

Original Research Article

A study on prevalence of carotid artery stenosis in acute ischaemic stroke patients in Amalapuram, Andhra Pradesh, India

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ABSTRACT

Background: Extra cranial carotid disease due to arteriosclerosis is usually associated with hypercholesterolemia and hyperlipidemia. Extra cranial carotid stenosis has been found to be less prevalent in black American and in Egyptians while intracranial disease is far more common. Various methods include transcranial doppler (TCD) ultrasonography, cerebral angiography, computed tomography angiography (CTA) and magnetic resonance angiography (MRA).

Methods: All patients with ischaemic stroke of acute onset admitted in the medical wards of Konaseema institute of medical sciences between June 2018 and January 2019 were included in the study. All patients were subjected to CT scan brain study and colour Doppler study of extra cranial carotid arteries and vertebral arteries. Systolic and diastolic velocity of blood flow, carotid intimal medial thickness, presence of atheromatous plaque and thrombus was looked for and then the percentage of stenosis of the affected arteries was calculated.

Results: In the present study out of 23 patients with carotid stenosis 9 patients had mild carotid stenosis, 8 patients had moderate stenosis and 6 patients had severe stenosis. Out of 23 patients with carotid stenosis the 11 patients have stenosis in the right carotid and 12 patients had stenosis in the left side. The site of stenosis is ICA in 17 patients and CCA in 6 patients.

Conclusions: In present study every patient with carotid artery stenosis had one or the other risk factor for carotid atherosclerosis. In other words, there was no patient with carotid artery stenosis, without any risk factor in present study. Hence asymptomatic patients with these risk factors should be screened for carotid stenosis to prevent stroke.

Keywords: Acute ischaemic stroke patients, Carotid artery stenosis, Correlation

INTRODUCTION

The third leading cause of death in both developing and developed countries is stroke. The ischemic strokes of approximately 12.9% occurs secondary to atherosclerotic arterial stenosis.¹

Factors which are responsible for stroke include increasing modernization, smoking, lifestyle changes, increase in prevalence of diabetes mellitus, hypertension, hyperlipidemia and obesity.^{1,2} Nonmodifiable risk factors

include age, sex, low birth weight, race/ethnicity, and various genetic factors like hyperhomocysteinemia.³ Atherosclerotic carotid disease is a common cause of cerebral ischemia. Common site for atherosclerosis is abdominal aorta, next comes the internal carotid artery. The common source of emboli that travels to the brain, is atherosclerosis of extra cranial part of carotid artery causing stroke.⁴

The endothelium is interrupted by atherosclerotic plaque, leading to platelet adhesion to the vessel wall and

formation of hemostatic plug. the occlusive thrombus is formed due to platelet nidus which initiates the coagulation cascade. The atherosclerotic plaques cause thrombus formation causes distal embolization and blood vessel obstruction causing hypo perfusion and infarct of brain tissue.⁴ Larger plaques can result in high grade stenosis or obstruction with subsequent ischemic stroke in watershed areas due to a reduction in blood flow.

Gold standard diagnostic tool for carotid stenosis is arteriography. Stroke mimics are to be differentiated from stroke to avoid inappropriate treatment. Though there are many investigations, CT and MRI play major role in the diagnosis of stroke.⁵ Though MRI is superior to CT scan, the higher cost of the MRI, and the easy availability of CT scan brain makes CT the commonest investigation in diagnosis and treatment of stroke.⁵ CT plays a major role in Stroke to assess site, size and nature of the lesion. Arteriographic and necropsy studies show that occlusion of the cerebral and extracerebral arteries are the frequent cause of ischemia and infarction

Extra cranial carotid disease due to arteriosclerosis is usually associated with hypercholesterolemia and hyperlipidemia. Extra cranial carotid stenosis has been found to be less prevalent in black American and in Egyptians while intracranial disease is far more common.⁶ The aims and objectives of this study were based on to find out the prevalence of carotid artery stenosis in acute ischemic stroke patients and the association between carotid artery stenosis and risk factors such as diabetes mellitus, hypertension, hyperlipidemia, smoking and age.

METHODS

The place of study was Konasema institute of medical sciences and research foundation, Amalapuram, Andhra Pradesh, India. The collaborative department was general medicine. The study design was cross sectional hospital-based prevalence study the study sample was 50 patients.

Inclusion criteria

- Age: 18-80 years,
- Sex: Both genders,
- Acute stroke of less than 2 weeks duration,
- Acute stroke with CT brain showing infarct,
- Patients with or without known H/o DM/HT/ hyperlipidemia,
- Patients with risk of accelerated atherogenesis like smoking,
- Patients with or without past H/o of CVA/CAD.

Exclusion criteria

Neurologic

- Duration of stroke >2 weeks,
- Patients with hemorrhagic stroke,

- Patients with H/o head injury.

Systemic illness

- Hemodynamically unstable patients,
- Malignancy,
- Unconscious patients,
- HIV,
- Stroke due to infections like TB,
- Metabolic emergencies,
- Poor general condition,
- Other systemic illness.

All patients with ischaemic stroke of acute onset admitted in the medical wards of Konaseema institute of medical sciences, Amalapuram, Andhra Pradesh, India between June 2018 and January 2019 were included in the study.

All vitals were recorded, and careful methodical examination of the central nervous system carried out recording all the physical signs in order cardiovascular system was carefully examined, arterial pulses including carotid, internal carotid, radial and all other peripheral pulses were examined. Investigations like Hb% TC, DC, ESR, platelet count, fasting blood sugar, urea, Serum Creatinine, fasting lipid profile, urine analyses, CXR, ECG, echo, CT-brain and carotid doppler were done for all patients. All patients were subjected to CT scan brain study and color doppler study of extra cranial carotid arteries and vertebral arteries. Systolic and diastolic velocity of blood flow, carotid intimal medial thickness, presence of athermanous plaque and thrombus was looked for and then the percentage of stenosis of the affected arteries was calculated.

The doppler instrument used in the study was sonicate. It has a triplex scanning system comprising of

- High resolution B-mode imaging,
- Pulsed wave doppler sonography,
- Color doppler flow imaging,

Carotid doppler ultrasound examination

Patients are made to lie in supine position for examining the carotid arteries and the examiner is seated at or next to the patient's head. Transducer positions are used accordingly to examine the carotid arteries in long axis planes, which show the CCA, ICA and carotid bifurcation best. The images are viewed and then recorded.

Statistical analysis

Statistical analysis was carried out for 50 subjects. Age, presence of diabetes, hypertension, smoking, alcoholism and hyperlipidemia were analyzed in patients with and without carotid stenosis admitted for acute ischemic stroke. The statistical significance was calculated using chi-square test.

Statistical significance was taken when P value was <0.05. Statistical analysis was carried using standard formulae. Microsoft Excel 2010 and SPSS (statistical package for social sciences) Version 13.0 software's were used for data entry and analysis.

RESULTS

As per (Table 1), in the present study conducted on 50 patient's carotid stenosis was present in 23 (46%) while remaining 27 patients are without carotid stenosis.

Table1: Prevalence of carotid stenosis in acute ischemic stroke patients.

Total No. of patients in whom carotid doppler was done	Patients with carotid stenosis	Percentage	Patient without carotid stenosis
50	23	46%	27

Age distribution and percentage of stroke patients with carotid stenosis

Table 2: Patient characteristics.

Characteristics	Present	absent
diabetes	18	32
hypertension	26	24
Smoking	24	26
Increased total cholesterol	28	22
Increased LDL	20	30
Decreased HDL	11	39
Increased TGL	26	24

(Table 2) shows that in the present study out of 20 patients who are below the age of 50 years only 6 patients had carotid stenosis, while in the remaining 30 patients who are above 50 years, 17 patients had carotid stenosis (70%).

Table 3: Sex distribution and percentage of male and female patients with carotid stenosis.

Sex	Total	Stenosis	No. stenosis	Percentage of patients
Male	40	21	19	53
Female	10	2	8	20

From (Table 3) it is clear that out of 50 patients in the study 40 are male and 10 are female patients with prevalence of carotid stenosis 53% and 20% respectively (P<0.001).

As per (Table 4), out of 18 diabetic patients 14 patients had stenosis and 4 were without stenosis. Out of 32 nondiabetic patients 10 patients had carotid stenosis. Out of 50 patients 26 patients presented with hypertension and among them 19 patients have stenosis.24 patients were non hypertensive among them 8 were having stenosis.

As per (Table 5), out of 28 smokers 17 had stenosis. Out of 20 non-smoker 8 have stenosis. Prevalence of carotid stenosis was more in smokers than in non-smokers. Cholesterol level was high in 32 patients out of them 20

patients were having stenosis.18 patients cholesterol was below 200mg/dl but out of them 12 having stenosis.

Table 4: Correlation between diabetes mellitus, hypertension and carotid stenosis.

	Total	Stenosis	No stenosis
DM	18	14	4
Non DM	32	10	22
total	50	24	26
HTN	26	19	7
Non HTN	24	8	16

Table 5: Correlation between smoking and increased cholesterol and carotid stenosis.

	Total	Stenosis	No stenosis
Smoker	28	17	11
Non smoker	22	8	14
Cholesterol(>200mg/dl)	32	20	12
Cholesterol(<200mg/dl)	18	12	6

Table 6: Degree of carotid stenosis in ischemic stroke patients.

Degree of stenosis	No. of cases	(%)
Mild stenosis (<50%)	9	18
Moderate stenosis (50-69%)	8	16
Severe or significant stenosis (>70%)	6	12
No stenosis	27	54

As per (Table 6), in the present study out of 23 patients with carotid stenosis 9 patients had mild carotid stenosis, 8 patients had moderate stenosis and 6 patients had severe stenosis.54 % patients have no stenosis.

Site of carotid stenosis

Out of 23 patients with carotid stenosis the 11 patients have stenosis in the right carotid and 12 patients had

stenosis in the left side. The site of stenosis is ICA in 17 patients and CCA in 6 patients.

DISCUSSION

In present study we have found that the prevalence of carotid stenosis in acute ischemic stroke patients is about 46%, consistent with studies done by Nonga NB et al, and Oliviero U et al.^{7,8} In their study the prevalence of carotid stenosis was about 46% in ischemic stroke patients.

The percentage of patients with significant stenosis (>70%) was about 12% which is associated with the recurrence of stroke. The prevalence of significant stenosis in studies conducted in Western population is about 21%. This variation could be due to racial and demographic differences. The prevalence of asymptomatic carotid stenosis (>50%) in a study conducted in asymptomatic carotid stenosis patients by Mineva PP et al, was 6.4%.^{9,10}

Age and carotid stenosis

Authors found in present study the percentage of patients who had carotid stenosis, increased with increase in age. The prevalence in patients 60 years was about 30%, 54%, and 63% respectively. In a study conducted by Rajamani K et al, showed increasing incidence of carotid stenosis with increase in age in African American men.³ Carotid stenosis in keeping with atherosclerotic diseases, increases with age. The risk of carotid atherosclerosis increases after 45 years of age.

Sex and carotid stenosis

Authors found that the prevalence of carotid stenosis was more in males (53%) than females (20%) which was consistent with studies conducted by Selhub J et al.¹¹ It is also shown by Sacco RL et al, that carotid stenosis was commoner in males (43%) than females.⁴

Risk factors of carotid atherosclerosis

Diabetes mellitus and carotid stenosis carotid artery stenosis was more common in diabetics (77%) than in non-diabetics (31%) and it was statistically significant. Rajamani K et al, have shown in their study that carotid stenosis was more common in diabetics (22%).³

Hypertension and carotid stenosis

In present study we found that hypertension was one of the risk factors for carotid stenosis and the prevalence of carotid stenosis was more in hypertensives (73%) than in normotensives (33%), consistent with the studies done by Ngo Nonga, in their study, found that asymptomatic carotid stenosis was found in 25% of adults with hypertension, than those without hypertension. The predictors of carotid stenosis were systolic BP>160

mmHg and in isolated systolic hypertension patients when diastolic BP was <75mmHg there is strong correlation with carotid stenosis.

Smoking and carotid stenosis

In present study authors found that smoking acts as a risk factor for carotid stenosis. More smokers (60%) had carotid stenosis than non-smokers (36%), which is also shown by Muller HR et al.¹²

Hyperlipidemia and carotid stenosis

Prevalence of carotid stenosis, just like coronary atherosclerotic disease, increases with hyper cholesterol (>200mg/dl) and Increased LDL (>150mg/dl) and Increased TGL(>130mg/dl) and decreased HDL (<40mg/dl). They are associated with extra cranial large vessel atherosclerosis and also coronary atherosclerosis. Extracranial carotid atherosclerosis is associated with major brain vessel occlusion, leading to infarct of brain tissue 6.

Site and carotid stenosis

In present study carotid stenosis was found at the bifurcation of CCA, and the origin of ICA. Carotid stenosis was almost equal on both sides.

CONCLUSION

Authors have found that age, male sex, smoking, HT, DM and Hyperlipidemia are associated with increased rate of carotid stenosis.

In authors study every patient with carotid artery stenosis had one or the other risk factor for carotid atherosclerosis. In other words, there was no patient with carotid artery stenosis, without any risk factor in present study. Hence asymptomatic patients with these risk factors should be screened for carotid stenosis to prevent stroke.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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