-cerebral and sub-arachnoid haemorrhage than for ischemic stroke. Reduction in alcohol consumption may be accompanied by a reduction in the risk of subsequent hemorrhagic stroke²⁰.

Other risk factors for intra-cerebral haemorrhage include age, race, substance abuse, anticoagulation, platelet dysfunction, and vascular and structural anomalies. Rates of intra-cerebral haemorrhage increase with age. Excessive anticoagulation and anti-platelet therapy also increase the risk of intra-cerebral haemorrhage^{20,21}. Dyslipidaemia is a major risk factor for CAD and ischemic stroke²²⁻²⁴. It causes insulin resistance which results in increased levels of plasma triglycerides and LDL cholesterol and a decreased concentration of HDL cholesterol, as an important risk factor for peripheral vascular disease, stroke, and CAD^{25,26}. Serum HDL cholesterol has anti-atherogenic properties with ability to trigger the flux of cholesterol from peripheral cells to the liver and thus having a protective effect²⁷. Diabetes mellitus is a prominent risk factor for cerebral infarction²⁸. Diabetes contributes to atherosclerosis of the cerebral arteries and alters cerebral blood flow. It has been associated with both small-vessel lacunar infarction and large vessel stroke²⁹. Therapeutic options to increase HDL cholesterol levels include lifestyle modifications such as increased exercise, smoking cessation, moderate alcohol consumption and adoption of a Mediterranean diet^{29,30}. Low-carbohydrate diets raise HDL cholesterol levels by approximately 10%; soy protein with isoflavones raises HDL by 3% (strength of recommendation [SOR]: **C**, based on meta-analysis of physiologic parameters). The Dietary Approaches to Stop Hypertension (DASH) diet and multivitamin supplementation raise HDL 21% to 33% (SOR: **C**, based on single randomized trial each measuring physiologic parameters). No other dietary interventions studied raise HDL (SOR: **C**, based on meta-analysis of physiologic parameters)^{8,31}.

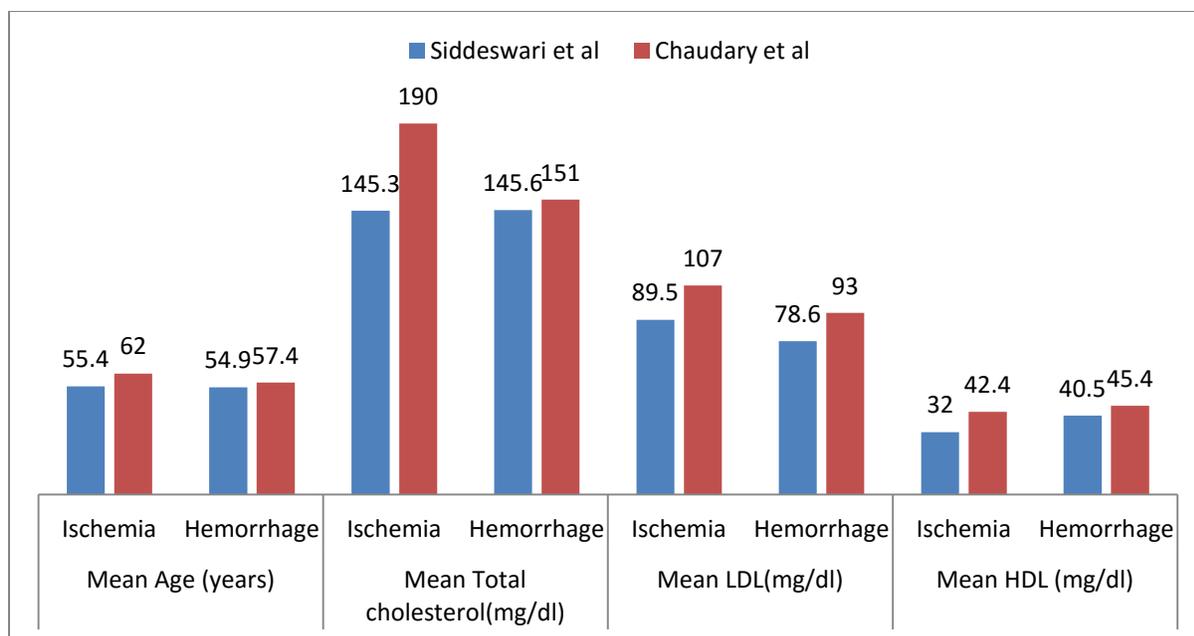


Fig 4. Comparison between two different studies

Table 3: Comparison between the current study and the study conducted by Chaudhury et al

Authors	Age (in years)		Male		Female		Total cholesterol		Low density lipoprotein		High density lipoprotein	
	Isch	Haem	Isch	Haem	Isch	Haem	Isch	Haem	Isch	Haem	Isch	Haem
Siddeswari et al	55.4±10.4	54.9±12.3	32 (64%)	36 (72%)	18 (36%)	14 (28%)	145.3±49.2	145.6±44.1	89.5±38.1	78.6±34.4	32±9.9	40.5±15.8
Chaudhury et al	62±10.0	57.4±7.3	35 (70%)	33 (66%)	15 (30%)	17 (34%)	190±35.0	151±29.0	107±21.0	93±17.0	42.4±6.0	45.4±5.0

In comparison with study conducted by Chaudhury SR et al³², mean age in years for stroke was 55.4 vs 62 in ischemic, 54.9 vs 57.4 in haemorrhagic. Mean total cholesterol in mg/dl was 145 vs 190 in ischemic, 145 vs 151 in haemorrhagic, mean LDL in mg/dl was 89.5 vs 107 in ischemic, 78.6 vs 93 in haemorrhagic, mean HDL in mg/dl is 32 vs 42.4 in ischemic, 40.5 vs 45.4 in haemorrhagic stroke as mentioned in table 3 and figure 4³².

Conclusion

Present study concludes that common non-modifiable risk factor was male sex in ischemic (64%) vs haemorrhagic (72%) stroke. Modifiable non life style risk factors includes: 1) low HDL (<40 mg/dl) in 70% in ischemic vs 50% in haemorrhagic, 2) hypertension 58% in ischemic vs 66% in haemorrhagic, 3) More than 2 risk factors 52% in ischemic vs 40% in haemorrhagic stroke. Modifiable behavioural risk factors include: 1) smoking 48% in ischemic vs 40% in haemorrhagic stroke, 2) alcoholism 44% in ischemic vs 32% in haemorrhagic stroke. By creating awareness about exercise

which improves HDL, motivating about DASH eating plan to control hypertension and motivating to quit smoking, we can reduce the incidence of stroke.

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Conflict of interest: None

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Clinical features, risk factors, lipid profiles and stroke patterns were identified. RESULTS: mean age was significantly higher in ischaemic stroke compared to haemorrhagic. Stroke was defined and categorized into hemorrhagic and ischemic stroke based on brain computerized tomography (CT) scan findings. As regard the patterns of dyslipidaemia in our study, low HDL-C is the most prevalent pattern in our study (74.5%), followed by elevated LDL-C (7.5%), high TC (5.7%) and elevated TG (4.7%). There was no significant difference in the pattern of lipids among ischaemic stroke compared to haemorrhagic stroke, although all lipid parameters were higher in ischaemic stroke compared to haemorrhagic stroke. A Study on Risk Factors and Lipid Profile Pattern in Patients of Ischemic Stroke in a Tertiary Care Hospital, Maharashtra, India. Aparna Patange*, Piyush Prajapati, Shilpa Patil, Pradip Warghane, Shruti Rao, and Ajinkya Bahulekar. Department of General Medicine, KIMS, Karad, Maharashtra, India. ABSTRACT. Stroke is leading cause of death worldwide. Dyslipidemia is one of the important risk factor in patients with coronary heart disease. To study the association of dyslipidemia with stroke. Study design- Retrospective cross-sectional descriptive study Method of collection of data- A hundred pati